DATAQUEST 1996 CONFERENCES

Dataquest sponsors an on-going series of conferences and invitational events focusing on trends and issues in information technology and IT services. These conferences are the preeminent source of insight and analysis of global IT market dynamics.

North America	January 24	Capitalizing on the Wireless Phenomenon	San Jose, California
	January 30	Dataquest Predicts	Boston, Massachusetts
	February 20	Dataquest Predicts	San Jose, California
	March 7	Channel Trends Conference	San Jose, California
	April 1-2	ServiceTrends Conference	Orlando, Florida
	April 1 *	Mining the Internet	Boston, Massachusetts
	May 6-7	Personal Computer Conference	San Jose, California
	May 13-14	Copier Conference	Boston, Massachusetts
	June 26-27	Storage Track Conference	Monterey, California
	July 1 *	SEMICON/West	San Francisco, California
	September 25-26 *	Multimedia	San Jose, California
	October 24-25	Semiconductors '96	Palm Desert, California
	December 1 *	Mining the Internet	San Jose, California
Europe	January 24	Computer Storage	Munich, Germany
	May 22-23	Semiconductors '96	Frankfurt, Germany
	September 10	Computer Storage	London, England
Japan	May 13-14	Semiconductors '96	Tokyo, Japan
	September 10-12	Computers and Peripherals	Tokyo, Japan
	December 6	Telecommunications	Tokyo, Japan
Dataquest Invitational Computer Conferences	December 1 *	Asia/Pacific Series	Tokyo, Japan
	December 1 *	Asia/Pacific Series	Seoul, Korea
	December 1 *	Asia/Pacific Series	Beijing, PRC
	December 1 *	Asia/Pacific Series	Shanghai, PRC
	December 1 *	Asia/Pacific Series	Xi'an, PRC
	December 1 *	Asia/Pacific Series	Guangzhou, PRC
	March 5	Dataquest Storage Solutions Series - USA	San Jose, California
	April 10	Dataquest Storage Solutions Series - USA	Irvine, California
	April 24	Dataquest Storage Solutions Series - USA	Nashua, New Hampshire
	September 24	Dataquest Storage Solutions Series - USA	Newton, Massachusetts
	April 1	Mediterranean Series	Dubai, UAE
	May 21	Mediterranean Series	Athens, Greece
	October 30	Mediterranean Series	Tel Aviv, Israel
	November 6	Mediterranean Series	Istanbul, Turkey

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DATAQUEST 1996 CONFERENCES

Dataquest Invitational Computer Conferences *(continued)*

January 17	Dataquest Storage Solutions Series-Europe	Paris, France
January 23	Dataquest Storage Solutions Series-Europe	Munich, Germany
January 30	Dataquest Storage Solutions Series-Europe	Milan, Italy
February 1	Dataquest Storage Solutions Series-Europe	Rome, Italy
June 10	Dataquest Storage Solutions Series-Europe	Budapest, Hungary
June 12	Dataquest Storage Solutions Series-Europe	Prague, Czech Republic
June 21	Dataquest Storage Solutions Series-Europe	St. Petersburg, Russia
June 25	Dataquest Storage Solutions Series-Europe	Moscow, Russia
July 1	Dataquest Storage Solutions Series-Europe	Warsaw, Poland
September 1	Dataquest Storage Solutions Series-Europe	Amsterdam, Holland
September 5	Dataquest Storage Solutions Series-Europe	Stockholm, Sweden
September 11	Dataquest Storage Solutions Series-Europe	London, England
September 19	Dataquest Storage Solutions Series-Europe	Frankfurt, Germany

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October 1 *	Latin America Series	Caracas, Venezuela
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October 1 *	Latin America Series	São Paulo, Brazil
October 1 *	Latin America Series	Buenos Aires, Argentina
October 1 *	Latin America Series	Santiago, Chile
October 1 *	Latin America Series	Bogotà, Columbia
October 1 *	Latin America Series	Lima, Peru
February 19	South Africa Series	Capetown, South Africa
February 22	South Africa Series	Johannesburg, South Africa
April 11	LINK Series - North America	Orlando, Florida
April 30	LINK Series - North America	Austin, Texas
May 1	LINK Series - North America	Philadelphia, Pennsylvania
May 9	LINK Series - North America	Charlotte, North Carolina
May 14	LINK Series - North America	Denver, Colorado
May 21	LINK Series - North America	Portland, Oregon
November 1 *	LINK Series - North America	Montréal, Québec
November 1 *	LINK Series - North America	Ottawa, Ontario
November 1 *	LINK Series - North America	Calgary, Alberta
November 1 *	LINK Series - North America	Vancouver, BC
November 1 *	LINK Series - North America	Toronto, Ontario

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- Computer and Client/Server Systems *Europe*
- Servers *Europe*
- UNIX and Open Systems *Europe*

Workstations
- Advanced Desktop and Workstation Computing *Worldwide*
- Workstations *Europe*

Computer Storage
- Removable Storage *Worldwide*
- Optical Disk Drives *Worldwide*
- Optical Disk Drives *Europe*
- Rigid Disk Drives *Worldwide*
- RAID Storage Systems *Worldwide*
- Rigid Disk Drives *Europe*
- Tape Drives *Worldwide*
- Tape Drives *Europe*

Graphics
- Graphics and Displays *Worldwide*

Personal Computing
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- Personal Computers Strategic Service *Europe*
- Personal Computers *Asia/Pacific*
- Mobile Computing *Worldwide*
- PC Distribution Channels *Worldwide*
- PC Distribution Channels *Europe*
- Desktop PC Technology Directions *Worldwide*
- Mobile PC Technology Directions *Worldwide*
- Personal Computers *Central and Eastern Europe*

Quarterly Statistics
- Advanced Desktop and Workstation Quarterly Statistics *Worldwide*
- Workstation Quarterly Statistics *Europe*
- Server Quarterly Statistics *North America*
- Server Quarterly Statistics *Europe*
- PC Quarterly Statistics *United States*
- PC Quarterly Statistics *Europe*
- PC Quarterly Statistics *Japan*
- PC Quarterly Statistics *Asia/Pacific*
- PC Quarterly Statistics *Worldwide by Region*

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- Multimedia *Europe* (Module)
- Online Strategies *Worldwide*
- Online Strategies *Europe* (Module)

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- Workgroup Computing *Worldwide*
- Workgroup Computing *Europe* (Module)
- Personal Computing Software *Worldwide*
- Personal Computing Software *Europe* (Module)

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- Electronic Design Automation (EDA) *Worldwide*
- Mechanical CAD/CAM/CAE *Worldwide*
- CAD/CAM/CAE/GIS *Europe* (Module)
- CAD/CAM/CAE *Asia/Pacific* (Module)

Services

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- Customer Services and Management Trends *Europe*

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  - Systems Integration and Applications Development
  - Consulting and Education
  - Systems Management
- Vertical Market Opportunities *North America*
- Professional Services *Europe*
  - Systems Integration
  - Consulting and Education
  - Systems Management
- Professional Services Vertical Market Opportunities *Europe*
- Professional Service Trends *Asia/Pacific*

Sector Programs
- System Services *North America*
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  - Notebook Services
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- Network Integration and Support Services *Europe*
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- Copiers *Europe*

Facsimile
- Facsimile *North America*

Printers
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- Printers *Europe*
- Colour Products *Europe* (Module)
- Printer Quarterly Statistics *Europe*
- Printer Distribution Channels *Europe*
- Printers *Asia/Pacific*
- Printer Quarterly Statistics *Asia/Pacific*

Semiconductors

Regional Markets
- Semiconductors *Worldwide*
- Semiconductors *Europe*
- Semiconductors *Japan*
- Semiconductors *Asia/Pacific*
  - China/Hong Kong
  - Taiwan
  - Korea
  - Singapore

Devices
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- ASIC Applications *Europe*
- Memories *Worldwide*
- Memory Applications *Europe*
- Memory IC Quarterly Statistics *Worldwide*
- Embedded Microcomponents *Worldwide*
- Microcomponent Applications *Europe*
- DRAM Quarterly Supply/Demand Report

User Issues
- Semiconductor Supply and Pricing Worldwide

Application Markets
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- Semiconductor Application Markets *Europe*
- Semiconductor Application Markets *Asia/Pacific*
- Communications Semiconductors & Applications *WW*
- Consumer Multimedia Semiconductors & Applications *Worldwide*
- Semiconductor Directions in PCs & PC Multimedia *WW*
- PC Teardown Analysis
- PC Watch *Europe*
- Electronic Equipment Production Monitor *Europe*
- Electronic Application Markets *Europe* – Automotive
- Electronic Application Markets *Europe* – Communications
- Electronic Application Markets *Europe* – Consumer
- Electronic Application Markets *Europe* – EDP

Manufacturing
- Semiconductor Equipment, Manufacturing, & Materials *Worldwide*
- LCD Industry *Worldwide*
- Semiconductor Contract Manufacturing *Worldwide*

Telecommunications

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  - Local Area Networks *North America*
  - Wide Area Networks *North America*
  - Modems *North America*
- Networking *Europe*
  - Asynchronous Transfer Mode *Europe*
  - ISDN *Europe*
  - Modems *Europe*
  - Local Area Networks *Europe*
  - WANs *Europe*
- Quarterly Market Watch *North America*
  - Intelligent Hubs & Switches
  - Network Interface Cards
- Network Distribution Channels *Europe*

Voice
- Voice Communications *North America*
  - Voice Processing *North America*
  - Computer-Integrated Telephony & Automatic Call Distributors *North America*
  - Premise Switching Systems *North America*
- Voice Communications *Europe*
  - Voice Processing *Europe*
  - Call Centres *Europe*
  - Telephones *Europe*
  - PBX/KTS Systems *Europe*

Public
- Public Network Equipment & Services *North America*
  - Public Network Equipment *North America*
  - Public Network Services *North America*
- Public Network Equipment & Services *Europe*
  - Public Network Equipment *Europe*
  - Public Network Services *Europe*

Personal
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- Personal Communications *North America*
- Personal Communications *Europe*
  - Infrastructure and Services *Europe*
  - Terminals *Europe*
- Personal Communications Distribution Europe

Cross-Technology Programs

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- Government Agencies
- Publishing, Media, and Consulting Firms
- IT Business Development for Financial Organizations
- IS and Purchasing Organizations
- IT Supporting Industries

Emerging IT Markets

Central and Eastern Europe
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- Telecommunications

Latin America
- Personal Computers
- Printers

Asia/Pacific
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- Personal Computers *Asia/Pacific* & Quarterly Statistics
- Printers *Asia/Pacific* & Quarterly Statistics
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December 1995

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The enclosed binder is for filing and storing the printed market research newsletters and reports that you will receive on an ongoing basis throughout 1996 as part of your subscription to Dataquest. You may notice that we've streamlined the binder tab and document filing structure this year. We hope that this 5-tab scheme increases your efficiency in filing and locating documents.

You probably know that in addition to paper-based delivery, Dataquest is also committed to delivering our market statistics and analysis electronically. We expect that our electronic products, known collectively as *Dataquest on the Desktop*, will play an increasing role in our ability to deliver information to you in a timely, efficient way. For your information, our electronic tools include:

- ***Dataquest on Demand***—Our monthly CD-ROM containing a rolling 13 months of Dataquest's printed documents
- ***MarketView***—A data analysis tool containing many of Dataquest's market statistics databases
- ***Electronic NewsTakes and Dataquest Alerts***—Weekly/event-driven summary and analysis of top IT news, published via e-mail or fax by most Dataquest research groups
- ***Dataquest Interactive***—Our Internet-based electronic delivery system that you are invited to preview at this URL: http://www.dataquest.com

One last note: an optional binder called *Electronic News* is available on request for clients who wish to file their electronic newsletters and Dataquest Alerts. To order your copy, please fill out the FaxBack form found in the binder pocket and fax it back to us.

We look forward to working with you in our continuing process to improve the content, quality, and timeliness of our products and services. I encourage you to share with us your comments about our publications and electronic delivery tools.

Sincerely,

Jeffrey A. Byrne
Vice President, Worldwide Marketing

ELECTRONIC DESIGN AUTOMATION WORLD

Dataquest provides worldwide information on ... forecasts for EDA ... applications and vendors ... of ...

Major Data Points

- ... and forecasts ...
- Services ...

Applications

- Electronic CAE
- ...
- PCB, IC, Hybrid ...
- 32 different subapplications by end use and by platform

Industries

- Industry analysis for consumer, industrial, data processing, defense, semiconductors, and telecommunications

Operating Systems

- All major processors and UNIX operating systems

Geographies

- North America
- Europe*
- Japan
- Asia/Pacific
- Rest of World
- Worldwide

* Country-level Europe and Asia/Pacific data is available ... optional Market Statistics

... comprehensive ... research and consulting services.

ELECTRONIC DESIGN AUTOMATION WORLDWIDE

Dataquest's Electronic Design Automation (EDA) program provides detailed analysis of the industry trends, players, products, and end-user issues that drive the market for EDA applications and tools. The program covers the three major EDA application areas – integrated circuit (IC) layout, electronic CAE, and PCB/MCM/hybrid tools – and provides the most reliable worldwide market size, market share, and market forecasts available.

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Dataquest provides worldwide software shipments, market share, revenue, and market forecasts for EDA tools, applications, and vendors, as follows:

Major Data Points

- Total factory, hardware, and software revenue
- Service revenue

Applications

- Electronic CAE
- IC layout
- PCB/MCM/hybrid

Subapplications

- 32 different subapplications by end use and by platform

Industries

- Industry analysis for consumer, industrial, data processing, defense, semiconductors, and telecommunications

Operating Systems

- All major personal computer and UNIX operating systems

Geographies

- North America
- Europe *
- Japan
- Asia/Pacific *
- Rest of World
- Worldwide

(* Country-level Europe and Asia/Pacific data is available in optional Market Statistics reports)

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WHAT YOU WILL RECEIVE AS A CLIENT

ELECTRONIC DESIGN AUTOMATION WORLDWIDE

Perspective

Dataquest Perspectives present analysis and commentary on key technologies, companies, market opportunities, trends, and issues in the electronic design automation market. A minimum of six Perspectives will be published on an event-driven basis throughout the year, as well as two Dataquest Predicts. Scheduled Perspectives for 1996 include:

Dataquest Predicts—Forward-looking analysis of EDA software market dynamics that include Dataquest's predictions about future industry and technology directions

Telebriefing Analysis—A teleconference will be held just prior to the Design Automation Conference (DAC) to advise clients what to look for at the show; a summary of the teleconference will be provided in written form.

Market Analysis—Analysis of industry news, mergers, announcements, and shows will be provided as events happen.

Market Trends

EDA Market Trends Report: This report provides an analysis of the leading trends and issues driving the growth of EDA software markets and contains detailed analysis of the CAE, IC layout, and PCB/MCM markets; detailed market forecasts balance the outlook.

Available September 1996

Market Statistics

EDA Market Statistics Reports: EDA market statistics reports provide hardware, software, and service market share and forecasts for worldwide EDA vendors. A total of four reports are published each year. Two reports presenting market share and forecasts are published during the first half of the year; these are updated during the second half of the year.

Reports

User Wants and Needs Report: Dataquest's annual EDA user study is the premier source of end-user buying and preference information in the industry. This year's survey research will focus on design challenges (speed, size, and so on), shifts in methodology (gate level, RT level, ES level), and design tool usage and satisfaction.

Available September 1996

Electronic NewsTakes

QuickTakes is a weekly electronic newsletter providing weekly summaries and analysis of the top news in the software, multimedia, and online information industries. These documents are delivered electronically every Monday morning to EDA program clients at any e-mail box accessible via the Internet.

Weekly delivery via the Internet

Optional Europe and Asia/Pacific EDA Data

Market Statistics reports presenting detailed EDA market shipments, revenue, and five-year forecasts for the seven major European countries and the six major Asia/Pacific countries plus Japan are available as separate, optional products.

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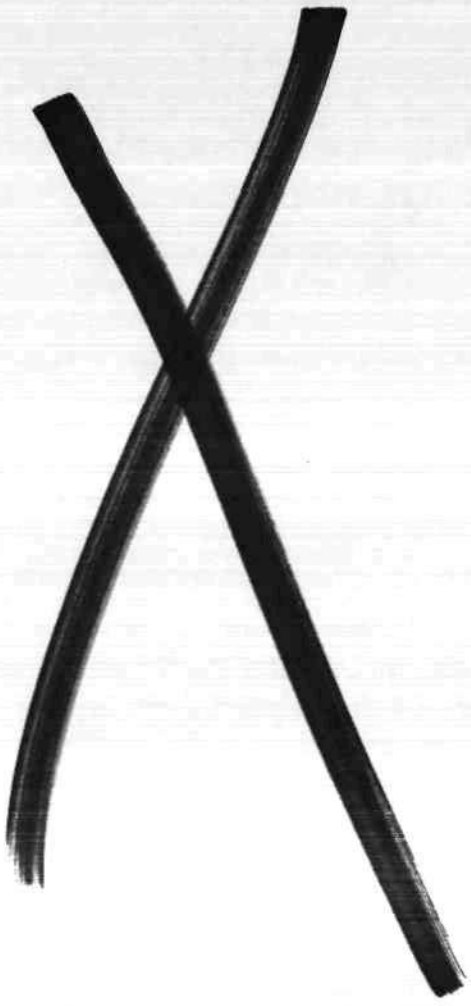

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Perspective

Electronic Design Automation Worldwide

Market Analysis

Why in the #@$% Do We Need Standards?!

Abstract: *This Perspective takes a brief look at the electronic design automation (EDA) industry today and argues why standardization is important for the industry overall. The growing design gap in the EDA industry is pushing the market to gravitate toward establishing standards and a road map for the industry. We explain why the EDA industry needs to grow larger, and make an argument for why standardization will help expand the market.*

By Gary Smith

Overview

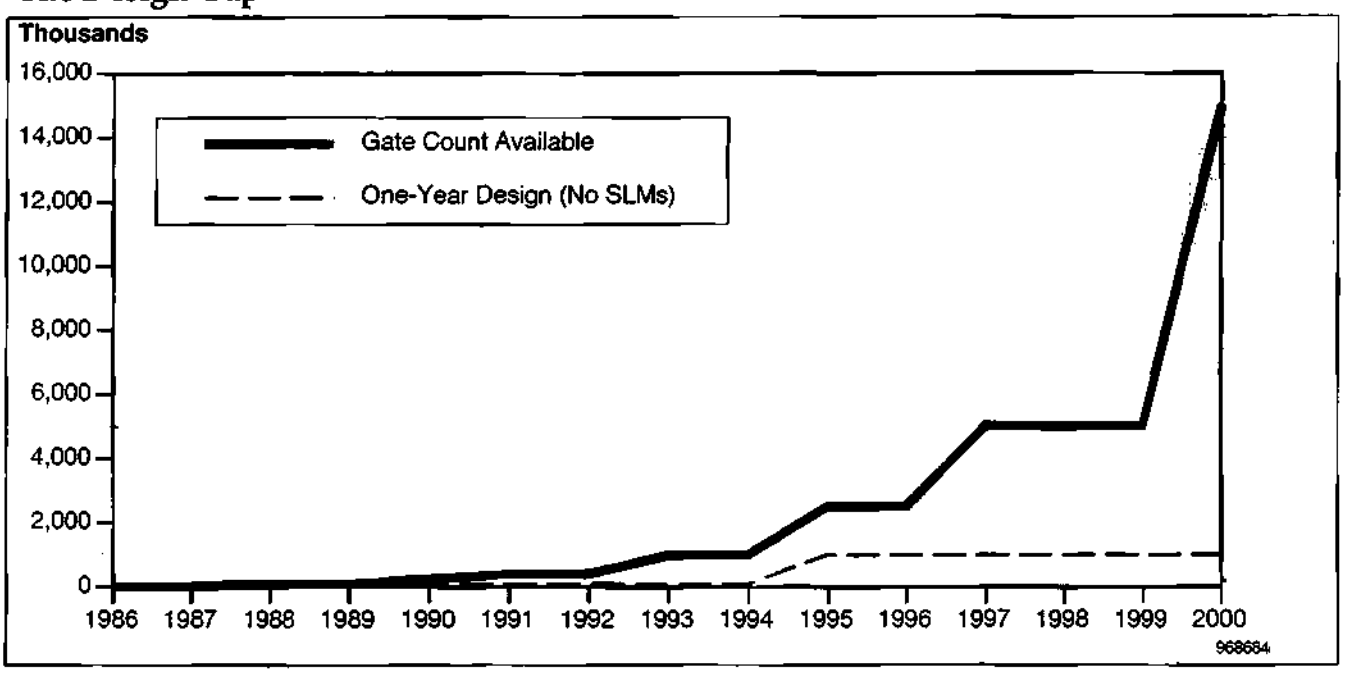
The design gap has started to have an impact, at least physiologically, on the semiconductor industry, and as a result, on the electronics industry as a whole. The worry is, that with the skyrocketing cost of wafer fabs, the semiconductor industry will invest billions of dollars, and at the end of the day, the electronics industry will be unable to utilize the wafer capacity. This has driven the discussion of what size the electronic design automation (EDA) industry is needed to finance the necessary R&D and develop necessary tools to close the design gap. Sematech is a consortium of semiconductor vendors that was formed to solve a similar problem in the fab equipment industry. Prior to Sematech, the fab equipment vendors found themselves unable to generate enough revenue to fund the ever-increasing R&D dollars necessary to develop the next-generation fab equipment. Five years later, we have the semiconductor industry road map, the necessary standards to end the reinventing of the wheel problem, and a healthy fab equipment industry that is about 15 percent the size of the semiconductor industry. Sematech is arguably the most successful industry consortium the electronics world has ever produced.

