

New Opportunity in the Value Chain

At this inflection point in the market, SATS firms have an unprecedented opportunity to capture new profit

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The semiconductor value chain is well known. It is a mix of captive and independent software, hardware and service vendors and suppliers that stretches from EDA tools through manufacturing to assembly, test and distribution. Players range in size from a handful of engineers designing a new tool to massive IDMs and foundries. This value chain is highly competitive and profitability is a slippery outcome.

In the 1990's integrated device manufacturers (IDM) followed a two step plan for profitability. First, IDMs and their fabled offspring tried to develop a "platform product". The hope was that their silicon platform would become the foundation around which the company could build derivatives and develop extensions, as Intel has done with microprocessors.

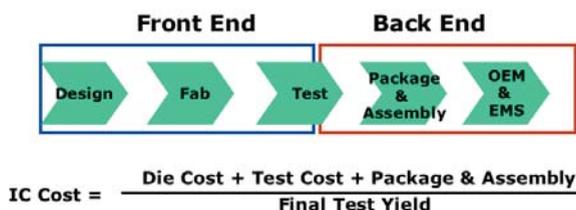
The second step was to find volume markets such as the PC, display or cellular phone, to take advantage of the silicon platform where the advantages of Moore's Law (greater performance at lower costs) would greatly expand the end market demand through lower end product prices with greater and greater functionality.

Blindly following the IC manufacturer for platform product, volume markets became the SATS siren song in the new millennium. Volume meant revenue and profits. However to get the volume required SATS companies to make capital investments in test and assembly equipment

Capital investments weren't in the game plan. Few SATS companies perceive themselves as anything other than working to reduce the cost of their expertise. SATS history is as a cost center. In the beginning assembly and test was seen as the labor intensive cost center for IDMs. Now the service is seen as a necessary evil, a cost requires to display the chip designer's brilliance. Meanwhile IDMs and foundries continue to coerce SATS companies into lower fees for their expertise and much of this expertise has nothing to do with labor costs.

Three forces affecting the IC value chain have driven SATS firms to lower return on investment (ROI).

The IC Cost Chain



IC costs are functions of process, leaving little wiggle room in today's merciless world of margin pressure.

One reason for margin crisis is increasing IC cost, rising die, test and packaging & assembly costs – while final test yields remain stagnant. Another indicator that margin leverage is migrating to STAT.

Elephant costs, canary returns. By the end of the 1990's boom SATS found themselves investing in an expensive technology curve but not getting the required return.

Suddenly a SATS company experienced the worst of Moore's Law – increasing capital costs and rapidly declining pricing not being amortized over larger and larger volume. New equipment was required to match new generations of new chips and packaging types. SATS firms were caught on the technology treadmill as they follow the lordly manufacturers to new geometry's which require new packaging techniques with ever-finer tolerances

Spider web supply chain. Today's global supply chain provides both a telescopic and microscopic look into the market never before available in the complex world of IC design, fabrication, and delivery. It is a great tool when running contract manufacturing or an original equipment manufacturer (OEM) business.

The growth of the global supply chain has destroyed the relationship SATS firms had built with customers. In the beginning foundries grew as OEMs disaggregated their business models to focus on their core competencies and SATS emerged as a key in product cost and delivery. Today SATS is integral to the web that is global supply chain; but the SATS have lost huge amounts of customer equity in the process, equity in the form of customer relationships and partnerships. The global supply chain with its telescopic view destroys vendor/partner. Old relationships and business partnerships die when procurement has the ability to look

globally for advantages in time, delivery and price.

Supposedly the supply chain creates a true capitalistic market where everyone can compete. But the SATS don't win because the supply chain traps them in a spider web of global competition. Stuck and they can't get out.

Mongoose Markets. The end market today resembles a mongoose with rapid movement in and out of holes, up, down and around looking fickle, but known to be ruthless. The mongoose keeps moving to forage for opportunities that become present and move on to the next opportunity. Like the mongoose, many end-user markets begin to look more consumer-like with price points that don't require deliberation (i.e. under \$200), short product cycles and high segmentation to meet specific end-user requirements or one to one marketing.

Three negatives driving today's SATS marketplace:

Elephant costs, canary returns: Running on an expensive technology treadmill without getting necessary returns

Spider web supply chain: Trapped in a web of global competition

Mongoose Markets: Fickle, fast and but ruthless

The movement to a short-cycle consumer-like business model tends to eliminate volume and long production runs. In addition

the IC value chain moves from a learning curve model, where smart players can make money following the learning curve – to an order stocking model where ROI is dependent on the having the product available during its short lifecycle and at a fixed price-point that leaves little opportunity for entering under the learning curve.

