

PROFIT BY DESIGN

Clara Basile and Ellen Ullman return to *The Red Herring* to explain why we see signs of an emerging long-term uptrend in design automation.

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Why hasn't design automation matched the gains in the semiconductor and semiconductor equipment sectors? Common sense would seem to dictate that chip makers need to improve in both fabrication equipment and design software to help them stay abreast of their markets, with their increased competitive pressures, rising complexities in technology, and shorter product cycles.

Yet, until recently, the sector did not show the anticipated stock-price leadership.

From the first technology long-cycle bottom in October of 1990, to the long-cycle bottom of June 1994, stocks of semiconductor companies and semiconductor equipment manufacturers quickly assumed market leadership. Semiconductors gained a startling 363%; semiconductor equipment an equally amazing 360%, compared to the average technology stock gain of 120%. Meanwhile, design automation limped behind, rising a mere 4% (excluding a gain of 524% for Parametric, which displayed leadership throughout the period, as discussed below).

A Mixed Portfolio

The answers that account for design automation's less-than-stellar past cannot be simple ones. The *Tech 250* and *New Tech 100* design automation groups comprise a mix of companies and do not offer a "pure play" in electronic design automation (EDA), the area of design automation most linked to semiconductors. The group includes companies selling software and services for mechanical design, such as Parametric (PMTC), Autodesk (ACAD), Computervision (CVN), Intergraph (INGR), Structural Dynamics Research (SDRC), and Wind River Systems (WIND), a supplier of embedded software (operating software and logic embedded in special purpose microprocessors). The group also includes Atria Software (ATSW), a vendor of products for computer-aided software engineering (CASE). These companies are mixed with EDA companies, those supplying software and services for integrated circuit design and system integration: Cadence Design (CDN), Integrated Silicon Systems (ISSS), Mentor Graphics (MENT), Quickturn Design Systems (QKTN), Synopsys (SNPS), and Viewlogic Systems (VIEW).

In addition to mixed product offerings, the category includes both older and newer companies. Our index begins in 1987, when the group consisted of only Autodesk, Cadence, Intergraph, Mentor, and Structural Dynamics. New participants joined steadily over the next eight years. The group therefore represents companies in varied portions of the automated design market, with product lines created at different technological stages--from mainframe-based computing to networked UNIX systems to today's powerful desktop systems.

The Cycle View

Figure 1 charts the group's performance relative to the *Tech 250*, from 1987 to the present. The group hit a major trough in late 1987--a difficult time for the overall market, and a period we identified in our first *Herring* column as a juncture between the old and new computer industries. Rising strongly out of the trough for the first eight months, the design automation group went on to outperform the *Tech 250* through 1991, which marked a major long-term high.

Then, from 1991 through the June 1994 bottom in technology, the group lagged. It underperformed the *Tech 250* and trailed the advances in semiconductors and semiconductor equipment. This is the period that kept us wondering: what's wrong with design automation?

The Downward Pressures

Brooke Seawell, CFO and senior vice president of finance and operations at Synopsys, offered the most obvious reason for the overall lag. He cites difficulties at Cadence and Mentor Graphics, two companies trying to recover from what Seawell diplomatically calls "internal execution issues." Cadence and Mentor have been acting as an overhang to industry statistics, according to Seawell. "The two biggest companies have not been hitting on all cylinders," he says.

The increasing complexity of modern chips and circuit boards is, ironically, another factor behind the lagging performance of the design automation group. Chips went from tens-of-thousands of logic gates to millions. Ever shrinking physical geometries imposed new challenges on chip makers, including electromechanical effects and delays in interconnects. While these technical difficulties would seem to translate into increased sales for design automation companies, the reality was that these companies did not yet have the right tools to sell. Software takes time to develop; the design automation vendors, especially the older ones, did not have the products ready to meet the rapidly changing needs of chip and board fabrication.

Ralph Zak, vice president of business development and communications at Quickturn, calls this product shortfall a "technology discontinuity." Chip makers and system manufacturers had already installed a generation of tools--"Everyone's got layout tools and simulators and the like," says Zak--but that generation of tools addressed physical layout and logic design as separate issues. What the chip and system makers needed was help in integration, something design automation vendors were not prepared to support. Therefore, the design automation market stalled, waiting for the development of what Zak calls "a whole new breed of tools." Older vendors with aging product lines were particularly affected by the end of this toolset generation.