Dataquest
Program: Electronic Design Automation Worldwide
Product Code: CEDA-WW-DP-9607
Publication Date: December 16, 1996
Filing: Perspective
(For Cross-Technology, file in the Online, Multimedia, and Software binder)

The Design Gap

What is the design gap? The design gap is the name commonly used to describe the inability of today's EDA methodologies and tools to take advantage of the ever-increasing gate counts available to the ASIC designer. The measurement is how many gates a design group can utilize within a year's design cycle. We briefly saw a design gap in 1986, but the development of the RTL methodology (HDL-based design using synthesis) closed the gap in 1998; only to see the gap reappear in 1990. This time we weren't so lucky, and the design gap has been growing ever since. By 1994, the design gap had grown to 900,000 gates (see Figure 1).

Figure 1
The Design Gap



Source Dataquest: (December 1996)

That's when the semiconductor industry started getting worried. By 1995, the electronic systems level (ESL) methodology was a proven design flow; however, even with this order of magnitude increase in a designer's productivity, the gap had reached 1,500,000 gates—a good reason for concern. At this rate, by the end of the century, it will take a design team 14 years to complete a design that uses the maximum gate count available. Which, of course, means that at this rate, we'll never catch up to the silicon.

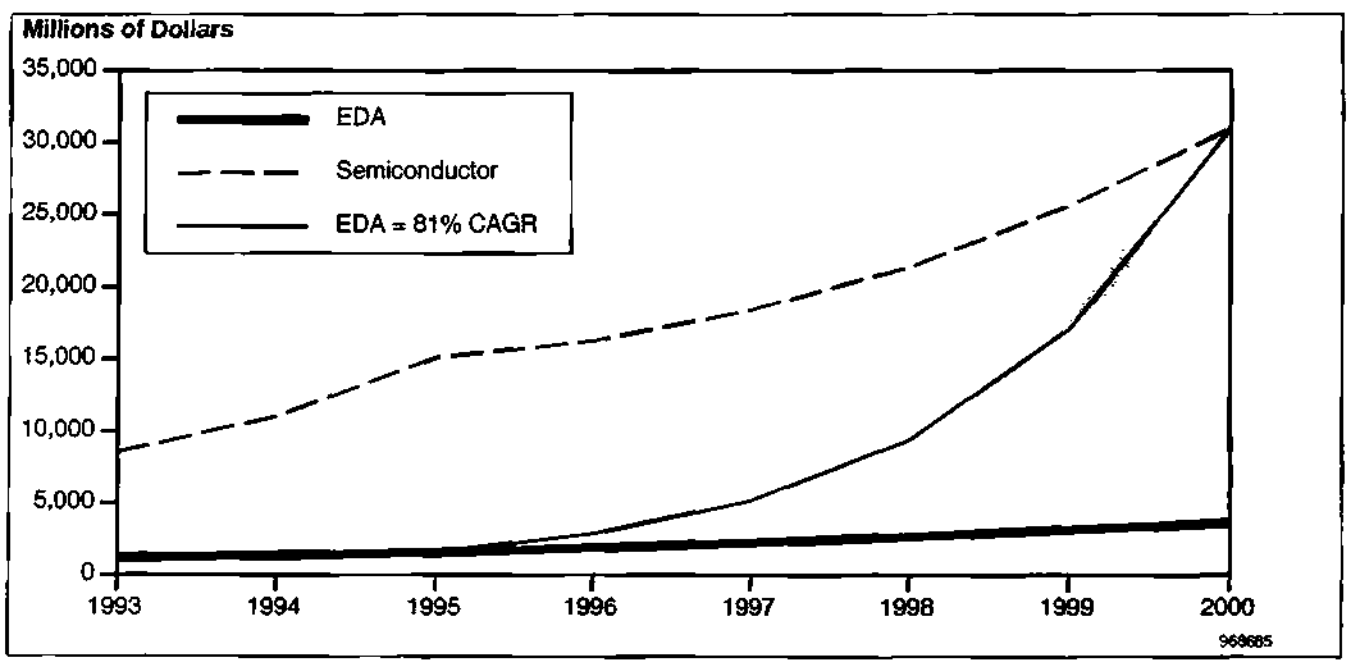
Why the EDA Industry Needs to Expand

That brings us back to the issue of what needs to be done with the EDA industry. First of all, it needs to be bigger. There's been a lot of discussion on just how big it needs to be, but a good number seems to be about 10 percent the size of the semiconductor industry. Today, the EDA industry is 1.2 percent the size of the semiconductor industry! That means it must grow at

an 81 percent compound annual growth rate (CAGR) for the next five years. Figure 2 shows the forecast growth for the semiconductor industry versus the EDA industry.

It's easy to say that it will never happen, but keep in mind that most people (engineers included) had written off the U.S.-based semiconductor industry just eight years ago. Then the question becomes, "Can we do to the EDA industry what we did to the fab equipment industry?" The answer is, "We don't have a choice." At least eight years ago, the United States could have conceded defeat in the semiconductor business, and turned the market over to the Japanese. After all, a service- and farming-based economy is an option. However, the EDA industry is almost nonexistent outside of the United States. Semiconductor companies could just start developing EDA tools themselves (the only viable option) but that would be going backward. The answer chosen was to put together the EDA Industry Council, develop an EDA road map, and fund certain critical programs needed to advance the design methodology.

Figure 2
EDA versus Semiconductor Revenue Growth



Source Dataquest: (September 1996)

Standards to the Rescue

So why are standards important? The reason is that lack of interoperability is the friction in the design process. Instead of creating heat, it wastes time and money. Ron Collett, of Collett International, was funded by CFI to do a

study on the cost incurred because of the lack of tool interoperability. The results are as follows:

- Approximately $4.3 billion in nonproductive engineering time
- Approximately $320 million in EDA support personnel
- Approximately $130 million retargeting ASIC and standard IC libraries (excluding amount spent by pure ASIC houses and EDA vendors)
- An increase of more that one month in cycle time (several billion dollars annually)

As one of the hidden costs is the cost of design time, let's explore the last item. The rock-bottom figure Dataquest has found, for the cost of one week of product design, is $150,000. We've been quoted a figure of $1,000,000 a day on a satellite program. So we are looking at a minimum of $600,000 a month. So you can see where the "several billion dollars annually" comes from. You can buy a lot of EDA tools for $600,000. In fact, even without considering new technical advances, the EDA industry could easily grow to 5 percent of the semiconductor industry just by eliminating the interoperability problem. In other words, without bringing anything else to the party, the EDA industry could grow by a factor of five just by developing the necessary standards to allow their tools to talk to each other without all the scripts and shells we all have come to love.

The Market Development Cycle

Anyone who has been in electronics for more than a few years has watched the market development cycle. At first is chaos, with few standards and great battles by the vendors involved to get their own proprietary standards positioned as de facto industry standards. That's where the EDA industry lives today. One of the interesting characteristics of this phase of a market is that it is small. Unit and dollar shipments just don't take off until the market moves into the second phase, that of a standards-enhanced market. This is where the money is. The last phase is the standards-constrained market. That is where, either by standards manipulation by the leading vendors or just plain mismanagement of the standards process, the vendors become train companies rather than transportation companies. The standards become a jail that restricts and eventually kills off the market.

Dataquest Perspective

So to answer the original question, we need standards so that the EDA industry and the electronic design industry as a whole can grow. The EDA industry must cross over into the standards-enhanced phase of its market. That way, it can fund the R&D necessary to develop the tools needed to close the design gap. The semiconductor industry can fill its new fabs. We can design way cool stuff that we can't even imagine today, and we will look back in 10 years and say, "I knew we could do that." And, with a little luck, a design methodologist will never have to hear a new design group ask how to remove back slashes from a design file.

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Perspective

Electronic Design Automation Worldwide

Market Analysis

1996 European ASIC Design Starts Survey

Abstract: *Design starts are a fundamental driver of the ASIC market and are the focus of this Perspective. The European design starts survey analyzes changes in several factors including the numbers of design starts, cell-based versus gate array trends, and industry sector issues in the 1995-to-1996 period. The communications sector is analyzed in further detail because of its importance to the European ASIC market. Trends in core usage, feature size, and interconnect are also considered, with many interesting findings. Also, the relative size and growth of designs in each European region or country is presented. Finally, the gate count explosion and the widening design gap lead to a discussion of design reuse and the sale of intellectual property in this fragmented and dynamic market.*

By Jim Tully

Introduction and Summary

Dataquest's 1996 European ASIC design starts survey was based upon responses from 26 vendors. These vendors accounted for 72 percent of the cell-based market (by revenue) and 87 percent of the gate array market in Europe. This is equivalent to a combined market coverage of 78 percent. The results of the survey are therefore highly representative of the overall market and provide a sound basis on which to make decisions. The main findings of the survey are as follows:

- The average number of designs per vendor has remained fairly flat over the past year, having fallen significantly from the figure of two years ago. This fall has been mainly attributed to the growing use of PLDs for many applications, a focus on high-value major accounts by the big vendors, and a growing penetration of application-specific standard products (ASSPs) into many applications.

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- The total number of array designs fell by 4.3 percentage points over the 1995-to-1996 period. Cell-based designs therefore increased their share of the total by the same figure.
- The increase in cell-based designs acts as a multiplier of future ASIC revenue in view of the higher average unit price of these devices compared to gate arrays.
- The communications sector continues to dominate ASIC design and production in Europe, taking 57.7 percent of all designs. Public telecommunications leads the ranking, followed by mobile, data communications, and voice applications.
- The consumer sector showed the strongest growth of all sectors between 1995 and 1996 (a rise from 11.8 percent to 14.4 percent of all designs).
- Gate counts continued to rise along their predicted curve. Although the largest user group was in the "less than 50,000 gates" category in both 1995 and 1996, significantly higher-gate-count devices are now common. One-million-gate-plus devices are now being reported.
- A myriad of cores and macros are now in common use. MPEG and digital signal processing (DSP) cores have shown the strongest growth over the past year, followed by micros (in all of its forms), ATM, and data communications cores.
- In 1995, the largest group of designs used feature sizes in the 0.7-to-0.8-micron range (38 percent of designs). In 1996, the lion's share of designs fall into the 0.5-to-0.6-micron band (40 percent of designs).
- Two-level metal remains the interconnect approach for most design starts in 1996 (56 percent), although this has fallen from 63 percent of designs in 1995. Over the same period, three-level metal interconnect continued to grow in popularity from 37 percent to 41 percent of design starts.
- In 1996, an average of 16 to 25 percent of a design is reused in subsequent designs. This average also applied in 1995, but the curve is skewed toward greater reuse in 1996, a trend we believe will continue.

Number of Designs

The average number of designs per vendor fell from 64.3 to 53.9 between 1994 and 1995 because of three main factors:

- The growing use of PLDs for many applications that had previously been exclusive to ASICs. The rapidly increasing speed and gate counts of PLDs have opened many new application areas, especially in the communications and industrial sectors.
- A focus on high-value large accounts by the larger ASIC vendors. These vendors, which represent the majority of ASIC shipments, have turned their attention to the higher-volume accounts in an attempt to minimize the overhead of design services as a percentage of total operations. However, these large accounts are the same companies that are now

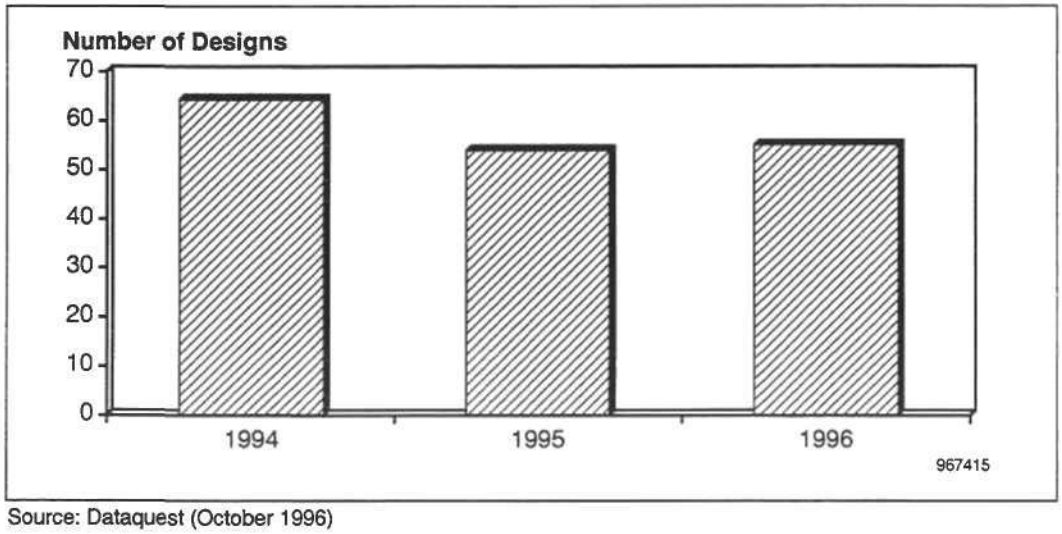
demanding system-on-a-chip solutions, which will require an increasing level of design support for some time to come.

- The encroachment of ASSPs into many traditional ASIC applications. As applications mature, vendors produce standard chipsets that can be used by many customers. This trend is bound to continue, particularly in connection with smaller customers and for applications where the ASIC is not considered to be a core part of the differentiation of the final product.

Figure 1 illustrates the average number of designs per vendor.

Between 1995 and 1996 the average number of designs per vendor remained fairly constant, rising slightly from 53.9 to 55. We believe this indicates that a degree of equilibrium has occurred in connection with the two points above. This is also an indication that ASICs are being produced using fab capacity previously allocated to DRAMs and other devices, which have suffered price erosion, a trend likely to continue for some time into the future. At the same time, the production quantity per design (see Figure 2) has shifted to higher values over this period.

Figure 1
Average Number of Designs per Vendor—Europe

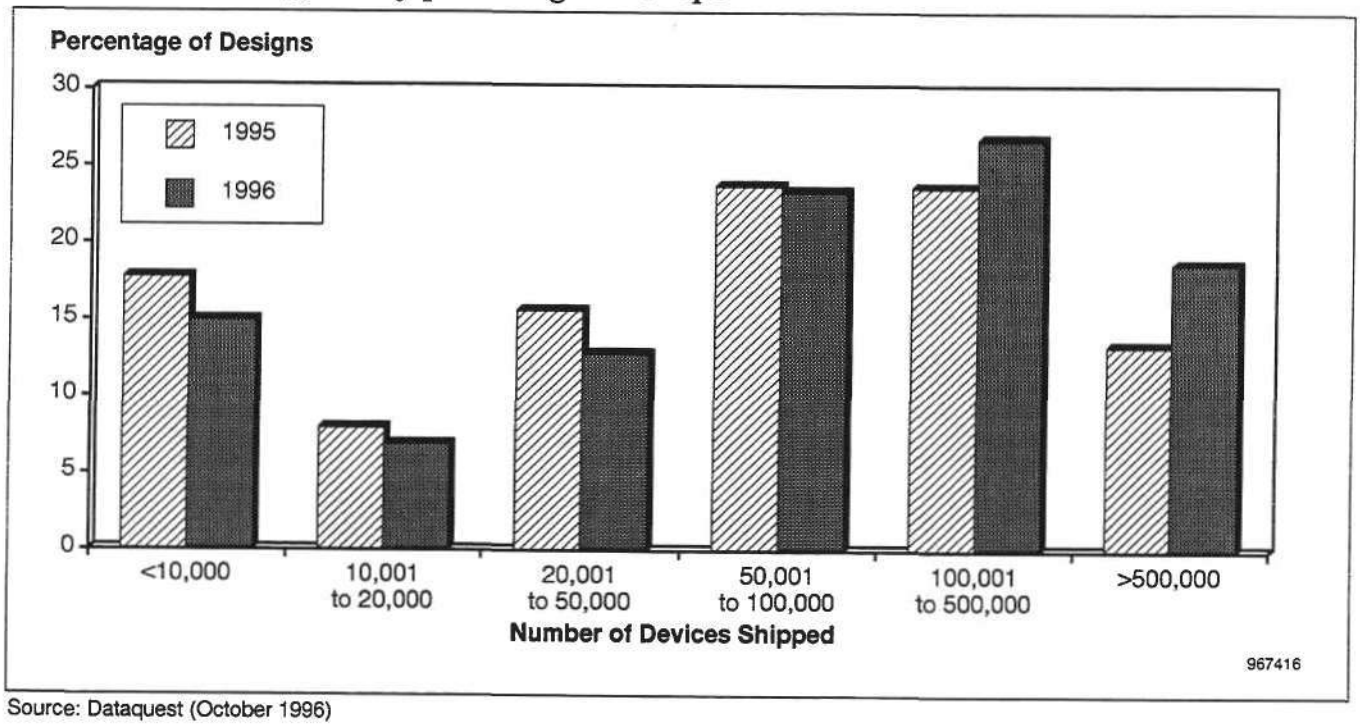


Source: Dataquest (October 1996)

Cell-Based Designs Move into the Lead

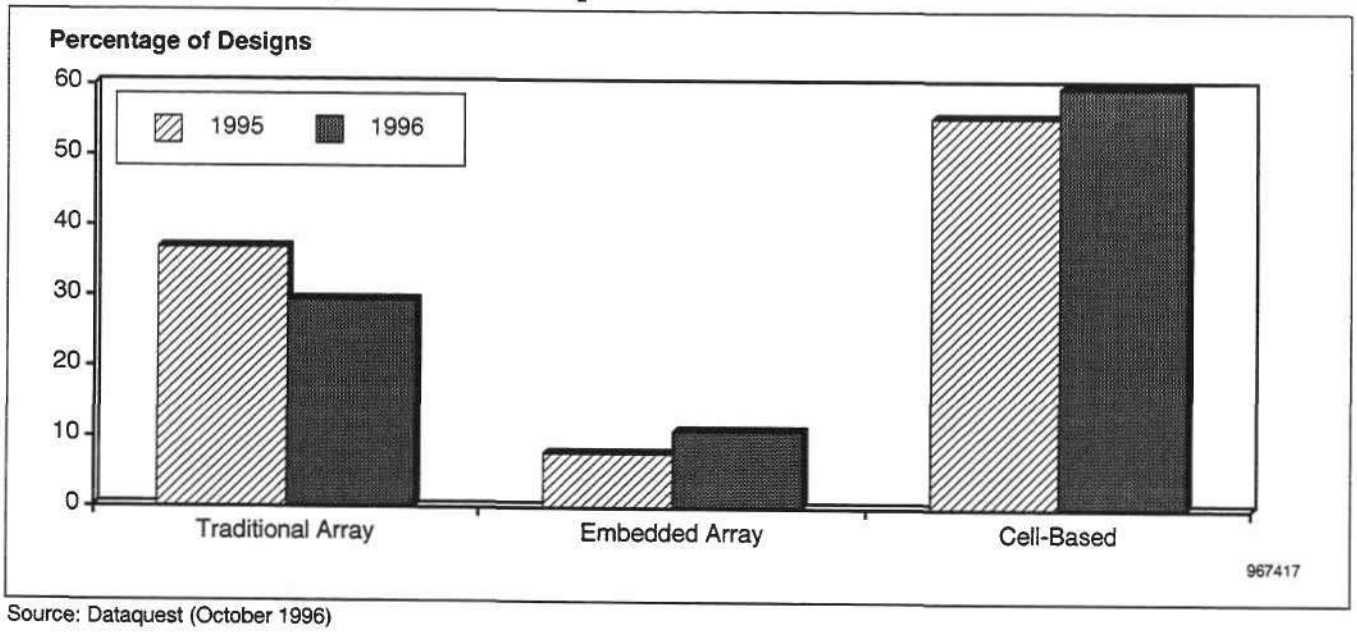
This year, the total number of cell-based designs is expected to exceed gate arrays in a 60-to-40 percent ratio. Furthermore, total array designs fell by 4.3 percentage points over the period, while cell-based designs increased their share of the total by the same figure. A closer examination of the gate array figures shows that the share of design starts attributable to traditional arrays fell by 7.5 points, while embedded arrays (an array containing embedded functions such as static RAM, or SRAM, diffused into its base wafer) grew by 3.2 points (see Figure 3).

