



Unmixed signals

By Geoffrey James, photo courtesy of Texas Instruments -- 5/1/2005

Electronic Business

Texas Instruments CEO Rich Templeton believes a culture that forces you to spend time with customers on real-world problems maximizes your tendency to innovate.

Twenty years ago, Texas Instruments was the lost lamb of the electronics industry. Its memory chip business was marginally profitable, its personal computers were a bust and even TI's signature calculator business was under assault from Asian knockoffs. "The 1980s was one of our most difficult periods," remembers newly promoted CEO Rich Templeton, a 25-year TI veteran who most recently served as the company's COO.

Today, things couldn't be more different. TI is now the dominant vendor of the digital signal processors (DSPs) that are the brains of digital cameras; wireless modems; and, of course, cellular phones. It's a strategy that's propelled TI into becoming the third-largest semiconductor company in the world, according to this year's ranking by IC Insights (see "Top 50 Semiconductor Companies" chart). Fully half of the cell phones worldwide contain TI DSPs, and the company dominates most DSP market segments.

But what's next? Can TI extend its market dominance? Will TI and Intel go head to head as DSPs become more like processors and processors integrate more DSP technology? What new DSP applications are critical to TI's growth plans? What is TI's management, especially CEO Templeton, doing to ensure that TI remains competitive? And will TI's underground engineering continue to be an engine for innovation?

Short-term winner

It would be hard to find a company sitting prettier than TI. In 2004 the worldwide market for DSPs grew a whopping 27 percent, to \$7.9 billion, according to Tony Massimini, chief of technology at market research firm Semico. TI got the lion's share of that growth, increasing its market share from 48 percent to 50 percent, positioning TI perfectly for rapid future growth, because it can offer customers increasing economies of scale. Massimini predicts that the market for DPS will grow to \$12 billion by 2007. "It's one of the most attractive segments in the industry," he says.

The primary engine behind record DSP sales is the cell phone, which over the past few years, has become one of the most common consumer devices on the planet. More important for TI, the cell phone market is unlikely to become saturated, because the telecom carriers subsidize the purchase of new devices. "It's easier to get a new phone than to get a replacement battery for an old phone," says Mike Hames, TI's senior vice president of application-specific products. "The cell phone business has tremendous legs left, especially as more value for the consumer is integrated into each new phone."

Producing communications-oriented DSPs is only part of TI's strategy. TI executives are just as excited about advanced analog chips; digital light processors (DLPs), which produce clear, readable images on screens in lit rooms; and advanced DSPs targeted at high-volume digital entertainment products. TI execs like to brag about the SlingBox, a TI DSP-enabled gadget that allows consumers traveling anywhere in the world to use a portable computer to view video content stored on the consumer's home entertainment system. "We expect a lot of growth from devices that stretch people's idea of what and where entertainment should be," says Hames.

"We had customers using our generalized DSPs for digital still photography long before we knew that it would be a major product category."—Mike Hames, Texas Instruments

Even though there are half a dozen vendors in every DSP segment, TI has no problem winning customers, says Jerry Worchel, principal analyst at market research firm In-Stat (a division of EB's parent company). "Because it's the largest manufacturer, it has the economies of scale to offer customers more bang for the buck," he says. Indeed, it's easy to find TI customers willing to sing vendor hosannas. A case in point is SlingMedia, the maker of the SlingBox. "We knew that TI could provide what we needed in a single chip," says Jeremy Toeman, SlingMedia's vice president of product management. "The company also has an extensive support infrastructure that ensured that our engineers would be able to spend less time coming up to speed on DSP programming and more time on the experimental and unique aspects of our system."

Medium-term contender

TI simply towers over its competitors. In cell phone DSPs, for example, TI's largest competitor is Qualcomm, which commands only a third of TI's share and overall corporate revenue of only \$4.8 billion, versus TI's \$12.5 billion. Similarly, in programmable DSPs, TI's largest competitor is Freescale Semiconductor, which accounts for a measly 13 percent share, versus TI's 50 percent (see the chart "Programmable DSP Market Shares," below). TI is such a dominant vendor that some analysts believe there's only one company that might give it some trouble in the future: Intel.

Although Intel and TI are currently targeting very different markets, their respective corporate strategies practically guarantee future conflict. TI assumes that more functionality will constantly be crammed onto a single DSP chip. "Customers are looking for us to build a system-level solution, including signal processing, analog circuitry and power management, that's optimized for both low cost and long battery life," says Hames.