The three drivers effect the entire value chain negatively shifting value from the technology provider to the end user. For example cellular phones are basically free regardless of the technology stuffed inside.

For IC firms higher levels of integration have led to lower system costs, prompting market to grow driven by lower system costs. Good? No! Because, at this point a weird economic inversion occurred. As the consumer became accustomed to newer, better, faster, cheaper – demand, driven by low cost, coupled with splintering markets, lead to higher technology costs. But, the sellers of technology received lower value for their technology because, in our example, the cost of the cellular phone remained zero to the end user.

To regain that lost value semiconductor manufacturers can cram more in a chip. Or rework and update the monolithic methodology. But despite these tactics, the cell phone is free.

In this environment profits have eluded many IC firms, while simultaneously with each chip they ship the value of their technology downstream to the OEM. The good news is that SATS firms can gain big profits in this environment.

SATS as a Profit Center

In the market the follower, the SATS, like the medieval vassals can lament that the lordly IDMs and fabless firms are in bad shape and thus their outlook is grim. Or the SATS firms can view this as an inflection point in the market, as a challenge for change. SATS firms have the chance to gain big returns, due to this unprecedented break

in the semiconductor value chain.

The positive driver is, why build it in silicon? Why not achieve same functionality using innovative packaging?

Promoting such ideas requires new thinking, especially a new understanding of “The Customer” with a sales shift from IC firm to OEM. No longer a vassal the SATS firm become a true mercenary seeking the greatest return for investors.

Instead of relying on the foundry to send over the monolithics, ASICS or FPGAs, the innovational firms could approach the OEM, asking system question to determine desired functionality, then help design teams to understand how their goal might be achieved through such techniques an multi-chip modules or stack packing. For the OEM the basic financial question is: Why integrate on silicon when you can achieve comparable functionality in the package. Roles reverse as the IC firm becomes a commodity supplier while the SATS delivers the high value-add.

The opportunity is now. 2004 is the year for SATS to leverage this change, capturing the value being lost by the IC firms.

SATS have this opportunity because it offers new flexibility, which until recently was part of the semiconductor company’s value proposition. This flexibility results

from technology such as flexible substrates that allow the SATS firm to add value, which was once reserved for the IC firm.

One idea is to sell the OEM that they can achieve required functionality using innovative package techniques rather than expensive FPGAs, PLDs or ASICS. The advantages are that innovative packaging techniques will cost less while meeting their need for time-to-market.

Another idea is to emphasize “good enough” benefits over traditional build to spec. For example by using packaging the OEM might achieve good enough results to fit the product need. Maybe not the highest functionality possible, but of high value to the OEM because it fills the need quickly getting end product to market faster.

In addition with good enough, real costs are lower in terms of engineering and hardware cost and the OEM can get to market sooner at a lower cost.

An irony is that this opportunity begins to make SATS look more like an aggressive contract manufacturer rather than a subservient foundry vassal. There is an analogy here in that EMS assembles boards while the SATS assembles chips – and boards are simply a higher level of integration than a modern package. If SATS firms seize the opportunity, the value chain will witness SATS growth into EMS-like strength. If not the EMS may acquire SATS capability.

Today SATS firms have the potential to turn old historic value chain inside out. Savvy executives are realizing that value is now in the hands of SATS not the IC firms. To capture the opportunity, gains profitability SATS firms must:

- Recognize high value of their work
- Stop thinking like a cost center
- Sell their value to end user/OEM not IC firm

On the other hand, if SATS do not take charge of this opportunity, value creation and profits that go along with it will most likely shift to the contract manufacturers. ♦

Changing Business Models

	Old Business Model	New Profit Model
Design & Process	<ul style="list-style-type: none"> ▪ Bigger Wafers ▪ Smaller Geometries ▪ Additional Design Tools ▪ High Cost ASICs 	<ul style="list-style-type: none"> ▪ Commodity CMOS Processes ▪ Promiscuous Foundries ▪ Ubiquitous Design Teams ▪ Ordinary FPGAs, ASSP, etc.
Markets	<ul style="list-style-type: none"> ▪ Big & Deep (PCs, Cell Phones) 	<ul style="list-style-type: none"> ▪ Fragmented & Short-term
Test, Assembly, Packaging	<ul style="list-style-type: none"> ▪ Cost Center ▪ Necessary/Boring ▪ Submissive to IC Companies 	<ul style="list-style-type: none"> ▪ Value Center ▪ Speeds Time-to-Market ▪ Improves Time-to-Revenue

New Opportunities for SATS Emerge in the Value Chain



Customer emphasis shifts from IC firm to OEM

OEMs can achieve required functionality using innovative package techniques to meet their need for time-to-market as consumer demand both variety and low price