Figure 2
ASIC Production Quantity per Design—Europe



Source: Dataquest (October 1996)

Figure 3
ASIC Design Starts by Product—Europe



Source: Dataquest (October 1996)

Differentiation for gate array suppliers is mainly limited to offering higher integration. In this respect, gate array cell densities for random logic approach those of cell-based products, but the prototyping time and engineering charges are lower. This makes the gate array the preferred solution for most random logic applications. However, many designs now

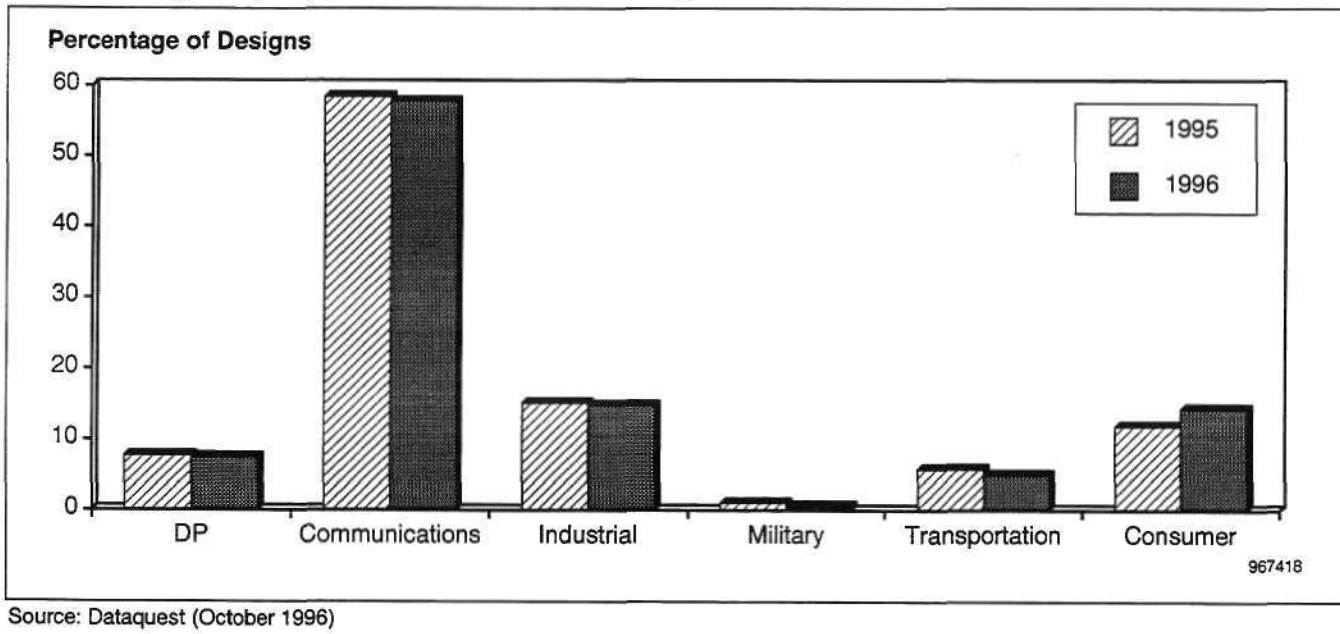
include a processor core, or a large section of memory. Here, gate array cannot offer the same level of efficiency as cell-based, so these designs tend to go to cell-based suppliers. However, embedded arrays are stepping in to partially fill the gap and are now having some degree of success.

The increase in cell-based designs acts as a multiplier of future ASIC revenue in view of the higher price of these devices compared to gate arrays. This follows from the increased functionality that cell-based devices typically have. This finding backs up our current forecast, which shows cell-based revenue pulling away from gate arrays at an accelerating rate over the next two to three years.

Design Starts by Sector

The communications sector continues to dominate ASIC design and production in Europe, taking 57.7 percent of all designs (see Figure 4). This reflects the strength of European companies in this industry. Industrial sector designs were the second largest group, closely followed by consumer. The industrial segment is powered by some large companies in Europe and will grow well above the market average (in production unit terms) as economic conditions improve in the major industrialized countries of Europe. The consumer sector showed the strongest growth between 1995 and 1996 (from 11.8 to 14.4 percent). As digital devices creep further into consumer electronics, this is certain to drive semiconductor purchases for the consumer segment. These results coincide with Dataquest's annual procurement survey of major purchasers of electronic devices as reported in a Dataquest User Wants and Needs, *European Semiconductor Purchasing Trends 1996-1997*, SEMI-EU-UW-9601, dated July 31, 1996.

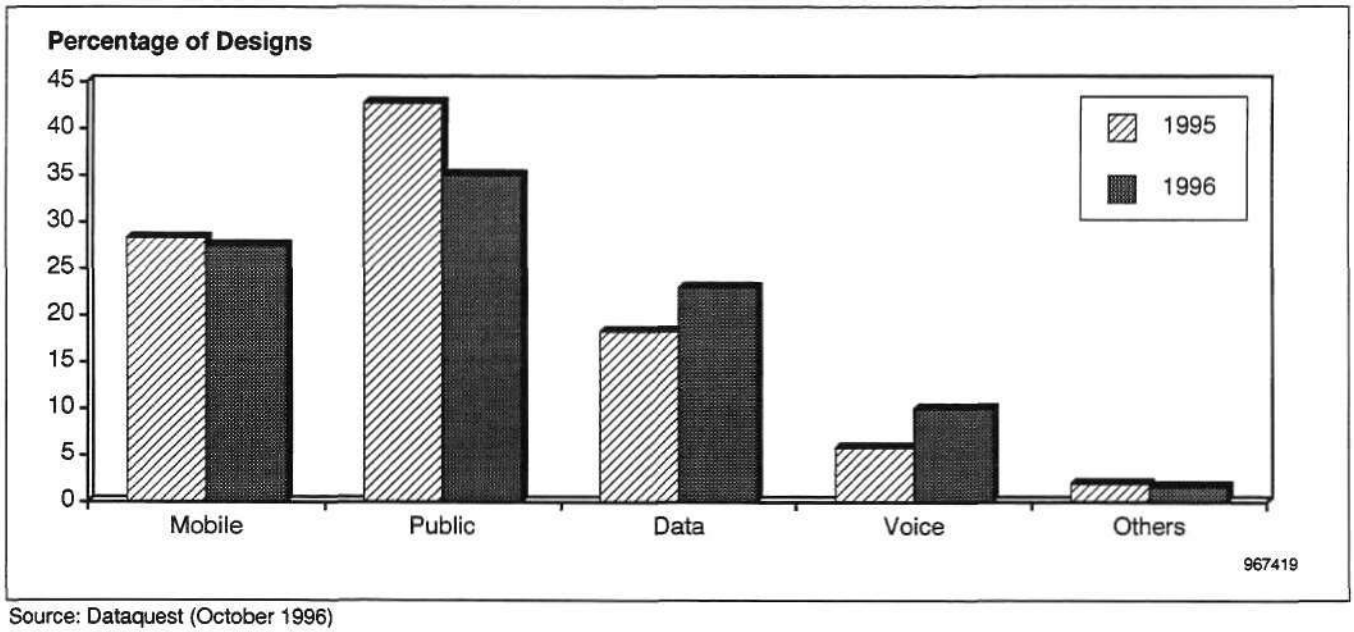
Figure 4
ASIC Designs by Application Market—Europe



Source: Dataquest (October 1996)

Because of the importance of the communications sector to the European semiconductor industry, a number of subsectors were also included in the design starts analysis (see Figure 5). For some time, the largest number of ASIC design starts in Europe have come from the public switching and transmission area. However, the large-scale digitization of European public networks is nearing completion, and a fall in growth rate is now occurring. Mobile telephony is now a significant part of the European end-equipment market, and purchases in Europe are growing fast. Even so, mobile's share of total designs fell slightly in 1996 in the face of strong growth in data communications design starts (rising from 18 percent of the total in 1995 to 23 percent in 1996). The increasing use of ASSPs in mobile phones is also having a slight effect on ASIC design starts in the mobile sector. Growth in data communication has been fueled by a strong PC aftermarket, changing standards and protocols, and a growing proportion of European-designed units. Another area of strong growth is voice communication, especially in the areas of PBX and cordless equipment.

Figure 5
ASIC Communications Designs by Category—Europe

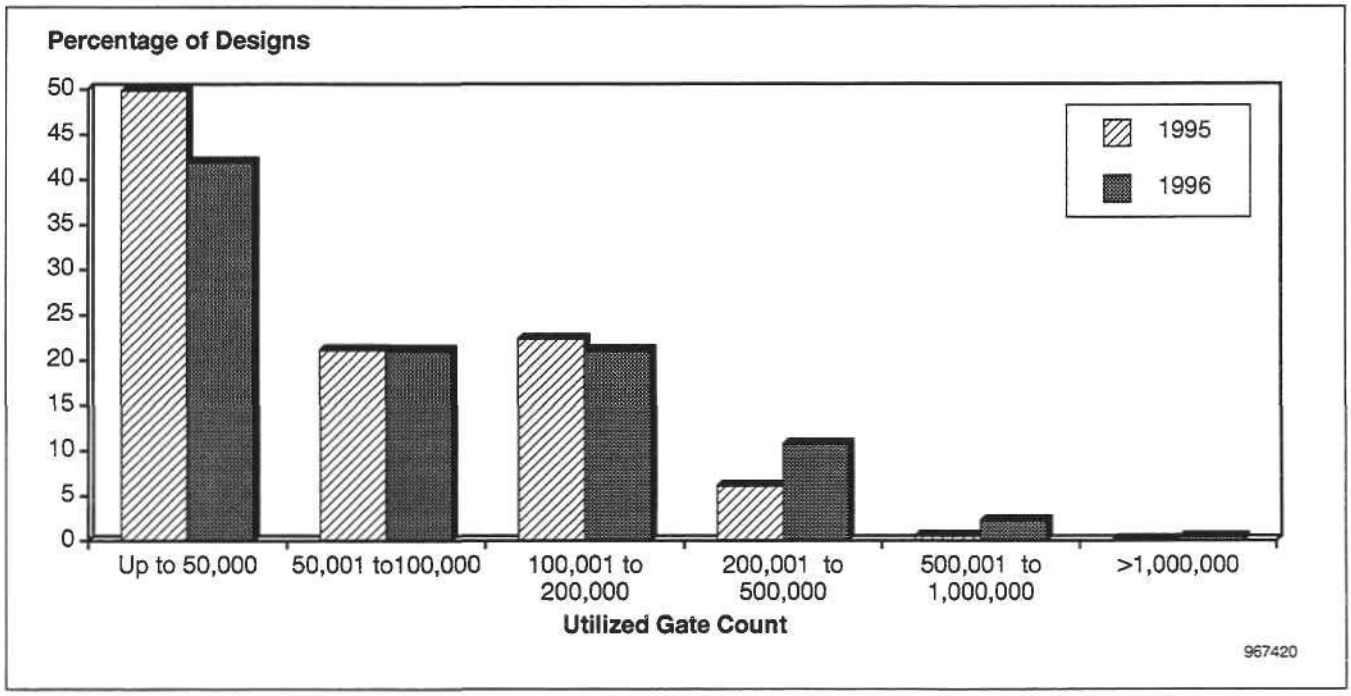


Source: Dataquest (October 1996)

Gate Counts

It is no surprise to see the average gate count per design increasing (see Figure 6). The demand from ASIC users is inexorably toward higher integration. This growth in gate counts for designs is driven by two sources: the growing demand of the user for single-chip solutions and the accelerating developments of the suppliers. In addition, the low-gate-count designs are now being penetrated even further by programmable devices, such as field-programmable gate arrays (FPGA), and complex PLDs. This has the effect of reducing the low-gate-count designs won by gate array, moving the average up.

Figure 6
ASIC Designs by Gate Count—Europe



Source: Dataquest (October 1996)

Cores and Macros

The high number of gates available from many vendors now introduces the problem of how to design components with such a high gate count. Design tools are keeping pace, but only barely. The most realistic option open to use this high number of available gates is to use very large predesigned blocks, cores or macros, as part of a hierarchical design approach. These cores include microprocessors, image compression circuits, large RAM arrays, and many more.

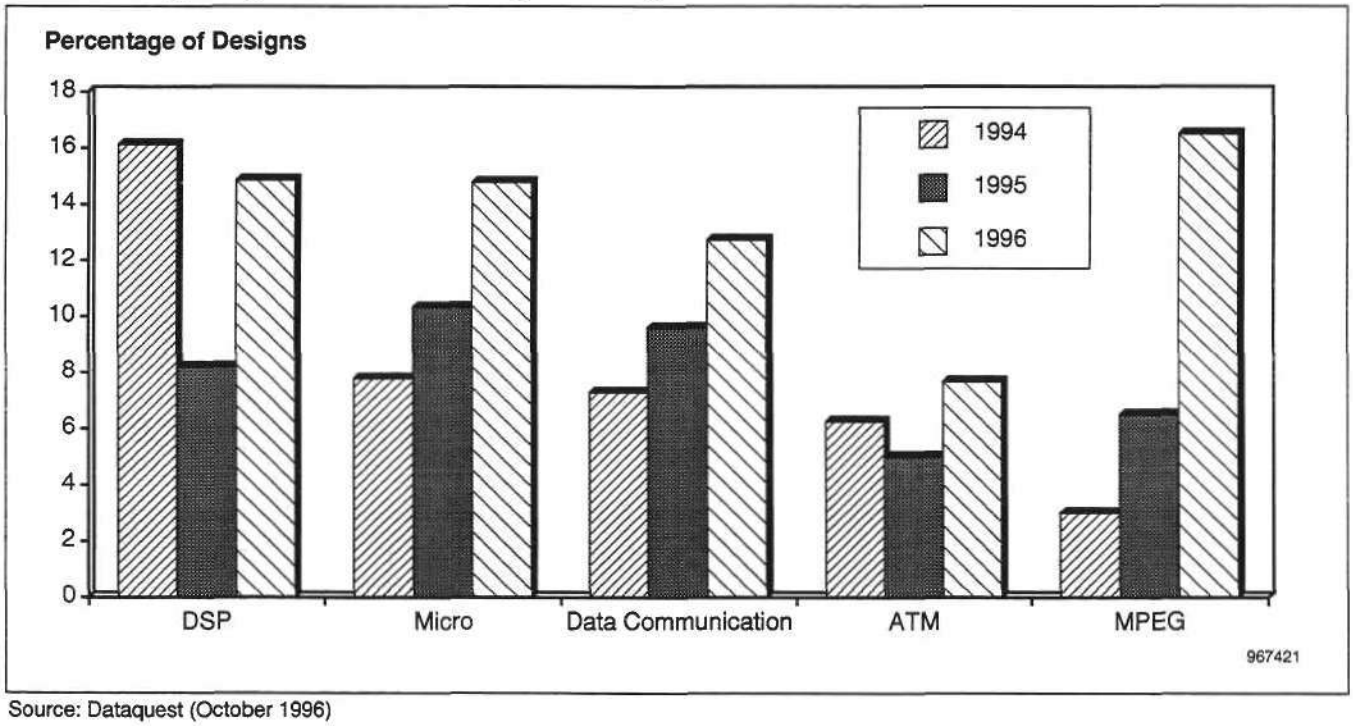
The availability of "added-value" cores is one of the more crucial factors affecting demand and profitability. These added-value cores confer a high perceived value (mainly in terms of reducing time to market against competitors), allowing the vendor to charge a high price for the use of the core. The large number of ASIC suppliers makes the market very competitive, so offering a differentiated product is vital for market success. Most suppliers offer a similar range of cores covering most applications. The real differentiator comes from cores with a much higher perceived value. These cores can raise the average price of a device significantly and thus improve profitability.

Cores with a high perceived value include some microprocessors, DSP, image compression, data communication, and cells used for mobile and cordless telephony. Figure 7 shows the percentage of designs that include five of the most widely discussed cores: DSP, micros, data communication (for example, Ethernet), ATM, and MPEG. All five have shown strong

growth over the past year, with MPEG and DSP cores showing the strongest growth. The major issue concerning the introduction of these specialized cores is the number of suppliers that intend to offer them. The first supplier to the market can gain a considerable start in that particular market, but many other suppliers will follow rapidly. This will result in price erosion for the premium charged on the higher-value cores.

This is an area of the market that is undergoing rapid change and turmoil as ASIC vendors search for new sources of intellectual property for sale as cores. Electronic design automation (EDA) companies are also active in this field. We are also seeing the formation of a new category of company—the broker—which channels intellectual property from design houses to users. Technical Data Freeway and Phoenix are two examples of such companies.

Figure 7
ASIC Designs by Core/Macro Usage—Europe

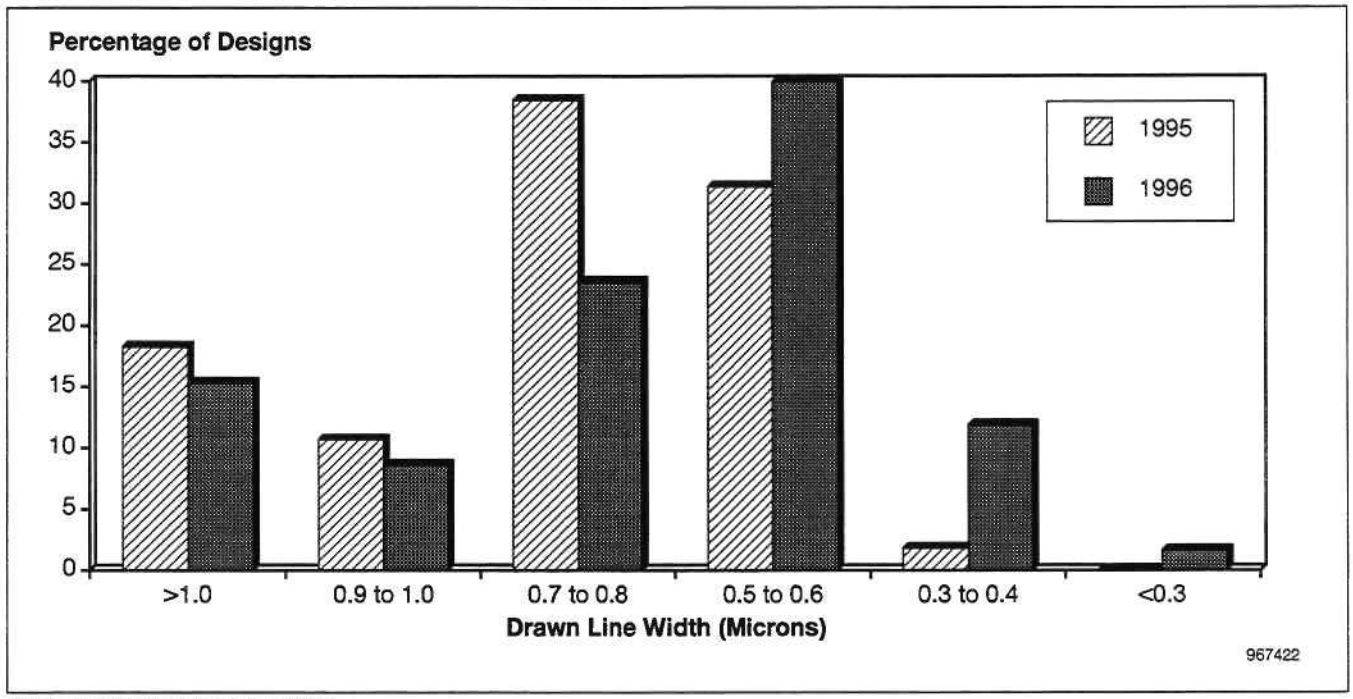


Source: Dataquest (October 1996)

Feature Size and Interconnect

Average feature sizes are continuing to decrease (see Figure 8), a factor that corresponds to the increase in gate counts. In 1995, the largest group of designs were in the 0.7-to-0.8-micron band (38 percent of designs). In 1996, the lion's share of designs fall into the 0.5-to-0.6-micron band (40 percent of designs). Larger feature sizes showed a corresponding fall in designs in 1996, while each of the smaller feature size groups showed an increase. In particular, designs targeted at 0.3 to 0.4 microns have increased by a considerable 10 percentage points—from 2 percent (1995) to 12 percent (1996) of design starts.