Meanwhile, the entire computer industry underwent the transformation from mainframe-based processing to client/server, networked computing, and open systems. Again, older vendors faced difficulties: their tools were designed to run on mainframes, using proprietary languages. In design automation, as in all areas of the industry, standards emerged, such as the design languages Verilog and VHDL--Very High-level Design Language. Newer vendors were better prepared to take advantage of these emerging technologies and standards, but there was a time lag before new tools could penetrate the market.

In addition, the increasing power of the desktop PC posed new challenges to design automation. An increasing number of components became oriented towards the retail market. Originally using an industrial market model, design automation vendors now faced a consumer market model. Bob Leach, senior vice president at Cadence, puts it this way: "What if I told you that you had six months to design something and make it available to market, and the total life cycle of the product is going to be between nine and 12 months? What is it I'm describing?" The answer is, PCs, desktop systems, small servers, multimedia, and networking technologies--essentially the modern computer industry.

An Emerging Long-Term Uptrend

Despite all the factors producing the downtrend from 1991 through 1994, Figure 1 also shows that July 1994 represents the beginning in a new upcycle in design automation. From the overall technology long-cycle bottom in June 1994 to the time of our current research (from 3/10/95), the stock prices of three groups have risen strongly on a long-term basis: semiconductor equipment manufacturers (up 71%), networking (up 67%), and education and entertainment software (up 58%). In the same period, the *Tech 250* design automation companies have also done well, rising 41% and matching semiconductor gains. In short, design automation is showing new signs of life. Our research shows that the group's advance is still in its early stages, akin to the

first smartly-upward moves out of the 1988 bottom. We expect that, on average, the group will continue to advance into 1996.

Why is the group advancing now? In many cases, it's simply because the design automation vendors have had time to freshen their product lines and refocus their markets. The more established vendors have had time to adjust their technologies, while newer companies can produce a whole new breed of products that can penetrate their target markets.

The increasing power of the desktop enables PC-software vendor Autodesk to bring higher and higher levels of functionality to its products. "The future is huge," says Christine Tsingos, Autodesk treasurer. What she calls the disappearing difference between high-end machines and PCs lets PC-based software deliver 98% of the functionality for 10% of the price. The eventual release of Windows 95 can only help the growth of the PC software market. "Our future market share depends on what happens up north," says Tsingos.

In addition, Autodesk stands to gain from the burgeoning multimedia market with its 3D Studio animation product. Although this may bring the company into direct competition with Microsoft (which has acquired SOFTIMAGE), according to Tsingos the best kept secret in the industry is that 3D Studio already has the number one market share in the world of PC animation. Our research shows Autodesk advancing from its 3/10/95 price of \$39.00 to \$50.00 over the course of the current uptrend.

Parametric (PMTIC; \$42.00) never suffered the 1991-94 performance slump of other design automation stocks. During that lag period, Parametric showed all the characteristics of a secular leader; its stock price moved from \$3.625 to \$42.00, an astounding rise of 1,059%. As a secular leader, it makes sense that Parametric should now be leading the design automation group out of the June 1994 bottom. From June 1994 to our current data, the stock has already appreciated nearly 86%.

Parametric's product line, created after the age of mainframe computing, started out with platform-independent software designed to run in heterogeneous networked environments, according to John Hudson, director of external communications. Parametric's mechanical design software runs on most UNIX platforms, as well as on Windows NT. "We're the only high-end vendor running on NT," says Hudson. Like Autodesk, Parametric may benefit from the increasing power of the desktop; the company intends to release its products on Windows 95. In addition, they will be testing the mid-range market with a product called ProJunior, which will give Parametric added revenues while placing pressure on Autodesk to better satisfy its own customer base.

Hudson says that Parametric, which has seen approximately 50% EPS growth, is now constrained by "the law of large numbers," which means he sees an inevitable leveling off. The company is looking for average revenue growth of 30% over three years. Their Q2 report is due at the end of March, and Hudson advises investors to watch whether estimates can be raised. Our own target price for Parametric is \$60.00 over the course of the current uptrend.