That's virtually the same strategy Intel is pursuing, but from the opposite end of the spectrum, according to Max Baron, an analyst who covers DSPs for In-Stat. "Intel's products, such as the MMX chip, include significant DSP-like capability," he says. In 2010 the system on a chip (SoC) for a smart phone may have as much processing power as today's PCs, which is why Intel is highly interested in DSPs, says Will Strauss, president of market research firm Forward Concepts. "There's already a lot of TI envy at Intel," he says.

Intel is also very much on TI's corporate radar. "Intel has been very public about its opinion that if a chip has a processor, then it ought to own the market for it," says Doug Rasor, TI's vice president of worldwide strategic marketing. "Because we're both processor companies, it sets up a natural competitive scenario." For his part, Hames unfavorably compares Intel to TI when it comes to delivering multiple products. "Intel releases only two or three products a year, as compared to anywhere from 50 to 200 for TI," he sniffs. "We know how to work better inside multiple customer market segments."

Given that TI basically owns the DSP market, Intel would seem likely to end up as the underdog, should the action move away from the desktop and data center and more toward consumer devices. However, Gary Smith, EDA analyst for Gartner Dataquest, points out that the DSP function in a CPU is far less important than the CPU function in an SoC, suggesting that market convergence might play to Intel's strengths. In addition, because there are only three large cell phone manufacturers, the defection of even one to Intel would immediately transform Intel into a major DSP vendor, predicts Baron.

Even so, Templeton pooh-poohs the idea of an Intel-versus-TI slap-down. "Business journalists like to write about the great chessboard in the sky," he says dismissively. Even so, he can't resist taking a potshot: "Whenever Intel gets outside the PC market, it hasn't managed to get the right product and customer focus, at least not to date." (It's the "at least not to date" that suggests that Templeton may not be all that nonchalant when it comes to Intel.)

Long-term visionary

Whatever happens between TI and Intel, TI's DSPs will definitely need some Intel-level processing power if the company's long-term vision is to become a market reality. Gene Frantz, a principal fellow and TI's "DSP visionary" identifies four areas in which DSPs will play a major role in the not-too-distant future: education, transportation, medicine and security (see the sidebar, "The Future According to TI," below).

For example, Frantz sees DSP-powered cell phones largely replacing the PC as the educational doodad of choice. "Today, schools are forcing kids to turn off their phones to keep them from cheating," he complains. "But in the future, schools will have to embrace telecommunications in order to implement new learning methods where students work collaboratively as a team."

Frantz similarly believes that cars should be controlling themselves rather than responding to the whims of a human driver. "Within 20 years, you'll just tell your car where you want to go and it will take you there," he predicts. Frantz's vision also includes security systems that make reasoned judgments about access to secure facilities and wearable medical monitoring devices that automatically administer life-saving drugs. "It will be a quality-of-life issue as the population ages," he says. "Why should diabetics be forced to test and medicate by hand?"

In other words, Frantz sees DSPs acting as intelligent agents, making decisions with life-and-death consequences. That such applications, even with a supercomputer, are far beyond the current state of artificial intelligence software doesn't worry him. "We're looking ahead to a time when these problems will be solved," he explains, pointing out that 20 years ago, the digital cell phone and digital camera, as concepts, were "very much on the lunatic fringe."

A skunk works culture

Even if Frantz's predictions turn out to be strictly science fiction, TI's growth will rely on the company's continued ability to innovate. Frantz is very optimistic on this subject, because he believes that TI's corporate culture ensures that new ideas will constantly emerge from the corporate underbelly. TI has what's sometimes called a "skunk works" engineering philosophy. Rather than pouring major funds into an advanced research group (like IBM or Microsoft) or granting research dollars to the execs with the most-ambitious development plans (like Intel), TI lets its advanced engineering take place largely in back rooms, using money that's intended for other businesses and product lines.