Figure 8
ASIC Designs by Feature Size—Europe



Source: Dataquest (October 1996)

Two-level metal remains the interconnect approach for most design starts in 1996 (56 percent), although this has fallen from 63 percent of designs in 1995 (see Figure 9). Over the same period, three-level metal interconnect continued to grow in popularity from 37 percent to 41 percent of design starts. High levels of interconnect are also beginning to be used but are currently used by less than 2 percent of designs. Interestingly, the usage of five-layer interconnect (1.4 percent) slightly exceeds that of four-layer (1.2 percent) in 1996. We find considerable interest in greater numbers of interconnect layers in order to reduce the average interconnect line length. This follows from the fact that, at feature sizes of less than 0.6 microns, signal delays through the interconnect begin to exceed delays through transistors. At smaller geometries, interconnect delays dominate the entire device. Effective, timing-driven place and route tools therefore become worth their weight in gold.

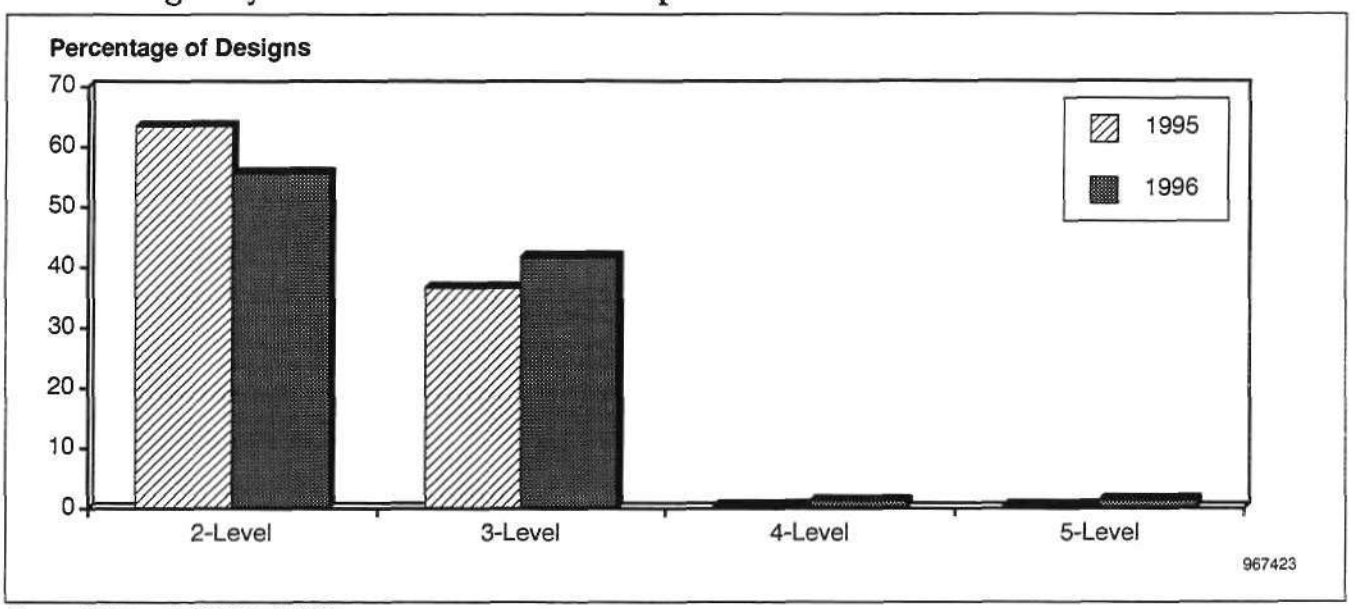
Design Reuse

Today's state-of-the-art devices contain approximately 2.5 million gates. While the average gate count is substantially lower than this figure, gate counts are nevertheless constantly rising. We forecast that 5-million-gate devices will be relatively common by the year 2000. Even today, the number of available gates in high-end devices are capable of incredible functionality within a single device.

Today's most sophisticated design tools offer productivity rates of about 10,000 to 20,000 gates per week. But this is not sufficient to match time-to-

market requirements on the one hand, with advances in semiconductor manufacturing technology on the other. There is a shortfall or gap, and the gap is growing year by year. The industry is now reaching a position where production capacity is exceeding design capacity by a considerable margin. There is no time to complete the designs within the market window.

Figure 9
ASIC Designs by Metal Interconnect—Europe



Source: Dataquest (October 1996)

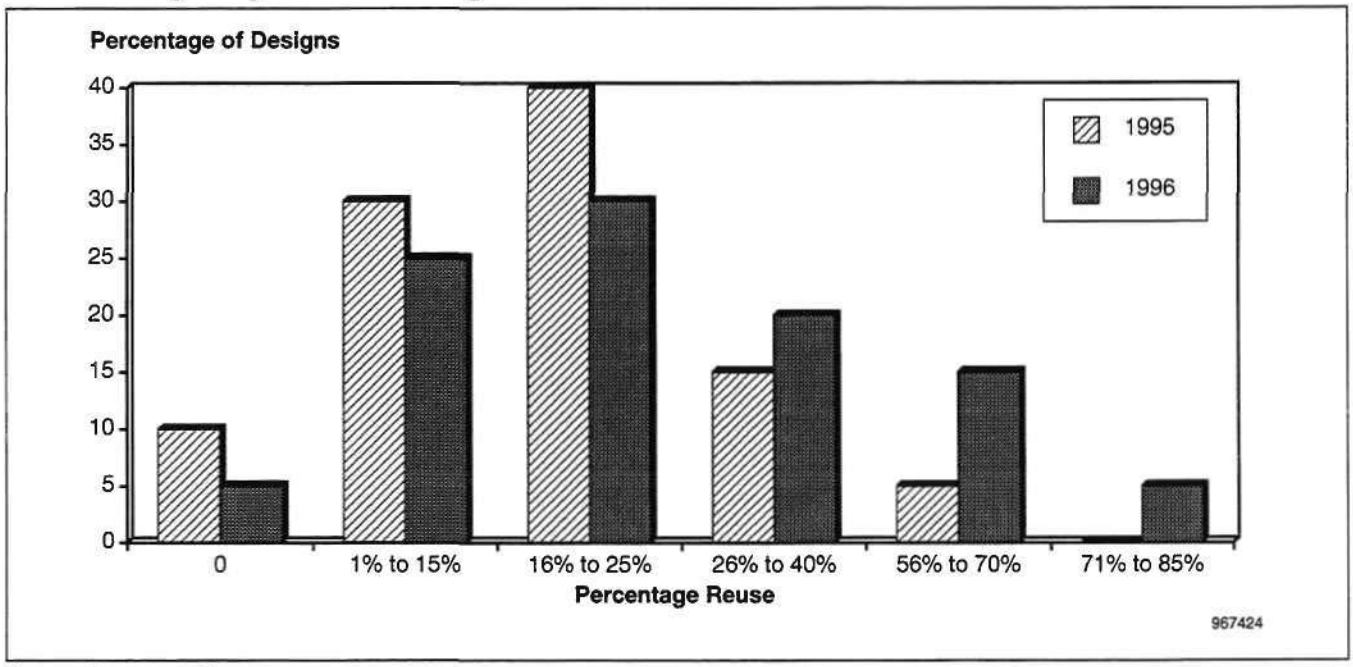
The solution increasingly adopted is to reuse designs and parts of designs. In 1996, an average of 16 to 25 percent of a design (including macros) is reused in subsequent designs (see Figure 10). This average also applied to 1995, but the curve is skewed toward greater reuse in 1996, a trend we believe will continue. Companies are not restricting themselves to reusing their own designs and the macros from vendors but are starting to buy portions of designs from other companies. This is creating a market for previously (partially) designed intellectual property that is currently in a period of rapid growth.

Country Distribution

The percentage of designs reported by country is shown in Figures 11 and 12. Design starts in the United Kingdom showed the strongest growth, in line with the economic climate in the United Kingdom and the market growth in computer, mobile communications, and data communications applications. The German market has also started to show some growth following a period of relative decline. The industrial sector in Germany, mainly related to export markets, gave a boost to the figures; the domestic market remained weak. Nordic countries showed a sharp decline following a reduction in the number of designs in the mobile telephone sector, coupled with reduced industrial activity throughout the Nordic region. Italy reported the sharpest fall of about 22 percent. The Italian electronics market is

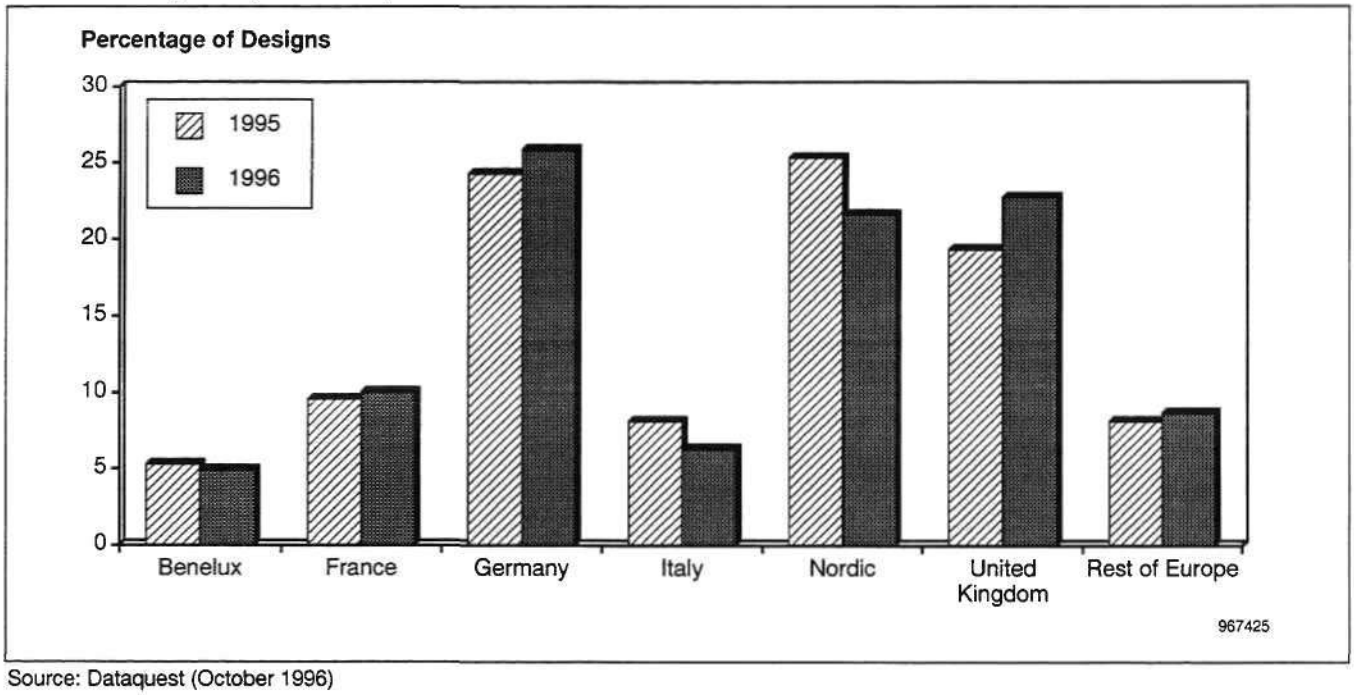
extremely fragmented with many small businesses and a small number of larger companies. We believe that the smaller companies are turning to programmable devices in large numbers. Even large companies in the public telecommunications sector are finding PLDs are a better solution because of their relatively low-volume requirements.

Figure 10
ASIC Designs by Reuse—Europe



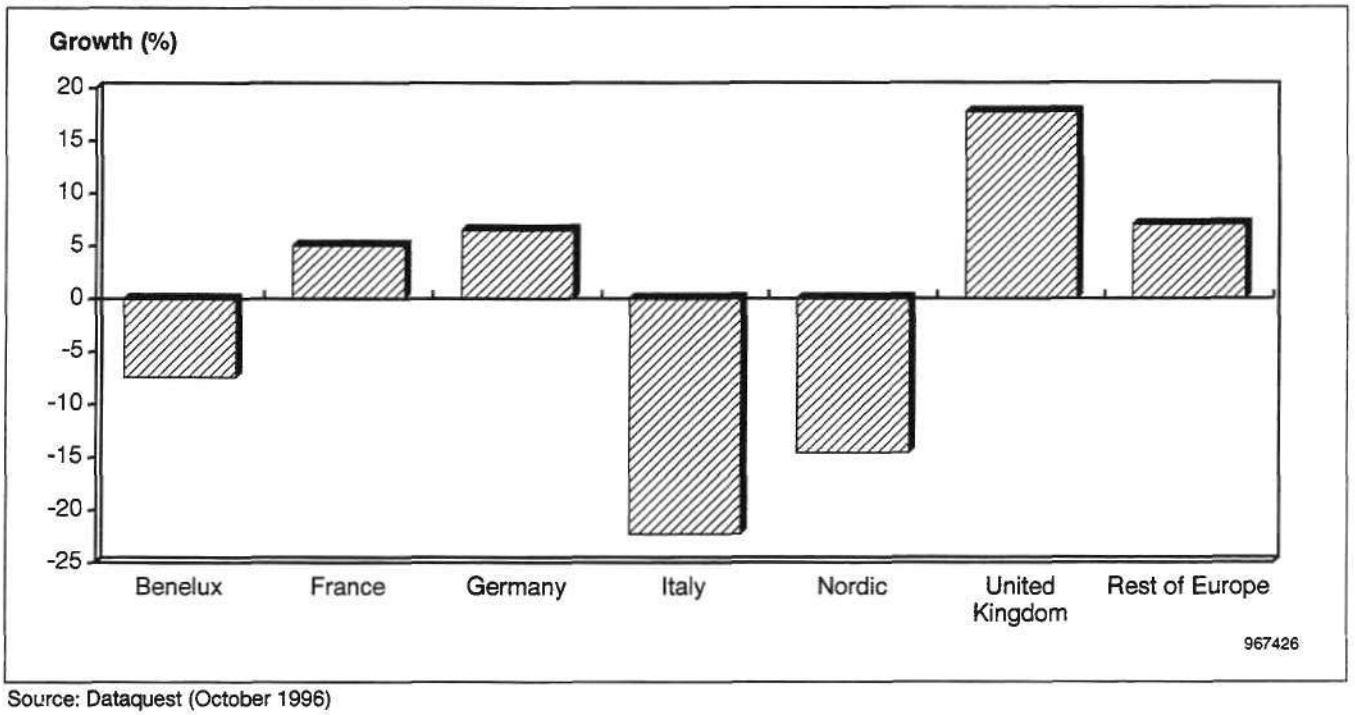
Source: Dataquest (October 1996)

Figure 11
ASIC Designs by Country



Source: Dataquest (October 1996)

Figure 12
ASIC Design Growth by Country



Source: Dataquest (October 1996)

Dataquest Perspective

The results of the design starts survey broadly agree with other Dataquest research including ASIC market share, EDA analyses, and procurement survey. Not surprisingly, most of the 1996 results are different from those observed in 1995 and in earlier years. The question is, which of these changes are the result of real trends rather than random or other fluctuations? We believe the vast majority of the factors measured are the result of trends, mostly long-term. Those factors likely to show more short-term fluctuations are country growth rates and number of designs. Country growth is impacted not only by the size, sector, and health of the local electronics industry but by macroeconomic conditions in the country. As markets mature, these economic effects become more important and have an increasing impact on the markets. The number of ASIC designs are impacted by the trade-offs of cell-based/gate array versus PLD, as discussed earlier, and the decisions of the ASIC vendors in terms of prices and minimum production thresholds for specific orders. The latter factor depends upon other production demands currently faced by the fabs. At a time of very poor DRAM pricing, many vendors are turning to high-value ASICs as a more profitable way of utilizing fab capacity. This will no doubt change when the current pricing crisis eases.

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Perspective

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Technology Analysis

What is Shrink-Wrapped EDA Software?

Abstract: *Perhaps the most misunderstood label in EDA today is the term shrink-wrapped. Not only is the term misunderstood, but it often produces emotional responses seemingly out of context to what it is trying to describe. This Perspective defines the term and places it in the context of the methodology adoption pyramid.*
By Gary Smith

The Design Methodology Pyramid

EDA, as is common in most markets, has a pyramid of early adopters (called power users in EDA), mainstream users and late adopters (sometimes called the cheap seats in EDA). Actually there are two pyramids, one for the silicon designer and one for the FPGA/CPLD and board designer. Because of the large number of board designers, as compared to silicon designers, we need to keep these two separated. As the shrink-wrapped market overwhelmingly applies to the FPGA/CPLD and board designer, we will generally address that pyramid in this perspective (see Figure 1).

Market Segmentation

Market segmentation has a major impact on the EDA industry. The power users make up 45 percent of the EDA industry's revenue, but only 8 percent of the seats. This gives us a cause-and-effect issue that is hard to analyze separately. This industry has always been driven by the power user community. The major EDA companies are all small in comparison to their customers, and have always used direct sales to penetrate these accounts. In fact, the service required from the sales team is so high that many sales forces have twice as many applications engineers as they have salesmen. This power user/EDA sales force interaction has generally kept the state of

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the art tools and methodologies away from the companies not in the power user category. This means most mainstream users are much less advanced than the power user community. As they are less advanced, they naturally buy few of the expensive high-end tools, contributing to this top-heavy market segmentation.

The PCB market has the following segments:

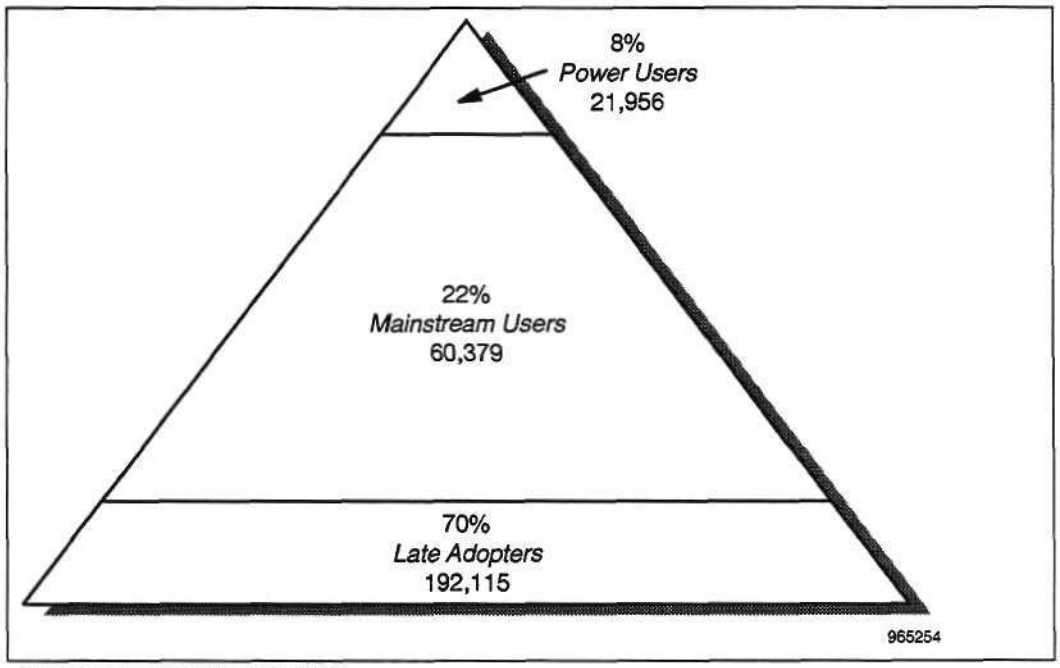
- **Power User:** A small community of designers that are constantly pushing the state-of-the-art. These users are concentrated in the computer and telecommunications markets. Although often competitors, they tend to have a lot of cross-communications with one another. A new tool or methodology is spread rapidly throughout the community. They eagerly accept beta software. They have strong CAD groups that maintain the methodology, the internal libraries (IP), and constantly search for new tools.
- **Mainstream User:** These users tend to be a generation behind the power users because they usually have weak CAD groups, or because, in some cases, CAD is handled out of the IS department. They demand robust tools and are struggling with the point tool integration issue. Often these users are prevented from becoming power users due to their companies internal organization structure. Today's complexity and speed does not allow designs to be thrown over the wall. Many mainstream companies have walls built into their organization.
- **Late Adopter:** These companies are two or three generations away from the power user. They tend to be small companies or companies in the industrial or consumer market. Engineering teams are small, often only one engineer. The FPGA/CPLD designer and the board designer are the same person.