Cadence (CDN; \$26.25) suffered due to its acquisition of ValidLogic, a move that Cadence vice president Bob Leach called "painful." The company underestimated the effort required to unite the two product lines. Says Leach, "We took our eye off the ball." Cadence has since gone through significant changes in senior management (a new CFO and COO) and a major refocusing of its marketing and product efforts. According to Leach, the company once concentrated on solving the most complex electronic design issues, issues which comprised only 5% of the designer community. Meanwhile, the "bread and butter issues" for customers were operational: integration, testing, and concurrent engineering were more important than how many logic gates could fit on the head of a pin.

Leach indicates that now Cadence is reorganizing to focus on the customer's overall solutions. Using an Arthur Andersen business model, the company will employ their own tools to support consulting and outsourcing efforts, working in partnership with other design automation companies as needed. For example, Cadence's recent contract with Unisys is essentially an outsourcing project, with Cadence doing an entire chip design. And partnerships are in the offing. Though not wishing to pre-announce anything, Leach mentions, "It wouldn't be much of a stretch to conclude that it would probably be a good idea for Cadence and Synopsys, as an example, to collaborate." Cadence could contribute its core competence in physical layout, while Synopsys could provide the higher level design through its optimizing compiler of design languages. Leach says that announcements about collaborations will be forthcoming. The company is looking for "slow and steady" revenue growth, approaching 20%. Our target price for Cadence over the course of this upcycle is \$35.00.

Another company that stands to benefit from collaboration efforts is Quickturn (QKTN; \$7.00). The company, which supplies EDA integration and testing tools, has already partnered with Cadence and Synopsys. But Quickturn has not fared well following the June 1994 bottom; its stock price is down about 30%. And Ray Oftby, Quickturn's vice president for finance and administration, remains cautious about immediate prospects.

Figure 2: Design Automation: Individual Stock Profiles		
(All prices as of 3/10/95)		
<i>Company & Symbol</i>	<i>Current Price</i>	<i>Target Price</i>
Advancing long-term trends & some 12-18 month targets:		
Parametric Technology (PMTC)	\$42.00	\$60.00
Autodesk (ACAD)	\$39.00	\$50.00
Cadence Design (CDN)	\$26.25	\$35.00
Integrated Systems (INTS)	\$21.00	\$30.00
Wind River Systems (WIND)	\$13.13	\$20.00
Declining long-term trends displaying turnaround characteristics:		
Structural Dynamics Research (SDRC)	\$8.19	\$12.00
Intergraph (INGR)	\$13.19	\$20.00
Declining trends at trading bottoms:		
Viewlogic Systems (VIEW)	\$9.25	\$15.00
Quickturn Design Systems (QKTN)	\$7.00	\$12.00
New issues off to a dynamic start:		
		<i>% change since IPO</i>
Atria Software (ATSW)	\$41.25	175%
Integrated Silicon Systems (ISSS)	\$29.25	36%

Source: Avalon Capital Management & NeoLogica

Nevertheless, Quickturn has technology that currently leaves it without competitors; for now it is the only company allowing chip vendors to test their logic designs inside the sample board. This permits testing of the design before expensive chip samples are made, which should vastly improve time to market through concurrent design and testing. If the company should prove stable financially, we see it as potentially akin to KLA Instruments on the semiconductor equipment side--a company with virtually no competition, and testing equipment and procedures that complement the entire chip manufacturing process. In short, Quickturn's technology is promising. It should be even more attractive once the company is able to handle chip designs

consisting of outputs from standard languages like Verilog and VHDL. (Quickturn is now in beta with Verilog-based HDL-ICE; the company did not wish to pre-announce any VHDL-based products.) The stock is now signaling an intermediate bottom. We see an initial target price of \$12.00 over the next 9-12 months.

There are more general factors in the computer industry that now favor design automation stocks. First is the growth in telecommunications, which Cadence's Bob Leach says will be dramatic. The need for bread and butter design in digital signal processors, switches, and networking products should keep designers busy, and design automation vendors along with them. For makers of mechanical design products, there is potential growth in the European and Asian markets, where most of the design automation companies already have a stake. The group that lagged (and nagged at us since we began writing for *The Red Herring*) now looks to be a laggard no more.