"We have an officially sanctioned engineering underground," explains Frantz. "Our management doesn't stop us from doing things that might pay off, even if those projects have failed to secure official funding." As a prototype of this arrangement, Frantz cites the Speak & Spell, an educational toy he pioneered in the mid-1970s. "We never obtained funding for the project, but management let us go ahead anyway," he says. Good thing, too, because although the technotoy never achieved "Tickle Me Elmo" popularity, it included a speech-synthesis chip that became the embryo for TI's DSPs. That technology survived, below the management's cost-cutting radar, for fully 15 years, only to emerge as a major product line, according to Templeton. "DSPs were hidden down in the business where little harm could be done to them from outside sources," he says.

"Intel has been very public about its opinion that if a chip has a processor, then it ought to own the market for it."—Doug Raser, vice president of worldwide strategic marketing, Texas Instruments

Allowing engineers latitude to experiment doesn't remove the need for management controls, though. To bridge the gap between what Frantz calls "wild hair" engineering and real business, the company has nonmanagement gurus (such as Frantz) assess the backroom efforts and provide whatever sponsorship they need in order to get beyond the experimentation phase. "I know I'm about to be fired from a project when I hear either of the following two words: schedule or profit," he quips.

Beyond the buzzwords

Skunk works aside, TI executives say that the company's major source for innovation is (warning: incoming management cliché) being "customer-focused." Although that term sounds like a sleep-inducing bromide, in the case of TI, it may be something more than run-of-the-mill buzzspeak. Here's why.

TI's DSP products come in two basic varieties: programmable and application-specific. TI markets its relatively expensive, low-volume programmable chips to companies developing new systems products or pioneering new product categories. Then, once a customer's products begin to get some sales traction, TI invests in building application-specific, high-volume chips that can provide the DSP functionality at a more attractive price point. "When you have a culture that forces you to spend time with customers on real-world problems, it maximizes your tendency to innovate," explains Templeton. Following this theme, Hames cites the digital camera as a market in which customers pushed TI into the business. "We had customers using our generalized DSPs for digital still photography long before we knew that it would be a major product category," he says. "As time went on, we began providing more and more options, integrating the technology into application-specific DSPs."

Templeton reinforces the company's "customer focus" in three ways:

First, he's keeping the company decentralized, so that product decisions are made close to the customer rather than at corporate headquarters. "We don't have a lot of corporate drones telling people what to do," Hames brags.

Second, Templeton measures TI primarily according to market share in specific customer product categories, such as cell phone DSPs and digital camera DSPs. "We know we're winning as long as we grow inside specific market segments," he says.

Finally, Templeton is keeping TI structured by customer market segment, rather than organizing the company around generalized areas of expertise. Rather than, say, throwing all of its analog designers into a single engineering group, TI integrates them into individual product groups. TI even builds organizational firewalls to discourage the ivory tower mentality that often plagues firms with centralized engineering empires. "If we're building DSPs for cell phones, we want employees who live and breathe the cell phone market," says Hames.

In order to keep firewalls from becoming stovepipes, representatives from TI's engineering groups meet on a regular basis to share inventions and innovations. Another unifying factor is TI's fab, which encourages engineers to share techniques for getting the best use of the company's process technology.

Bringing it together

Despite being committed to decentralization, TI's management has been willing to bet the company's future on a long shot. In the 1990s, TI put the bulk of its resources into DSPs, even though the market for digital cell phones was tiny at the time. Not satisfied with that gamble, TI upped the ante in 2001, by investing heavily in R&D in the middle of an industry downturn. Templeton explains: "When we had the memory business, we invested during upturns and cut back during downturns, even though that meant taking two years to ramp up when the next upturn came along. But in 2001, when our revenues dropped by 40 percent, we kept our R&D investment at virtually the same level and continued to invest in our 300-millimeter wafer fab." As a result, TI was perfectly positioned to take advantage of the sudden DSP demand generated by the popularity of the cell phone.

"As long as we grow faster than the rest of the semiconductor industry, I'll know we're doing pretty well."—Rich Templeton, CEO, Texas Instruments

TI is now betting that DSPs will fuel a consumer product revolution that will extend into nearly every aspect of daily life. TI is also betting that its market domination, giant customer base and skunk

works engineering culture will give TI both the financial muscle and technological brainpower to hold its own against Intel. However, the problem with corporate gambles is that there's no guarantee they'll pay off as planned. Templeton, though, seems unworried: "As long as we grow faster than the rest of the semiconductor industry, I'll know we're doing pretty well."

Will Intel and TI be able to happily co-exist in the future? Send your thoughts to feedback@eb-mag.com.

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