This lack of advanced tools distorts the ASPs. The power user, in the PCB community, has an ASP of around $33,000 a seat. Where the mainstream user's ASP is about $9,000 a seat. The late adopters only spends about $2,500 a seat, which is why they are fondly called the cheap seats. It is this late adopter category that is being targeted by the shrink-wrapped vendors.

Three Different Business Models

Most of the confusion, over the term shrink-wrapped, is caused by trying to analyze the technology rather than the business model. The observation that EDA software will probably never sell at Fry's or Egghead Software is probably true. The point, often missed, is that if the design community numbered in the millions, instead of just under three hundred thousand, there should be no reason why EDA software shouldn't be sold at these large retail stores. Shrink-wrapped EDA software needs to emulate the software being sold at Fry's. That means the highest quality, the best documentation, and the best ease of use available in EDA. The point being, when changing $2,500 for a tool, service-related phone calls are not affordable, neither is a sales force or even a VAR. Actually, at $2,500 a seat a VAR's attention cannot

Figure 1
The PCB Designers Pyramid (Seat Count)



Source: Dataquest (January 1996)

be held. Today most leads are generated by advertising and most sales are done over the phone. It looks like the Web and e-mail have the potential to become the major sales channels for the shrink-wrapped market.

This price point and channel issue is where most EDA companies miss the boat. Some of the most reliable tools in EDA are not shrink-wrapped tools. The most well-known is Model Technology's V-System VHDL Simulator. In fact, Antares, a subsidiary of Mentor, is selling tools that encompass many of the features necessary for the shrink-wrapped market. The main difference is that the level of sophistication of the Antares tools is high enough that application support is called for, no mater how high the quality of the tools. This is the market Dave Kohlmeier, from Synario, has called Ready-to-Use tools. These tool suites have been on the market for a few years now. Perhaps the best is VeriBest with tools well-integrated and easy to use. One of the characteristics of Ready-to-Use tools is that even with the highest quality, the best documentation, and superior integration and ease of use, the engineer will need help learning to use the tools. Some things cannot be picked up out of a book. The Ready-to-Use tools vendors (Antares, Synario, VeriBest, and Viewlogic) are fighting for the mainstream market, and the driving force is the second wave designers that are moving to the registered transfer (RT) level for FPGA/CPLD design. The secondary driving force is high-speed board design. Instead of three levels of tool performance, the PCB design world is splitting into two levels. There is high-speed design and there is low-speed design. The dividing line seems to be at 50 MHz. Above 50 MHz the traditional high-end EDA vendors and the Ready-To Use tools vendors will fight for market share. Below 50 MHz the traditional PC-based low-end vendors and the shrink-wrapped vendors will fight it out. The price

point of Ready-to-Use tools is about $25,000 and the channels are a combination of direct sales and VARs. The issue is that, once you offer a high-end tool, you must have a level of support well above what a shrink-wrapped vendor can afford to offer. This support issue is where the Ready-to-Use vendors and today's established EDA leaders are battling for the mainsteam user.

Today's top EDA vendors develop tools for the power user. Once the tool is on the market long enough to stabilize, they offer it to the mainstream user. One of the characteristics of all but the largest of the mainstream users is the lack of CAD resources. This means the engineer is left with the task of writing the scripts, shells, and libraries needed to hook all these tools together. This is where the service organizations come in. Anyone can go to any of the major EDA vendors and hire in the engineering talent necessary to get these tools to work in a design methodology. The exception is Viewlogic. Viewlogic was one of the pioneers in the world of Ready-to-Use tools. The whole concept is, that if you integrate the tools and make them easy enough to use, the whole expense of a CAD organization or hiring a consulting service group is unnecessary. Although Viewlogic is a large company, in EDA terms, it is one-forth the size of the market leader Cadence. The problem has been the technical lag and, therefore, an ASP gap between the power users and the mainstream users. The second wave is now making a difference. EDA vendors, targeting this growing mainstream market, will soon be able to challenge the high-end vendors for overall market leadership.

The Shrink-Wrapped Business Model

In the wake of this battle is the shrink-wrapped vendor. Those vendors are trying to replace the cheap seats with shrink-wrapped tools. The market is about $200 million a year. These tools are not only used by the late adopters, but are also often used as supplemental tools in the mainstream environment. There are over 123 low-end vendors in this market currently. If the four shrink-wrapped vendors (OrCAD, MicroSim, Accel, and Protel) can take over this market there should be the fairly normal market split of a one hundred million dollar company, a fifty million dollar company and two twenty five million dollar companies instead of a large group of companies doing a million or two a year. The difference between the shrink-wrapped vendors (that will succeed) and today's PC-based vendors will be resources. It takes considerable financial resources to produce high quality, well documented, easy to use tools, and spend the money necessary for marketing. Marketing will be the major differentiating factor between the winners and the losers (see Table 1).

Conclusion

The key to domination of the shrink-wrapped market will be marketing. One of the more important issues will be market focus. It will be tempting to try to move up into the Ready-to-Use tools market arena. It would be easy to migrate technically. It will prove next to impossible to move a business model. Do not make the mistake of focusing on the technical issues instead

Table 1
Business Model Differentiating Factors

	Price Point—Tool	Price Point—Seat	Support Level	Direct Sales	VARs	Other Channels
Point Tools	35,000	120,000	Very High	Yes	No	No
Ready-to-Use	25,000	65,000	Medium	Yes	Yes	Yes
Shrink-Wrapped	5,000	15,000	None	No	No	Yes

Source: Dataquest (August 1996)

of the business issues. A good shrink-wrapped vendor will be driven into the ground with even the small increase in service cost needed to address this mainstream market. The lack of a traditional sales organization will, on the other hand, never allow a major market penetration. The Ready-to-Use tools vendor can never get the cost of sales low enough to be a factor in the shrink-wrapped market. Also, the focus on technology will not leave enough funds available to implement the necessary marketing campaign. These two markets may seem similar, but there is a wide gap between them. Do not loose track of your key competency.

The shrink-wrapped vendors must concentrate on producing tools of the highest quality, with the best documentation, and the best ease of use available in EDA. They are not there yet. The Ready-to-Use vendors seem to hold that distinction today. The alternate sales channel issue must be solved. No one thinks they have the complete answer yet. The fact that a good portion of this market could evolve out of Eastern Europe, Asia, and the ROW countries complicates the sales channel issues. There is no lock on this market. OrCAD seems to have a lead, but it's still early. The other three vendors must fine-tune their business models or risk dropping by the wayside as the race progresses.

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Perspective

Electronic Design Automation Worldwide

Dataquest Predicts

Dataquest Predicts: CALS to Be Transformed by the World Wide Web

Abstract: *Nearly 10 years ago, Dataquest actively covered the continuous acquisition and life-cycle support (CALS) initiative, a U.S. government mandate that adopts current industry standards to better manage design, purchasing, ownership, and retrofit of complex products with long life cycles. In the following years, general interest in the topic waned. In the last year, based on the resurgence of interest in CALS, particularly in Japan, Dataquest has researched the topic once again. Our extensive series of interviews with industry participants produced some surprising findings. Based on this research, we evaluate the trends impacting CALS today, identify opportunities for vendors interested in a piece of the CALS industry, and outline the most likely future scenario for CALS.*
By Sharon Tan and Kathryn Hale

Dataquest Predicts

Dataquest predicts that the World Wide Web and, to a lesser degree, the PDM market will begin to transform the continuous acquisition and life-cycle support (CALS) standards-setting body within two years, primarily because the Web is able to absorb CALS standards at a much faster rate than the CALS initiative can adapt to the opportunities presented by the Web.

A Brief History

CALS was first launched in 1985 by the United States Department of Defense (DoD). It was designed to implement, through a broad range of specifications, a system that can create, transmit, and use technical information in digital form to design, manufacture, and support defense

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weapon systems and equipment. The original objectives of CALS were:

- To require technical information on weapons systems in digital form, replacing the existing paper system
- To increase the DoD's ability to receive, store, use, and update technical information in digital form for any weapons systems that are purchased

To put the need for CALS into perspective, consider the fact that at any one point in time it is estimated that 25 percent of all military specification manuals are out of date or incorrect. Early projections for savings from CALS implementation were $1 billion in documentation administration and maintenance costs alone in 1989.

After its inception in 1985, CALS quickly expanded to include other U.S. government interests. In the late 1980s and early 1990s, cooperation among other government agencies, including Commerce, Energy, Transportation, and NASA, expanded the arena for CALS. Today, CALS has a much larger focus and has generated international interest from a number of diverse industries and countries.

The CALS Vision Today

Although the original stated goal of CALS was to get U.S.-based industries to deliver all documentation on weapons systems in digital format to the DoD, the CALS vision has been slowly evolving over the past 10 years. While the underlying goal of getting documentation in digital format is still very real, the CALS vision has evolved to serve as a catalyst for the integration of enterprises on a worldwide basis. Today, the vision of CALS is for all parts of an enterprise to be able to work from a common digital database, in real time, on the design, development, manufacturing, distribution, and servicing of products.

Although the vision of CALS may be all-encompassing, in reality, CALS implies a strategy to attain this vision. The current emphasis of this strategy is the development and implementation of a set of international standards and technical requirements that, when combined, meet the CALS vision. Table 1 outlines the major CALS standards as they apply to the United States. CALS in Japan or Europe will contain most of these standards and initiatives but not all.

Table 1
CALS Standards and Initiatives

Acronym	Name	Application
	Automated Interchange of Technical Information	Umbrella standard specifying overall guidelines for electronic data storage and exchange of CALS documents
CCITT Group 4	Raster Graphics Representation in Binary Format	Specification used in compression of scanned images, especially important for accommodation of legacy data
CGM	Computer Graphics Metafile	Standard associated with describing, storing, and transferring 2-D graphical information
CITIS	Contractor Integrated Technical Information Service	Defines scope of electronic services that allow government and contractors access to business and technical information
EDI	Electronic Data Interchange	Suite of standards for the exchange of routine business transactions in a computer-processable format
EDIF, Gerber, and IPC-D-350	Electronic Data Interchange Format	Addresses exchange of electronics product data
IETM	Interactive Electronic Technical Manual	Prescribes requirements governing creation of interactive electronic technical manuals
IGES	Initial Graphics Exchange Standard	Data exchange standard focused on design data
SGML	Standard Generalized Markup Language	Defines a standard for preparation of textual technical information.
STEP	Standard for the Exchange of Product Model Data	Evolving standard that addresses the representation and exchange of product data throughout a product's life cycle

Source: Dataquest (June 1996)

Industry Perspective on CALS

The value of CALS to particular industries is directly proportional to the complexity of the products of the industry and their longevity. More specifically, industries whose products require little or no maintenance or industries associated with raw materials (such as coal mining) have little use for a CALS-based system. However, CALS can add value for industries that are component- and process-intensive, such as the aerospace and automotive industries.

Remember that CALS originated from a focus on products like submarines and fighter planes—complex products with long life cycles. This origin is key to understanding the vitality of CALS today. CALS is a philosophy of adopting current industry standards to better manage design, purchasing, ownership and retrofit of complex products with long life cycles—thus the early commercial interest in the aerospace, shipbuilding, and automotive

industries. An important third industry that meets these criteria is the process plant design business (such as nuclear power plants and chemical plants). Nuclear plants have many of the same components, complexities, and life-cycle management issues as submarines (and in fact are sometimes designed with the same software). However, U.S. industry has done little with CALS in the plant design/build/operate industry. Dataquest believes that Japan is poised to take the lead on this front, based on the strong interest in CALS throughout Japan. Table 2 illustrates what Dataquest believes are the likely adoption rates of CALS in various industries.

Table 2

Industry Adoption Rates of CALS

Industry	Likely Adoption Rates
General Components (Mechanical)	Moderate
Electronic Components and Accessories	Low
Production Machinery	Low
Electrical Equipment (Power Generation)	Moderate
Aerospace	High
Shipbuilding and Repair	High
Printing and Publishing	Very low
Electronic Information Services	Very low
Computers and Peripherals	Low
Telecommunication Services	Very low
Telecom and Navigation Equipment	Low
Motor Vehicles and Parts	Moderate
Household Consumer Durable Goods	Moderate
Drugs	Low
Medical and Dental Instruments and Supplies	Low
Insurance	Very low
Chemical and Allied Products	Very low
Plastics and Rubber	Low
Food and Beverages	Very low

Source: Dataquest (June 1996)

Not a Standard, Not a Market

It is important to understand that CALS never created a standard. This was explicit from the beginning. The plan was to aggressively adopt (capitalize on) accepted industry standards, then foster their development, all for the goal of addressing existing problems in weapons programs. The most pressing problem was documentation (manuals). So the founders adopted a series of existing standards that started with the highly achievable ("You must at least send everything in CCITT fax standard") to a minor struggle ("Now, this year we expect you'll have SGML-coded all your words before you send them, and we think you can squash your CAD drawings and

technical illustrations flat into CGM format") to the more demanding requirement to receive vector data in IGES format.

So the spirit of CALS is to drive adoption of relevant standards already established in the commercial community. This approach advocates measured, least-common-denominator progress in exchange of electronic information.

Further, CALS is not a market in the traditional sense. A company cannot simply go out and "buy" CALS. Most of the CALS standards exist as modules or features of other products. (For instance, IGES translators are often included as modules in many CAD/CAM/CAE packages). These same CALS standards are also of interest to organizations that have never heard of CALS.

Typical software decisions most impacted by CALS include high-end publishing, imaging, CAD/CAM/CAE software, document management, product data management, and databases. The service most impacted by CALS is systems integration. In either case, the closer an industrial sector is to the historical roots of CALS, the more directly affected it is today.

Trends Impacting CALS Development

In looking at the trends affecting CALS in the future, there are several key questions that need to be asked:

- How are the demands of the market changing? What impact will this have on CALS?
- How is the technology changing? Will this accelerate, change, or cause problems for CALS?
- What are the potential threats (that is, "competitors" or substitutes) for CALS?

In this section, we will discuss each of these.

Changing Market Demands

One set of forces impacting CALS is the changing demands of the market. Perhaps the most important market demand change is the divergent perceptions of those knowledgeable about CALS. It is not much of an over-simplification to say that those people knowledgeable about CALS fall into one of two groups that disagree significantly about the current state of CALS and its prospects for the future.

CALS Is Dead

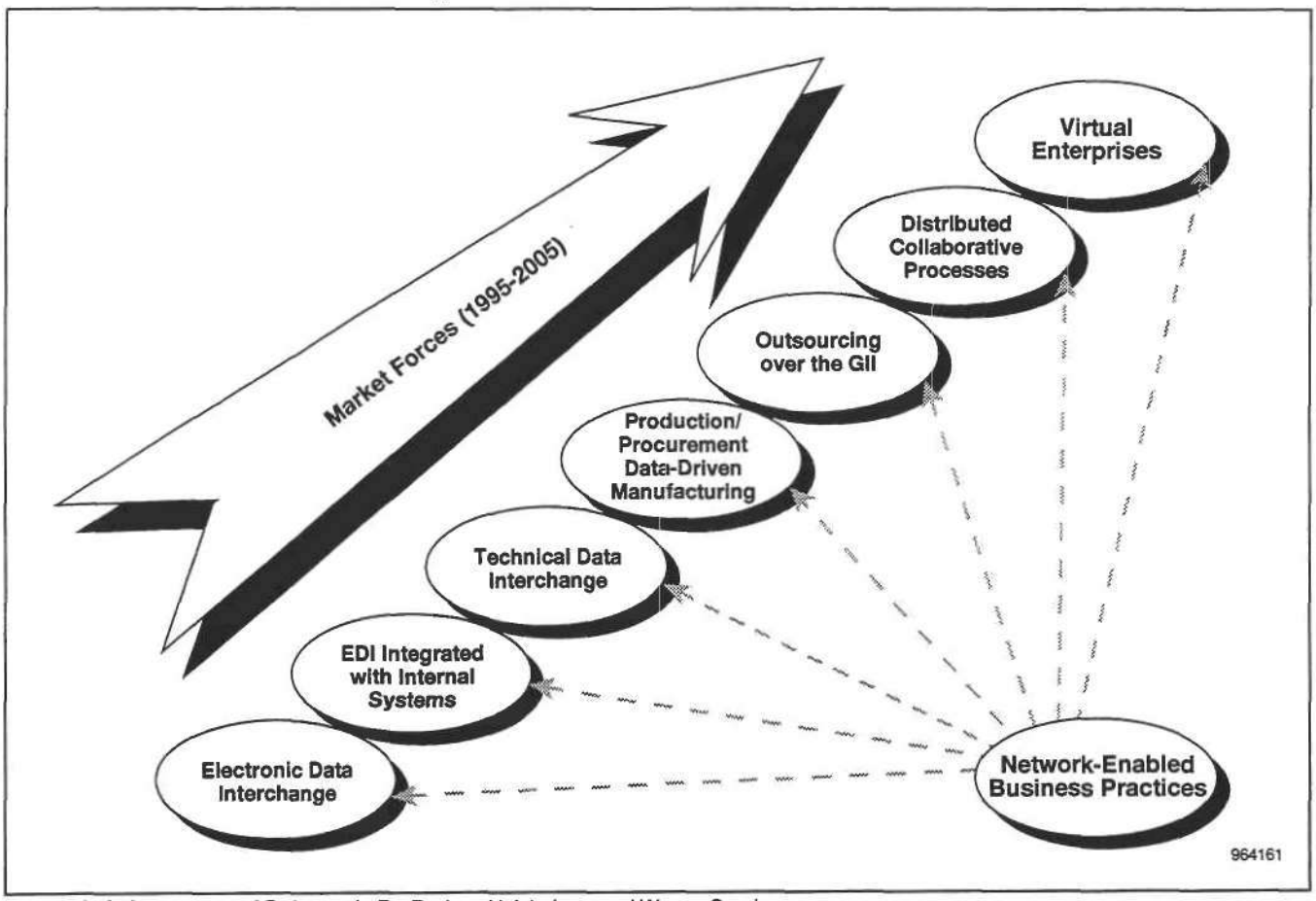
On one hand, many knowledgeable people considered CALS to be a standard from the late 1980s. In their view, it gained some attention for a time, and then the market moved elsewhere. All remembered the expected impact on the market, and none felt that it had succeeded at much more than getting military equipment manuals converted into SGML and helping

establish IGES as a file interchange standard and CGM as a technical illustration standard.

Long Live CALS!

On the other hand, there were those who thought that CALS was finally starting to deliver on its promise. In this view, CALS was ahead of its time, and now that the technology is catching up, the detailed thinking that went into CALS is finally starting to show some results. Particularly with the surge of interest in Japan, these people felt that the time they had invested in CALS positioned them well in the emerging global electronic marketplace. Figure 1 illustrates the long-term view of CALS as seen by this camp.

Figure 1
Electronic Commerce/CALS Spectrum



Source: U.S. Department of Defense via Dr. Rodney Heisterberg and Wayne Snodgrass

It Is a Matter of Definitions

As is so often the case, Dataquest believes that the reason these two groups see things so differently is because they are talking about different things.

The members of the first group define CALS narrowly. They define it in terms of the current specifications. To them, CALS is the way the U.S. Department of Defense wants to manage weapons life cycles. In this view, the declining U.S. military budget means that the limited impact CALS has

had to date will only decline over time. They would say that the only companies that should be paying attention to CALS are those that supply weapons to the military ... and that those companies should do the minimum possible.

The members of the second group defines CALS much more broadly. They define CALS in terms of the "vision" of getting rid of paper in business transactions and see CALS becoming increasingly important in light of the interest in electronic commerce. This group's members now refer to CALS as "Commerce at Light Speed." They rightly point out that businesses in the late 1990s and beyond should not be printing out and rekeying information on both sides of every business transaction and that a good number of procurement departments in government entities and aerospace companies are already requiring that suppliers use CALS-compliant communications. Many of the people in this group talk about "the spirit of CALS" or use some similar phrase to clarify that they were talking about something more than simply the way the DoD buys weapons today.

The differences in perception include a difference in perception of the scope of CALS. The truth is somewhere between these two views. In particular, efforts to use CALS in the automotive and aerospace industries are far enough along to be quite real. However, efforts to apply CALS to making movies or PC game software are remarkably out of touch with what is going on in those industries.

Changing Technology

CALS traces its roots back to 1985. The technologies mature at the time were what was in the mind of those architecting CALS. Inevitably, some implied predictions about what would happen in the market were designed in. Not all those predictions have played out as expected. The CALS architecture was designed before the emergence of several key technologies:

- The Web—A key concept of CALS, employing industry standards for a variety of file formats, is also a core component of the World Wide Web, but the implementation that has emerged (and continues to evolve each day) is not cognizant of CALS. For example, Web documents are in Hyper Text Markup Language (HTML), a subset of SGML, and the action today is on the evolving HTML standard, not on SGML. The graphics formats commonly found on the Web are not limited to those defined in CALS, Virtual Reality Modeling Language (VRML) being a prime example. Audio and video are emerging as key components of the Web and could obviously contribute significantly to effective product documentation, but both media are underdeveloped in CALS. In fact, with the exception of IETM, the entire concept of hypertext and hypermedia, which is the basis of the Web, is absent from CALS. Were CALS designed today, it would certainly incorporate all the standards of the Web instead of a subset of them. (The impact of the World Wide Web on CALS will be discussed further in the latter part of this document.)

- Distributed databases—CALS was designed when distributed database technology was merely at the talking stage. It clearly fills a need that would have been architected into CALS "if we had known then what we know now." Instead, the concept of a single large database that everyone accesses is embedded in CALS.

- Objects—CALS could benefit from many object-oriented techniques and concepts, but, again, these were not well developed when CALS was architected. Instead, implicit assumptions of a relational data model are embedded in certain aspects of CALS.

- Open systems—The emergence of the client/server model and Microsoft's dominance of the desktop were not envisioned. In the early 1980s, some military suppliers were producing their documents on VAX-based word processors, others on IBM mainframe-based word processors, and so forth. There was no ubiquitous format that one could count on. Today, it is much more likely that a potential partner can read a Microsoft Word file than an SGML file. At the time CALS was designed, the world was much more heterogeneous. It is very, very difficult (although not impossible) to gain a competitive advantage by diverging significantly from what "most" organizations are using. If the mainstream is using a product that is not truly an open system, it may be unwise to refuse to consider doing the same simply because it is not truly an open system.

Changing Competition

Because CALS is not a single product or company, talking about competition to CALS is also a discussion of potential substitutes. In other words, the question is what will replace CALS if CALS does not "take over." Of course, the answer to that question varies according to which part of the CALS vision one is focused on. Two viable substitutes for CALS exist today—product data management (PDM), and, more important, the World Wide Web.

Product Data Management

Product data management and engineering document management (EDM) are topics that are seldom talked about in the context of CALS, yet PDM, EDM, and CALS all strive to attain variations of the same vision—access to information that is instantaneous and up-to-date. A product data management system or electronic document management system is a system that helps manage the workflow processes within a company, whether it is a discrete manufacturing company (as in the automotive industry) or a process-oriented company (such as petrochemicals). A typical PDM system contains applications for:

- File access and control, including security, check in/check out, user access privileges, backup, and archiving

- Workflow, including change management capabilities, workflow routing, notification, revision control, audit histories, and electronic sign-off

- Product structure management, including relationships between parts or products such as options and versions, bill of materials creation, and report generation for product information

The threat that PDM and EDM vendors pose to CALS is minimal; instead, the two could benefit one another. Part of the reason that PDM advocates are not more focused on CALS is that PDM began as an electronic version of the document control center in engineering departments, responsible for maintaining knowledge of where the drawings and change orders were, of which version was approved when, and so forth. It was used in particular to integrate drawings and data produced from multiple CAD vendors. Because CAD vendors and PDM-only vendors compete in this arena, they have been more focused on competing with each other than on determining how to use standards to share data. Thus, CALS and STEP both represent standards the PDM industry must absorb as features in products that address more sophisticated problems than meeting a few standards requirements.

PDM vendors understand process re-engineering, the value of a common database, product data exchange, and concurrent engineering. As a result, these vendors stand to gain expanded business in focusing on some aspect of CALS, and the CALS community stands to gain a better understanding of CALS-related implementation issues.

Not If, but When—The World Wide Web

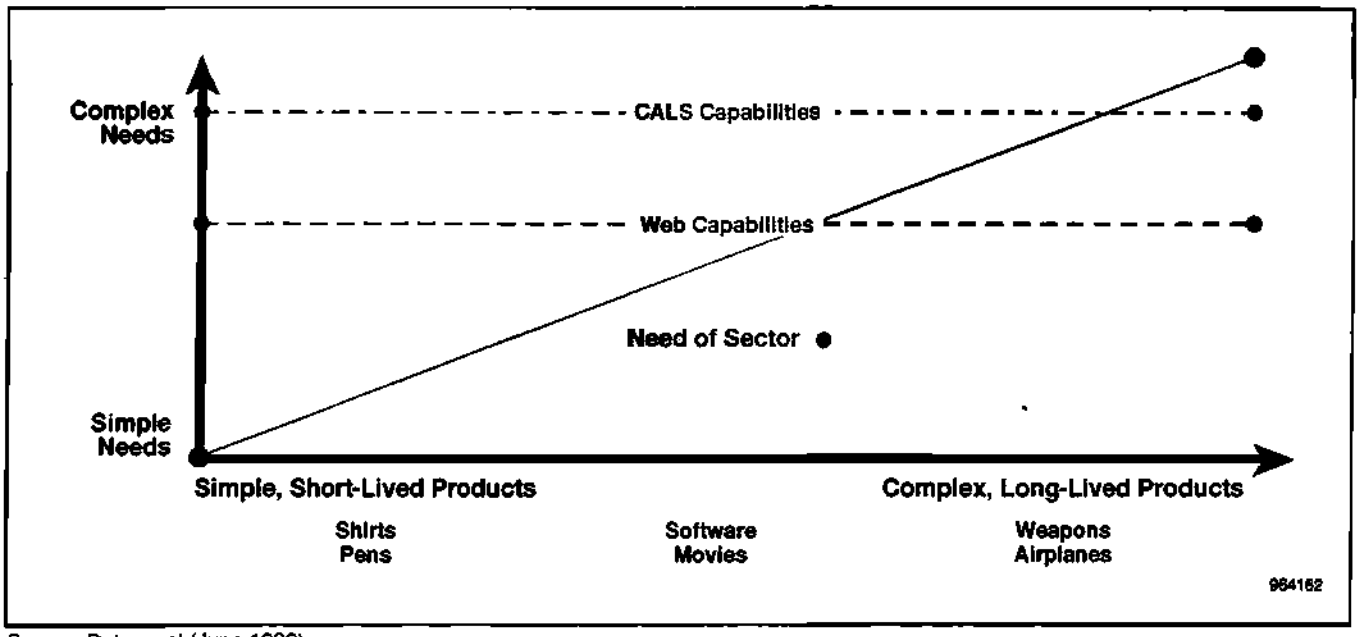
CALS has a serious competitor that the mainstream market will find good enough for the transition to doing business electronically, and that is, of course, the World Wide Web, commonly known as the Web.

There is an important concept of threshold in the discussion of the Web versus CALS that is illustrated in a qualitative fashion in Figure 2.

If the costs associated with implementing both were basically similar and if both shared a similar position in the mind of the market, Figure 2 would argue that CALS would win. However, the costs are not similar, and the Web clearly has a far stronger mind share in the market today. Because of intense competition in a relatively open environment, the Web is also increasing its capabilities at a rate that is unprecedented. In effect, CALS is now a "committee of committees" and the Web is the perfect example of an open system.

The reason that the open systems model has flourished is exactly because of the rapid rate of change it supports. There is no requirement that the change embodied in one product be bought off by the rest of the industry. This rapid change comes at a price, however. Changes are not coordinated and result in a loosely architected solution.

Figure 2
Threshold and the World Wide Web



Source: Dataquest (June 1996)

Early Signs: The Web Ensnares CALS

Standards nurtured in the CALS environment are flourishing on the Web. It is unlikely that HTML would have emerged as quickly as it did were it not for the fact that all electronic publishing software vendors had been forced by CALS requirements to deliver products that produced SGML documents. Recently, CGM was registered as a Multipurpose Internet Mail Extensions (MIME) type, essentially making it officially an Internet file type. What was in 1987 primarily a compact 2-D vector file format has evolved over the years to include raster and text and, in 1995, application structures that can be used to support hyperlinks and some degree of animation—all with support of standards bodies such as ISO and CALS.

Recently InterCAP (now an Intergraph company) produced the first CGM plug-in for Netscape and Microsoft Explorer, in addition to a CGM authoring tool. Although CAD vendors have been the primary producers of quality CGM output, almost no vendors appear to be aggressively pursuing the additional features possible in the latest CGM standards. However, given the fact that CGM is both an ISO standard and an Internet standard, it should be only a matter of time before someone produces a shareware version of a CGM authoring tool that supports the most recent version. When that happens, the poorest government entity can publish engaging, navigable "views" of their jurisdictions; a garage operation will be able to publish animated documentation that demonstrates how to use or assemble a new product. Beyond that, however, the CALS initiative has no present recognition of the rapidly emerging VRML specifications, which address 3-D on the Web. At the same time, IGES has already been approved as a MIME type for the Web, awkward as this hefty format might prove to be.

The Next Phase

Clearly, the Internet is testing existing CALS standards a lot faster than the reverse is happening. Again, within two years, we believe the Web will have pulled far ahead of CALS as a standards-setter for publishing and documentation.

Today, system design is often still being accomplished through weekly status meetings, which require that engineers participate in meetings to discuss the status of their portions of the systems. Dataquest believes that internal Web sites (intranets) will one day commonly serve as collaborative, interactive project management systems to enable a project design team to develop specifications, allocate the work, check status, make changes, and generally drive progress—working with contributors both inside and outside the company, from any location. In this space, ultimately, the virtual prototype is most likely to live—not in one vendor's CAD system or in another vendor's PDM system, or in a CALS- or STEP-compliant setting.

In fact, the Web also provides an opportunity to break down the walls in the workflow in a way that creates value; that is, the Web creates an opportunity to break down the walls between engineering, marketing/sales, and manufacturing. Many people can remember the old cartoon that begins with a contraption showing "what sales ordered," moving through" what engineering delivered," ending with a very simple product labeled "what the customer wanted." This cartoon focuses on the walls that create waste in every organization—walls that the Web is poised to attack. As a result of the recent global downsizing, companies have lost a lot of layers, creating new communication problems. In many cases, the lost functions were not highly efficient, and recreating them will change some business models—that is, change the way that value is created by the company. Already some marketing departments share space on internal project development Web sites, posing, for example, a market opportunity analysis for the developing product. Achieving a state in which everyone knows what is being developed and why would be a great leap forward.

Already, collaborative weapon design on the Internet has been successfully tested using documentation approaches that go well beyond CALS standards (see http://www.madefast.org/mf/ACM/paper.html). At the back end (the data model), Dataquest expects that both CAD vendors and the PDM community will continue developing product life-cycle management scenarios that eclipse the relatively modest goals of CALS. In fact, the Madefast Web site is virtually a road map for the PDM/EDM community on how to integrate the Internet into its products. Thus, within two years, Dataquest expects to see CALS become more of a backwater in the United States.

Coping with the Present

It is still clear that for some industries, such as aerospace and automotive manufacturing, the best solution today is CALS or a derivative of CALS. These high-end users cannot afford to wait until the Web adds features and evolves to be good enough for their documentation needs (although we do

expect them to use Web-based strategies increasingly in conjunction with CALS-based strategies). For other industries, particularly those that do not sell manufactured goods to the government, automotive, or aerospace industries, the Web is likely to prove good enough.

Over the next two years, both the Web-based and CALS-based initiatives will grow under distinct and separate efforts. However, Dataquest predicts that the capabilities of the Web-based initiatives, which are growing very rapidly, will have significantly passed those of the CALS-based initiatives within two years. It is unlikely that these Web-based efforts will be well coordinated with the efforts of the CALS advocates. Dataquest believes that CALS will eventually be forced to match the Web-based efforts, particularly in terms of electronic commerce, additional media types, and new data formats. At that point, it may no longer be meaningful to talk about a separate "CALS-based" initiative, except within the narrow definition of the original mission—which was, roughly speaking, to allow the U.S. federal government to continue to demand extensive (and often extravagant) documentation while eliminating the messy requirement of receiving it in paper form.

One of the greatest challenges to CALS advocates will be not just finding a place to fit audio files in documentation standards, but also finding ways to accept less documentation that makes more sense. New media could significantly change the manual on "how to keep your submarine running smoothly"; whether the government will readily accept the notion that a video could be worth many thousand words is an entirely different question.

The bulk of the information technology industry, at least in the United States, is heavily focused on the Web today. Senior executives of the leading U.S.-based IT companies—companies such as Microsoft, Novell, Apple, Netscape, IBM/Lotus, Oracle, Cisco, Bay Networks, AT&T, MCI, TCI, and EDS—are very, very focused on the opportunities presented by the Web. As Dataquest listens to their plans, they are talking about visions similar to the vision of CALS, but they do not mention CALS. They are not restricting their efforts to those "approved by" CALS. In fact, Dataquest believes that most have not thought seriously about CALS for several years. The awareness of CALS is still present in many of these companies, but it is centered in the groups that are responsible for sales to the U.S. government or the aerospace industry. In this environment, a divergence is almost inevitable, and the momentum will, Dataquest believes, be with the Web-based efforts.

Recommendations to the Vendor Community

CALS is clearly not a solution for all electronic commerce or enterprise integration problems, despite the hopes of a number of Japan-based corporations. Although CALS solves some problems that are critical to certain industrial sectors, it is, unfortunately, not applicable to all situations. One could argue that the same problems exist to some extent in all industrial sectors, but it would be a mistake to think that these problems are key

success factors in all industrial sectors. Even the most ardent advocates of CALS do not claim that it is important to all industrial sectors.

- CALS is best suited for certain industries that cannot afford to wait for the Web to develop fully.
- Skills and concepts from the CALS effort will be useful in the Web effort, even in instances where the standards and procedures that technically make up CALS do not quite fit.

Have a Two-Pronged Strategy

As stated earlier, over the next two years, the Web-based and CALS-based efforts will be complementary, and a vendor that could afford to do so might focus on both efforts, targeting the Web prong of the strategy at the mass market and the CALS prong at the high end.

However, if only one must be chosen, Dataquest would recommend a focus on the Web over a focus on CALS in any market except possibly Japan. With the large CALS momentum in Japan today, that would be a difficult choice (see next recommendation).

Realize That Japan Has the Strongest CALS Momentum Today

Even though CALS started in the United States, it is clear from Dataquest's research that Japan is where the momentum toward CALS is today. All major regions of the world show high interest in the Internet and in electronic commerce, but only Japan is at the same time keenly focused on CALS. We acknowledge that certain other Pacific Rim countries are watching Japanese CALS efforts closely; however, they do not show the same level of interest as the Japanese. The Web and electronic commerce are widely perceived in the United States as being very separate from CALS; in some quarters in Japan, they are perceived as being closely related. Again, we reiterate that CALS means surprisingly different things to different audiences.

The keen level of interest in deploying CALS standards in Japan could result in some interesting solutions—solutions that could then prove worthy of export. Japanese vendors are in an excellent position to exploit and improve on a set of standards that is showing relatively little forward motion in the United States.

Dataquest also believes that Japan has an opportunity to enhance international standards in plant design, construction, and operation. In the United States today, certain weapons systems (for example, a submarine) ship with a CD-ROM containing all the relevant technical data, and the CD-ROM is updated over time. A similar effort would benefit manufacturing plants, especially if it was done quickly and at the good enough level instead of the excruciatingly detailed STEP level. The U.S. government does very little to drive good enough data in plant design and operation, so today, everything is in the hands of the very slow-moving STEP advocates.

The Standards Process Is Complex; Watch the Mainstream

Although CALS itself is not a standard, it is closely linked to the standards process. CALS endorses certain standards. It is interesting to note that none of the standards endorsed by CALS are de facto standards closely associated with a single vendor. There is an implicit assumption in CALS that if a standard is associated with a single vendor, it should not be considered.

More to the point, what if there is a new product available from only one vendor that decreases design times by 50 percent? Is that benefit worth the danger of being locked into a single vendor? Does it make a difference if nine out of 10 of a vendor's competitors are using that product? How important is it if the benefits of the product require information or techniques that are not yet part of any interchange standard? These are tough, real-world decisions that CALS does not address, primarily because the original focus was on documentation, not on design.

There are those who believe it is simply a matter of time until we have a single set of coherent standards, at least for documentation. Dataquest does not agree. The standards process is a part of the way that technology moves forward, but it is not the only part. While there are many other elements that affect this, including research and development investments and the resulting discoveries, one key factor is the market. New ideas are not coordinated, and they never will be. The standards committees are a valiant attempt to minimize the confusion. But they often get it wrong and argue for "the way it should be" long after it is clear that the market has gone in some other direction. No matter how good a product or standard is, if the market does not invest in it, the impact is academic at best.

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Perspective

Electronic Design Automation Worldwide

Technology Analysis

The RTL Virtual Prototype

Abstract: *Both silicon design and printed circuit board (PCB) design are in the midst of a change in design methodology. In silicon design, this shift is unusual in that it is not the development of a methodology that sits on top of the existing methodology, but it is a new implementation of the existing register transfer-level (RTL) methodology. These shifts have the potential of causing major upheavals in the positions of the market leaders, as well as a restructuring of the design community itself.*
By Gary Smith

Silicon Design

Today's silicon design methodology is showing the signs of obsolescence. Not long ago, designs were thrown over the wall, to the IC CAD group, without a second thought. Designs now are being iterated, between IC CAD and design engineering, multiple times. One design was laid out 24 times in an effort to reach a 160-MHz goal. Finally engineering gave up, and the company introduced its product at 155 MHz. This many iterations normally would cause a product to completely miss the market window. Many design projects are canceled as a schedule, initially set for a year, stretches to two.

The other problem sign is the growth of verification teams. Verification once was the responsibility of the design team. Now we are seeing a separation of design and verification. Some verification teams actually exceed the size of the design team. Unfortunately, as these responsibilities separate, the verification team has become less and less capable of doing its job. The knowledge of the design was what made the design and verification cycle a powerful methodology. An organization where one engineer does the

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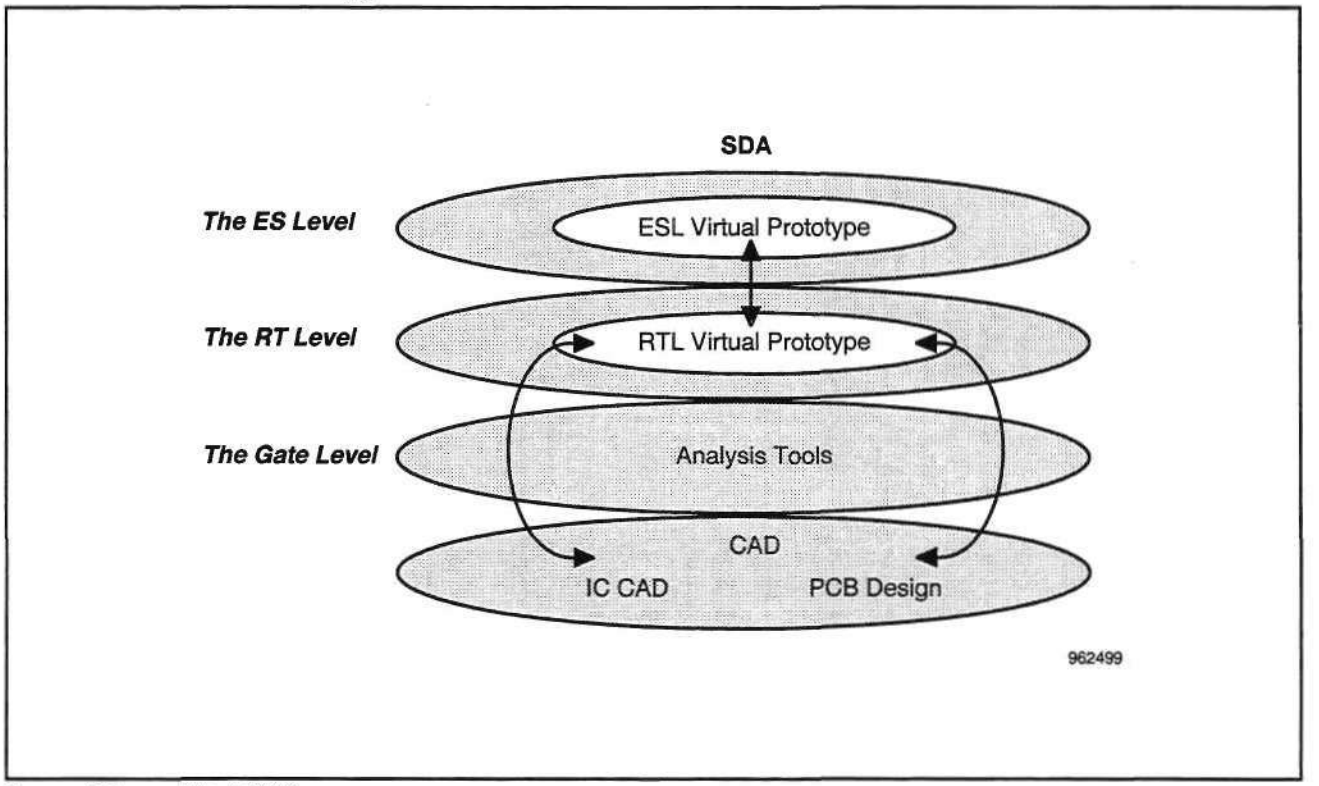
designing while another finds the bugs just doesn't produce great designs or bring projects in on time. It has become obvious that the design engineer must see the total impact of the system, the silicon, and the software on the design.

The Silicon Problem

The main reason for the methodology change is that the speed of today's designs, coupled with the physical effects encountered when you approach 0.5 microns, force the engineer into taking the silicon implementation into account. It's generally agreed that power has displaced area as the No. 2 design consideration. A fast, compact design isn't worth much if it burns a hole in the silicon as you power up the ASIC. Initially, EDA vendors considered low-power design the market for their power-optimization tools. It is now apparent that minimization and distribution of power in high-speed designs is the largest market. Most EDA vendors haven't even started looking at the problems caused by signal integrity, EMI, and metal migration. Soon the verification teams will need to look at all of these issues, an increasingly impossible task. The problem must be handled by the person with the most knowledge of the design, the design engineer. The only way the design team can come to grips with this task is by anticipating the problems before actual implementation. We must then represent these problems in an easily understandable form during the actual design phase. You now have the design and verification cycle back where it belongs, with the design team. Figure 1 shows the RTL prototype.

Figure 1
The RTL Virtual Prototype



Source: Dataquest (April 1996)

The ESL Virtual Prototype

Virtual prototyping came out of the development of the electronic system level (ESL) methodology. Redwood Design, now part of Cadence's Alta Division, was one of the early proponents of this type of tool. Today Eagle Design is the main driver with its tool, Eagle-i. Eagle started out as a classical EDA hardware-oriented company, but one that understood that software was becoming a major component of the design problem. i-Logix, on the other hand, has come at the problem from more of a software direction. Both have powerful ESL offerings and both have concluded that the virtual prototype must migrate down to the register transfer level (RTL) if a complete hardware/software co-design methodology is to be implemented.

Hardware/software co-design has always been a major motivational factor in the development of the ESL methodology. Unfortunately, if you look at the companies listed under the category of ESL, they are all classical EDA hardware-oriented vendors. The software companies are generally categorized as embedded software vendors or as CASE vendors. The major market driver for ESL tools today is digital signal processing (DSP) design. Over 50 percent of ESL revenue is brought in from this application. DSP design falls into the "standards enhanced" area of system design. That means that there isn't enough industry standards developed to stifle innovation; however, there are enough standards that the full advantage of hardware/software co-design can't be applied. Once algorithmic development is completed, you rapidly get into the nitty-gritty implementation and integration of the software with the hardware. This happens at the RTL. This is also where the Wind Rivers, the ISIs, the Microwares, and the Microtecs fit, which is why Mentor bought Microtec. As the methodology develops, you will see this implementation and integration being accomplished through the RTL virtual prototype.

The Silicon Virtual Prototype

The RTL virtual prototype includes both the silicon virtual prototype and the PCB virtual prototype. The PCB virtual prototype is a new tool that sits above the existing PCB tools. The silicon virtual prototype is another story. As Eagle and i-Logix push down from the ESL, the CAE vendors that control the RTL are fighting to take, or keep, control of their market. Presently, the synthesizer is the center of this world. This was not the natural outcome of the development of the RTL methodology. Synopsys, by way of its strong engineering, superior marketing strategy, and a real tough salesforce, grabbed this position before the competition knew what hit it. Synopsys has held this position for eight years. Recent product introductions—Design Source, HDL Adviser, Design Power, Power Compiler, and Behavioral Retiming—indicate it is not willing to give up the high ground anytime soon. Its competitors have other ideas, and for the first time in years they have an opening.

A lot of engineers believe that the silicon virtual prototype will become the cockpit from which they will drive tomorrow's designs (See Table 1). In this view, the synthesizer will become one of many tools that will plug into this virtual prototype, allowing engineers to do their design and verification. This pushes the synthesizer out of the center of the RTL universe. This view is obviously well in advance of today's tools; however, recent introductions have started to light up the path toward this goal.

Table 1
The Silicon Virtual Prototype

Company	Prototype	Floorplanner	Point Tool	Area	Timing	Power
Cadence	SiliconQuest	Yes	-	E	E/C	E
HLD	Top-Down DP	Yes	-	E	E/C	E
Compass	ChipPlanner	Yes	-	E	E/C	-
Synopsys	DesignPower	-	Yes	-	-	E
Sente	Watt Watcher RTL	-	Yes	-	-	E
Systems Science	POWERSIM	-	Yes	-	-	E
VeriTools	Power_tool	-	Yes	-	-	E

Notes: E = Estimation; C = Constraints
Source: Dataquest (April 1996)

Synopsys and Cadence have been working on the problem of submicron design longer than anyone. Over a year ago, they both introduced tools that were a good indication of their direction. Synopsys took the synthesis-centric path and Cadence took the silicon virtual prototype path. It was fairly easy to recognize Design Power and SiliconQuest as breakthrough tools, they both were ridiculed. Design Power was obviously too inaccurate to do any real power design work, and SiliconQuest was just two tools that didn't sell well bundled together. And back in the late 1980s, a synthesizer obviously could never design a circuit that would compete with a hand design, and Verilog simulation was far too inaccurate to do real ASIC design work. Those who do not study history are doomed to repeat it.

If you look at Table 1 it becomes obvious that the companies with RTL floorplanners hold a fairly powerful position. It's still early, but a pattern is emerging. Not shown in the table, but a seemingly important point, is that Cadence, HLD, and Compass all also have their own gate-level floorplanners, their own timing analyzers, and their own delay calculators. These were three of the IBM tools mentioned in the Synopsys/IBM agreement to produce tomorrow's silicon design methodology. Where Synopsys and Cadence have specifically targeted this market, Compass and HLD have evolved into the RTL floorplanner from their positions as leaders in the gate-level floorplanner market. HLD has the disadvantage of not having IC layout tools. This was probably the driving factor in the recent HLD/Mentor agreement.

Sente, Systems Science, and VeriTools have entered the market with point tools for power design. Obviously, from engineers' standpoint, the silicon virtual prototype should be an open environment. That way, they can plug in the best tool available. Just the sheer size of the task could force this to happen. Don't forget that we haven't started to look at signal integrity, EMI, or metal migration yet.

The PCB Virtual Prototype

The PCB problem is similar to the silicon problem. As board speeds pass 50 MHz, board layout becomes a critical issue in system performance. Unlike the silicon world, the PCB designer understands that the world is really analog. Dealing with these analog effects has been a major part of the

"art of PCB design." Dataquest's 1994 EDA User Wants and Needs document, *Electronic Design Automation Worldwide* (CEDA-WW-UW-9401, published July 25, 1994), revealed that most board designers had analysis tools but didn't use them. The average board speed reported was 40 MHz. In Dataquest's 1995 EDA User Wants and Needs document, EDA *Applications in North America* (CEDA-WW-UW-9501, published January 22, 1996) Dataquest reported that board designers were now using analysis tools. Forty-seven percent of the boards were over 50 MHz. The problem is that trying to solve layout issues while being guided by design constraints passed down from engineering has become an impossible task.

The PCB virtual prototype is further along than its silicon cousin. Two companies, Northern Telecom and Harris, did a considerable amount of work developing PCB virtual prototyping tools. Both companies then spun their efforts out into independent companies, UniCAD and Harris EDA. UniCAD has the most robust PCB virtual prototyping tools, while Harris EDA has been the leader in multichip modules (MCM) tools, reflecting the strengths of their origins. Two years ago a new company appeared on the scene, Interconnectix. Interconnectix introduced a new, technically elegant solution to the virtual prototyping problem. Unfortunately, as with most technically elegant solutions, it proved to be more difficult to implement than anticipated. It took an extra year to bring to the market, but all reports indicate that it was well worth the wait. Interconnectix is now in the process of building a strong organization and is having a major impact on the PCB virtual prototyping market.

The surprise has been Viewlogic's recent introduction of ISIS, its PCB virtual prototype tool. All other companies listed come out of the traditional PCB design world. Viewlogic has only (and by all indications will only) marketed tools into the CAE world. This brings up a major issue: Who will be designing printed circuit boards in the future? A rough guess would be that 80 percent of today's boards are not being laid out by engineers. This is reminiscent of the IC layout technicians of the 1960s and 1970s. As was the case with the IC layout technicians, today's PCB designer is highly skilled at his or her craft. Craft is the right word. We were amazed at how many times the phrase "the art of PCB design" was used in this year's PCB Design Show. Unfortunately, as the PCB design tools prove capable of replacing the art of PCB design, the issue will become an engineering problem. So who is going to be the PCB designer of tomorrow? Viewlogic obviously sees the design engineer as the focal point of tomorrow's PCB design. In effect, PCB design becomes just part of the overall design group's responsibility, as the ASIC design has. A design team sometimes includes an ASIC specialist, but the standalone ASIC designer has slowly disappeared as an engineering discipline. What you may see instead of PCB designers is a physical design engineer who specializes in the physical design of both the ASICs and the printed circuit boards. Recent sales experiences reported by UniCAD, Har-ris EDA, and Interconnectix seem to confirm Viewlogic's view of tomorrow's PCB design world. As shown in Table 2, Viewlogic has done an excellent job targeting today's PCB design issues. Only UniCAD and Harris EDA target more areas of the design problem. The only cautionary note would be that there are yet to be sufficient reports from the user community to verify the tool's actual performance. If ISIS does what it claims, it will have a major impact.

Table 2
The PCB Virtual Prototype

Company	Prototype	Floorplanner	Point Tool	Area	Timing	Power	Thermal	Signal Integrity	EMI
UniCAD	UniSolve	Yes	-	E/C	E/C	E/C	E/C	E/C	E/C
Harris EDA	EDAnavigator	Yes	-	E/C	E/C	-	E/C	E/C	E/C
Viewlogic	ISIS	Yes	-	E/C	E/C	-	E/C	E/C	-
Interconnectix	IS_Optimizer	Yes	-	E/C	E/C	-	-	E/C	-
Savantage	SavanSys	Yes	-	E/C	E/C	-	E/C	-	-
PADS	PowerPCB	Yes	-	-	-	-	-	E/C	E/C
Incases	Theda	Yes	-	-	-	-	-	E/C	E/C
Omniview	Fidelity	Yes	-	E/C	-	E/C	-	-	-
Pacific Numerix	PCB MCM Explorer	Yes	-	-	-	-	E/C	E/C	-
Cadence	BoardQuest	Yes	-	C	E/C	-	C	C	C
Zuken-Redac	Design Partitioner	Yes	-	E/C	-	-	-	-	-
Quantic	AutoTools		Yes	-	E/C	-	-	E/C	E/C
Hyperlynx	BoardSim		Yes	-	-	-	-	E/C	E/C
Quad Design	TLC, XTK, Quiet		Yes	-	-	-	-	E	E

Notes: E = Estimation; C = Constraints
Source: Dataquest (April 1996)

An interesting company is Savantage. Savantage spun out of the Microelectronics and Computer Technology Corporation, a consortium of electronic companies. The funding companies for this project were Eastman Kodak, Hughes, and Northern Telecom. Savantage's tool, SavanSys, is heavily targeted toward the manufacturing environment but still comes in high on the PCB virtual prototyping table. It would almost be accurate to call this tool a system virtual prototype, but perhaps a PCB virtual prototype upper half would best describe it. Most of its capabilities are positioned above the other tools in this table. Next comes two traditional PCB design companies, PADS and Incases. Incases is the German company that took over the responsibility for Computervision's Theda PCB tool. These companies may not be the sales leaders in the PCB design market, but right now they are looking like the technical leaders. Omniview and Pacific Numerix are both worth watching. Omniview introduced Fidelity a few years ago and received good reviews. Unfortunately, it never really launched the company off the ground. Recently, the company was restarted. It will be interesting to follow its progress. Until recently, Pacific Numerix looked like a fairly normal point tool analysis company. Its recent introduction of PCB MCM Explorer has pulled it away from the pack. Both Omniview and Pacific Numerix face the daunting task of fielding a sales presence, daunting especially with the existence of a very large, very capable Viewlogic salesforce. Cadence has been concentrating on developing constraint-driven tools. Until recently, it viewed analysis as a function used once the PCB had been laid out. That opinion has shifted, and you may expect it to take a more active role in the PCB virtual prototype market. Zuken-Redac should not be ignored. So far, it has missed the analysis estimation issues, but it has started to look at PCB design from a hierarchical viewpoint. That has allowed it to introduce Design Partitioner. One of the strongest features of this tool is the ability to define—and add to a design library—hard macros. This is starting to sound like the IC world, isn't it? This tool allows you to do a portion of a board design, complete all the necessary analysis, freeze the design, and then use that over and over again on other boards—a powerful tool.

There are three analysis point tool companies participating in the PCB virtual prototype world. All three not only field their own tools but have a close agreement with a PCB floorplanner company. Quantic's tools are integrated into the Interconnectix's tool, Hyperlynx has just joined PADS in its efforts, and Quad Design supports its parent company, Viewlogic. As you can see, a sizable group of companies is targeting this market.

The Race Is On

Today we are seeing just the beginning of the RTL virtual prototype market. If this follows the normal EDA pattern, it will be five or six years before the sales volume leaders will emerge from the pack. Those leadership positions, however, will be set in concrete in the next three years. The stakes are high, and the race is on. Take this market seriously or face joining the large group of EDA vendors that have fallen off the EDA landscape.

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Dataquest
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Perspective

Electronic Design Automation Worldwide

Dataquest Predicts

The EDA Landscape

Abstract: *EDA is by its very nature a dynamically changing market. Each design challenge calls for a change in methodology and an upgrade in tool performance. The more drastic changes create new subapplications. Because of this, any depiction of the industry rapidly becomes obsolete. This is a view of the EDA market by application, methodology, and subapplication as it looked at the end of 1995.*
By Gary Smith

EDA Industry by Subapplications

There have been various changes in this year's electronic design automation (EDA) landscape. The new subapplications are silicon synthesis, PCB virtual prototype, radio-frequency (RF) simulation, multichip modules (MCM) and hybrid design, and the breakout of IC place and route into gate array layout, cell-based IC (CBIC) layout, and custom layout. The old IC toolset subapplication was dropped. There were also two name changes: Cycle-based simulation was changed to behavioral simulation to reflect the use of transactional simulators, which are an important part of data-path design, and the old CAE framework label was finally retired and replaced with interoperability tools, a much more all-inclusive term. Another major change was the inclusion of the analysis tools (the five sisters) into the gate-level methodology. Timing analysis remains in the register transfer-level (RTL) methodology.

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Electronic Design Automation Subapplication Definitions

The following sections identify and define various EDA subapplications:

CAE

CAE is categorized by the following:

- Electronic-system level (ESL)
  - ESL design—Design at the conceptual level, including hardware/software co-design, design partitioning, and specification; includes neither RTL nor logic-level descriptions
  - Behavioral simulation—Nontiming-based simulation
  - Behavioral synthesis—Synthesis of an ESL-design description to the RTL
  - Formal verification—The process of mathematically proving that an RTL description equates to an ESL description (less specifically, that any design representation equates to another)
- Register-transfer level (RTL)
  - RTL design—Tools designed to assist engineers in entering a design or analyzing the simulated results of that design. Includes use of graphical symbols to represent RTL VHDL or Verilog.
  - RTL simulation—Simulation at the RTL
    - VHDL—Simulation using the VHSIC Hardware Description Language
    - Verilog—Simulation using the Verilog Hardware Description Language
  - Logic synthesis—Synthesis or translation of an RTL description to a gate-level description
  - Target compiler—A translation of an RTL description to the silicon implementation
  - Timing analysis—Verification of the timing of a design; usually involves providing inputs to a physical circuit model or computer simulation to test the nondynamic functions of a design; static timing verification does not require the use of test vectors to determine timing violations
  - Design for test tools—Tools used to determine, improve, or add to the testability of electronic circuits
  - Silicon synthesis—Tools that estimate silicon-level performance at the RTL by synthesizing the RTL description to a virtual silicon implementation of that code and reflecting the estimated silicon performance backup to the RTL
  - PCB virtual prototype—A process similar to silicon synthesis but without using synthesis technology; uses a virtual representation of the PCB to estimate physical effects, bringing those effects back up to the CAE level of design.

- Gate level
  - Schematic capture—Design process that consists of graphical schematic entry and netlist extraction
  - Simulation—Use of representative or artificial data to reproduce conditions in a model that could occur in the performance of a system; simulation is used to test the behavior of system under different operating conditions
    - Gate-level simulation—Simulation based upon a gate-level netlist (not VHDL or Verilog)
    - Analog simulation—Simulation in which analog inputs are used
    - Mixed-signal simulation—Simulation in which both digital and analog inputs are used
    - SPICE simulation—Simulation using a derivative of the Berkeley SPICE transistor-level simulator
    - RF simulation—All frequency-based simulators.
  - Analysis tools—Tools used for the analysis of designs
    - Signal-analysis (including transmission line and crosstalk analysis)—Analysis of high-speed coupling effects between signal line and reflection/degradation of high-speed signal on PCBs, MCMs, or ICs
    - Power analysis—Analysis of the power consumption of the design
    - Thermal analysis—Analysis of the effect of heat on the design
    - Electromagnetic interference—Analysis of electromagnetic generation and interference for PCBs, ICs, and cables/connectors/packaging
    - Metal migration or electromigration—The unauthorized movement of metal in an IC because of excessive current density
  - Miscellaneous
    - Accelerators—Dedicated hardware/software or optimized software used to speed up simulation, typically at the gate level
    - Emulators—Dedicated hardware/software that allows a designer to observe the function of a circuit or design prior to prototype
    - Fault simulation/grading—A process that determines which nodes in a design can be detected by a given set of test vectors
    - Interoperability tools—Software used for database, library, and tool management; includes backplanes, file translators, and design environments; in general, all tools used specifically to integrate a set of EDA tools
    - Libraries—Description of elements used in EDA designs (for example, components, simulation models, and symbols)
    - Field-programmable gate array (FPGA) toolset—Dedicated EDA software sold as a package for FPGA/complex-programmable logic device (CPLD) design

IC CAD

IC CAD is categorized by the following:

- DRC—The design rule and logic rule checkers used to perform final verification on an IC design prior to making masks
- Floor planner—A tool that allows a designer to place elements of a design so that the designer can look at estimations of the effects of the final place and route
- FPGA place and route—Tools used to implement designs into the targeted FPGA or CPLD. Also called "fitters" because they fit designs into the already existing logic structure of the targeted FPGA or CPLD.
- IC place and route—Tools used to implement (lay out) designs into silicon
  - Gate-array layout—Tools used to lay out designs into a fixed-based array
  - CBIC layout—Tools used to lay out nonfixed cell-based designs
  - Custom IC layout—Silicon design tools that work at the transistor level to size transistors, accomplish analog design, and generally handcraft silicon implementation; also called "layout editors"
- PCB design—Tools used to implement a design on a PCB or substrate
  - PCB—Tools used to design, place, and route a printed circuit board
  - MCM and hybrid—Tools used to design, place, and route a multichip module or hybrid substrate

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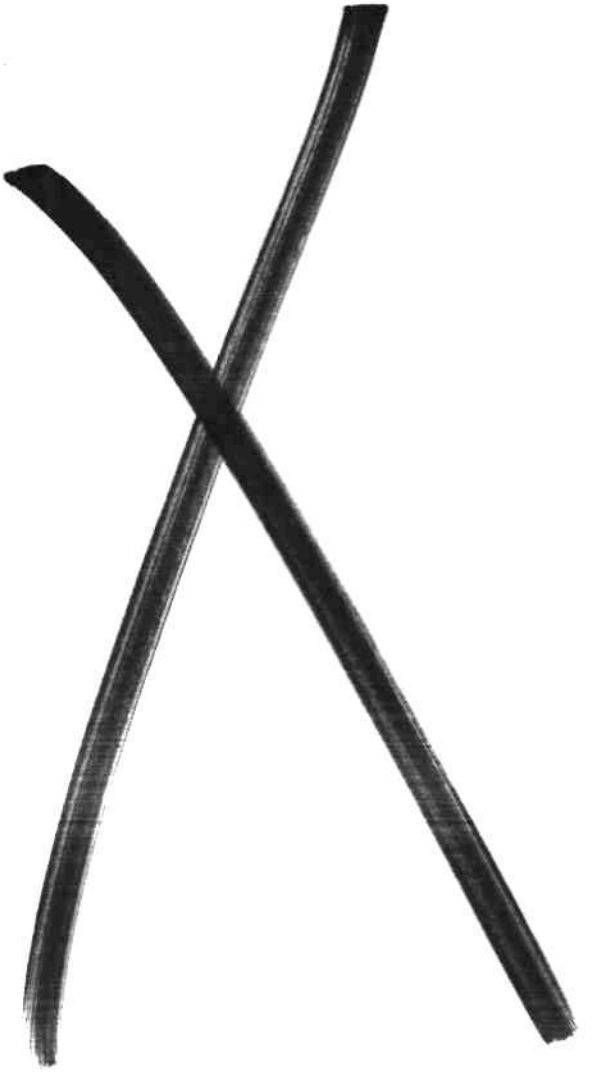

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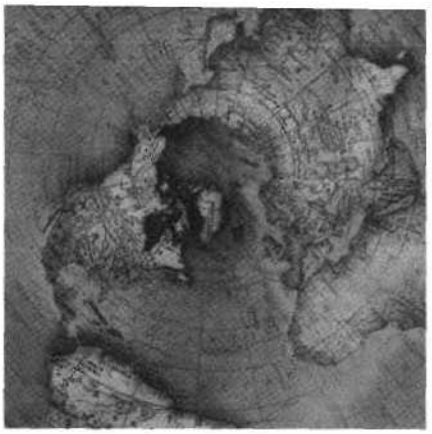

Dataquest

CAD/CAM/CAE and GIS Market Definitions

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CAD/CAM/CAE and GIS Market Definitions

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Chapter 1
Market Share Survey Overview

Each year, Dataquest surveys CAD/CAM/CAE/GIS vendors in order to estimate their annual revenue. The survey for 1995 covers 300 vendors worldwide by six main applications segments, four operating systems groups, four world regions, European and Asian countries, hardware, software, services, and distribution channels. This exercise provides input for Dataquest's dynamic database of CAD/CAM/CAE/GIS shipments/revenue by world region/country, operating systems, and applications segment. The information gained is supplemented by, and cross-checked with, Dataquest's other information sources.

The CAD/CAM/CAE market share survey takes place twice each year. The first survey in the fourth quarter is to prepare early estimates for the calendar year. This is followed by a second survey in the spring in order to finalize estimates for the previous calendar year. The first survey takes place from October to December. Our preliminary estimates are completed by the end of the calendar year under review, and the results are summarized in a fax report that is released in January of the following year and published in a Source: Dataquest document by January 31.

The second survey takes place during April. Our final CAD/CAM/CAE/GIS market share estimates are again published in a Source: Dataquest document by May 31. There is usually minimal difference between early and final rankings, as Dataquest makes every effort to ensure preliminary estimates are as accurate as possible. However, there are usually some surprises at year-end, and our numbers do change. It should also be noted that when new information becomes available concerning a previous year's numbers, the database is updated to reflect the best information available.

The categories for which CAD/CAM/CAE/GIS revenue is reported are defined comprehensively for the purpose of clarity and guidance to survey participants. These definitions may occasionally be revised, altered, or expanded to reflect changes in the industry. To support these definitions, Dataquest will send an annual survey guide to all participants in its CAD/CAM/CAE/GIS market share survey program. This document comprises the 1995 survey guide.

Methodology

Dataquest utilizes both primary and secondary sources to produce market share data. In addition to the annual market share survey, Dataquest uses the following sources in order to accurately quantify market activity:

- Information published by major industry participants
- Estimates made by knowledgeable and reliable industry spokespersons
- Government data or trade association data
- Published product literature and price lists
- Interviews with knowledgeable manufacturers, distributors, and users

- Relevant economic data
- Information and data from online or CD-ROM data banks
- Articles in both the general and trade press
- Reports from financial analysts
- Annual reports, Securities and Exchange Commission documents, credit reports
- Reseller and supplier reports and reports from a vendor's competitors
- User studies

Dataquest also sums vendor revenue across other industries covered by Dataquest to make sure revenue is not credited twice, and checks with multiple sources at one company to cross-check data on that company.

Dataquest analysts have many years of experience in how to apply the tools described to get the most accurate information possible on a particular company (such as what to use when, and what industry averages are). It is the CAD/CAM/CAE/GIS group's policy to continually update our market information for any year, based on any new data received, in order to arrive at the most accurate market representation possible.

We survey worldwide, which involves more vendors and therefore presents higher total market revenue, lower market share per vendor, and a more accurate overall market picture.

Despite the care taken in gathering, analyzing, and categorizing the data in a meaningful way, careful attention must be paid to the definitions and assumptions used herein when interpreting the estimates presented in this document. Various companies, government agencies, and trade associations may use slightly different definitions of product categories and regional groupings, or they may include different companies in their summaries. These differences should be kept in mind when making comparisons between data provided by Dataquest and data provided by other suppliers.

Chapter 2
CAD/CAM/CAE/GIS Companies to Be Surveyed Worldwide for 1995

Dataquest will survey the following CAD/CAM/CAE/GIS companies throughout the world for 1995 data.

The North American Companies

- 3Soft
- Accel Technologies
- Accugraph
- ACTEL
- Adina R&D
- ADRA Systems
- ael Advance Graphics Systems
- ALDEC
- Algor Interactive Systems
- Alias Research
- Altair Computing
- Altera
- Analogy
- Ansoft
- Ansys
- Applicon
- Aptix
- Ashlar
- Aspec Technology
- Aspect Development
- Aspen Technology
- AT&T Bell Laboratories
- Auto-Trol
- Autodesk
- Autometric
- Avant!
- B.A. Intelligence Networks
- Bentley Systems
- Boothroyd Dewhurst

- CAD WORKS
- Cadence
- Cadis Software
- CADKEY
- CADSI
- CAE Plus
- CAMAX
- Carrier Corporation
- Cascade Design Automation
- CGTech
- Chronology
- Chrysalis Symbolic Design
- Cimlinc
- Cimplex
- Claritas/NPDC
- CMstat
- CNC Software
- Compact Software
- COMPASS Design Automation
- Computer Aided Design Software
- Computervision
- Concentra
- Contec Microelectronics
- Cooper & Chyan Technology
- CrossCheck Technology
- CSAR Corporation
- Data I/O
- Database Applications Inc.
- Deneb Robotics
- Design Acceleration
- Digital Equipment Corporation
- DP Technology
- Dynamic Graphics
- EA Systems
- Eagle Design Automation
- Eagle Point

- Earth Resource Mapping
- EDS-Unigraphics
- Enghouse Systems Ltd. (Canada)
- Engineered Software
- Engineering Mechanics Research
- EOSTAT
- EPIC Design Technology
- Equifax/NDS
- ERDAS
- Escalade
- ESRI
- ETAK
- Evolution Computing
- Fintronic
- Formtek
- Frontline Design Automation
- Genasys II
- Geo/SQL
- Geographic Data Technology
- Geomax International
- Gibbs and Associates
- Graftek Inc.
- GRAPHSOFT
- Harris EDA
- Hewlett-Packard
- Hibbit, Karlsson & Sorensen
- High Level Design Systems
- i-Logix Inc.
- IBM
- Ikos Systems
- IMSI
- Information Handling Services
- Intergraph
- InterHDL
- International Software Systems
- Intusoft

- ISICAD
- Landmark Graphics
- Livermore Software Technologies
- LSI Logic
- LV Software
- MacNeal-Schwendler Corporation
- Macon
- MapInfo
- MARC
- MCS
- Mechanical Dynamics
- Mentor Graphics
- Meta-Software
- Micrografx
- Microsim
- Minc Software
- Motorola
- Nextwave Design Automation
- NovaSoft Systems
- OEA International
- Optem Engineering
- Orcad
- Pacific Numerics
- PacSoft
- PADS Software
- Parametric Technology
- PCI Remote Sensing Corporation
- PRC
- Protel Technology
- Quantic Laboratories
- Quickturn Systems
- Radian Corporation
- Rebis
- Research Engineers—Civilsoft
- Royal Digital Centers
- Scientific & Engineering SW

- SDRC
- Sherpa Corporation
- SHL Systemhouse
- Sigma Design
- Silicon Graphics
- Silicon Valley Research Inst.
- SIMUCAD
- Simulation Technology
- Softdesk
- Spatial Technology Inc.
- Speed
- SpeedSim
- Spot Image
- SRAC
- Strategic Mapping
- Summitt Design Inc.
- Sun Microsystems
- Surfware
- Sweet's Electronic Publishing
- Synopsys
- Synplicity
- Systems Science
- T D Technology
- Tactician Corporation
- Tanner Research
- Terr-Mar Resource Information Systems
- Terra Sciences
- TYDAC Technologies Inc.
- Unicad
- Unisys Corporation
- Variation System Analysis
- Veritools
- Viagrafix
- Viewlogic Systems
- VISTA Environmental Inf.
- VLSI Libraries

- VLSI Technologies
- Workgroup Technology
- Xilinx
- Zeelan Technology
- Zycad

The European Companies

- ABB Industria
- Abstract Hardware
- ACA Ltd.
- ALS Design
- Anilam Electronics
- APIC Systemes
- ARKTEC SA
- ASCAD/ASCAM
- Assigraph
- CAD Centre Ltd
- CAD Lab S.p.A.
- Cad-Distribution AG
- CAD-UL
- Cadtronic Computer Systeme
- CATALPA Groupe Missler
- Cimatron
- CIMTEK SA
- Cisigraph
- Clemessy Innovation SA
- Complansoft CAD GmbH
- Computational Mechanics
- Computer Services Consultants
- Dapco SA
- Dassault
- debis Systemhaus GmbH
- Delcam Systems International
- Eigner+Partner GmbH
- Elstree Computing Ltd
- Engineering Computer Services
- Exapt

- FHECOR
- Fides Industrielle Automation
- Framasoft
- Gable CAD Systems
- Geometria GIS Systems House
- Graphisoft Software Development
- Ground Modeling Systems Ltd.
- Han Dataport
- Hochtief
- ICEM Technologies
- ICL Finland OY
- IEZ CAD-Systeme GmbH
- Investronica SA
- ISD Software und Systeme GmbH
- ISDATA GmbH
- ISKA
- Kloeckner-Moeller GmbH
- Kockums Computer Systems AS
- Laser-Scan
- M.O.C.
- Marcus Computer Systeme
- Matra Datavision
- mb Programme
- Moss Systems Group
- Nemetschek Programmsystem GmbH
- Norlinvest Ltd Visionics
- Number One Systems
- PAFEC
- Pathtrace Engineering Systems
- Poppenhaeger Grips GmbH
- PROCAD GmbH und Co.KG
- Radan Computational Ltd.
- RIB/RZB
- RoboCAD Solutions Ltd.
- Sagantec Europe BV
- Sener Ingenieria y Sistemas SA

- Serbi SA
- Siemens Nixdorf Informationssysteme
- Sinus Software GmbH
- Smallworldwide
- Soft-Tech Software Technologies
- Softronics
- Speed
- Star Infromatic
- Straessle AG
- Superdraft
- Sysdeco Innovation AS
- Tebis
- Technische Computer Systeme GmbH
- Triplan
- ULTImate Technology
- VEDA—Design Automation
- Vero International Software
- Whessoe Computing Systems
- Wiechers Datentechnik
- Ziegler Informatics

The Japanese Companies

- Andor
- ARGO Graphics
- C. Itoh Techno-Science
- Cadix
- Century Research Center
- CPU
- Design Automation
- Fujitsu
- Graphtec Engineering
- Hakuto
- Hitachi
- Hitachi Zosen Information Systems
- Information Services International Dentsu
- Informatix
- INS Engineering

- Kubota Computer
- Marubeni Hytech
- Mitsubishi Electric
- Mitsui Engineering
- Mutoh Industries
- NEC
- Nihon Itek
- Nihon Unisys
- Omron
- Pasco
- Ricoh
- Seiko Instruments
- Sharp System Products
- Sony
- Sophia Systems
- Sumisho Electronics
- Sumitomo Denko Workstation
- Tokyo Electron
- Toshiba
- Toyo Information Systems
- Uchida Yoko
- Wacom
- Zuken-Redac

Of the 302 companies to be surveyed, 179 are North American, 85 are European, and 38 are Japanese.

Chapter 3
Research Metrics

Definitions for the research metrics used in this survey are as follows:

- Total revenue with the original equipment manufacturer (OEM): The total amount of money received by a company for all goods and services sold into the CAD/CAM/CAE/GIS market. This figure is typically only released when requested.
- Distribution channels: Distribution channels are defined as follows:
  - Direct channel—The channel through which product moves directly from the manufacturer or vendor to the end user, usually by means of a professionally trained salesforce
  - OEM—The channel through which vendors or manufacturers sell their finished product to other companies for resale through an agreement. Once sold, the product is usually modified slightly and then resold directly to the end user or through an indirect channel. Vendors that resell nonbranded product differ from VARs in that they often add their name to the product and back up its warranties.
  - Indirect channels—All other channels through which the finished product moves to the end user, including VARs, dealers, and mass merchandisers
- Turnkey: Bundling hardware and software for sale as a unit
- Total factory revenue: Money received by a company for its goods, excluding OEM revenue or consulting revenue
- Hardware revenue: Revenue derived from the sales of CPUs (including operating systems), terminals (for host-dependent systems), and peripherals
- Software revenue: Revenue derived from the sales of bundled (part of a turnkey system) and applications software. It does not include operating systems revenue, which is part of the hardware revenue.
- Service revenue: Revenue derived from the service and support of CAD/CAM/CAE/GIS systems. Service revenue can be calculated in the market share tables by subtracting hardware and software revenue from total factory revenue. Service revenue includes the following:
  - Applications development—Adding new functionality through design and development of new customized CAD/CAM/CAE/GIS software applications, or the modification, enhancement, or customization of existing software applications
  - Consulting—Including an assessment of a company's CAD/CAM/CAE/GIS business IT needs and formulation of a plan based on needs identification
  - Integration services—Planning, implementing, migrating, and integrating software products
  - Maintenance—Fees for hardware and software

  - Management and operations services—Includes help desk, education and training, disaster recovery, vaulting, facilities management, configuration management, and relocation services
  - Service bureau—Includes construction of database, data conversion, product design, analysis, or manufacturing
- Seats: The number of possible simultaneous users
- Unit shipments: The number of seats delivered, excluding those sold to another company for resale (OEM). CPU shipments are defined as the number of CPUs delivered, which is the same as unit shipments for all platforms but host-dependent platforms.
- Average selling price (ASP): The average amount of money received by the factory for the sale of a turnkey/hardware system. The database forces reconciliation of a company's revenue and unit shipments with the average selling prices of each application and platform.
- Installed base: The total number of seats/CPUs in use, calculated by forecasting the previous year's installed base plus the year's unit/CPU shipments, less retirements.
- Compound annual growth rate (CAGR): A computed, compounded growth rate used in forecasting

Chapter 4
Worldwide Geographic Region Definitions and Exchange Rates

Dataquest divides the different geographic regions as follows:

- North America: Includes Canada, Mexico, Puerto Rico, and the United States
- Europe
  - Western Europe: Includes Austria, Benelux (Belgium, the Netherlands, Luxembourg), France, Germany (including former East Germany), Italy, Scandinavia (Denmark, Finland, Norway, Sweden), Switzerland, the United Kingdom, and the Rest of Western Europe (Andorra, Cyprus, Gibraltar, Iceland, Liechtenstein, Malta, Monaco, San Marino, Spain, Sweden, Turkey, Vatican City, and others)
  - Eastern Europe: Includes all countries currently categorized as Central Europe in addition to Albania, Bulgaria, the Czech Republic and Slovakia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and the republics of the former Yugoslavia. Also included in this group is Russia and the other republics of the former Soviet Union (Belarus, Ukraine, Georgia, Moldova, Armenia, Azerbaijan, Kazakhstan, Uzbekistan, Tajikistan, Kyrgyzstan, and Turkmenistan)
- Japan
- Asia/Pacific: Includes Hong Kong, Korea, Singapore, Taiwan, and Rest of Asia (Australia, Brunei, Cambodia, China, India, Indonesia, Laos, Malaysia, Maldives, Myanmar, Nepal, New Zealand, Pakistan, the Philippines, Sri Lanka, Thailand, and Vietnam)
- Rest of World: Includes Africa, Central America, the Caribbean, the Middle East, Oceania, and South America

When converting a company's local currency sales into U.S. dollars, or vice versa, it is important to use the 1995 exchange rates provided below (see Table 4-1). These rates will prevent inconsistencies in the conversion of offshore sales between each company. These are the exchange rates that will be used in the final 1995 CAD/CAM/CAE and GIS market share survey. Exchange rates for historical years are available on request.

Table 4-1
Average 1994 and 1995 Exchange Rates against the U.S. Dollar

Country	1994 Rate	1995 Rate
Austria (Schilling)	11.33	10.06
Belgium (Franc)	33.36	29.42
China (Renminbi)	8.68	8.35
Denmark (Krone)	6.31	5.59
ECU	0.84	0.77
Finland (Markka)	5.21	4.37
France (Franc)	5.54	4.97
Germany (Mark)	1.62	1.43
Hong Kong (Dollar)	7.73	7.74
Italy (Lira)	1,609.19	1,628.21
Japan (Yen)	101.81	93.90
Netherlands (Gulden)	1.81	1.60
Norway (Krone)	7.04	6.33
Singapore (Dollar)	1.52	1.43
South Korea (Won)	802.40	770.57
Spain (Peseta)	133.48	124.40
Sweden (Krona)	7.7	7.14
Switzerland (Franc)	1.37	1.18
Taiwan (Dollar)	26.46	26.48
United Kingdom (Pound)	0.65	0.63

Note: The annual rate is estimated as the arithmetic mean of the 12 monthly rates.
Source: Dataquest (February 1996)

Chapter 5
CAD/CAM/CAE/GIS Operating Systems Group Definitions

Dataquest segments CAD/CAM/CAE/GIS data by four main operating system groups. These groups are as follows:

- UNIX—UNIX is a 32-bit, multitasking, multiuser operating system, originally developed at AT&T Bell Laboratories. It is portable and can be found on most CISC and RISC MPUs, including the Intel 80xxx, Motorola 68xxx, and Sun SPARC. UNIX includes all UNIX variants. A complete list of UNIX operating systems can be found in Chapter 8.
- Host-dependent systems—These systems include all minicomputer and mainframe operating systems in which the functions of external workstations are dependent on a host computer. The dominant operating systems in this group are IBM's VM and Digital Equipment's VMS operating systems.
- Windows NT—Windows NT is Microsoft's multiplatform, 32-bit operating system (either Windows NT or Windows NT Advanced Server) for high-end PCs, servers, and workstations.
- Personal computer (PC)—This group includes MS-DOS, PC-DOS, or DR-DOS operating systems. MS-DOS was designed by Microsoft for the original IBM PC. It is the dominant operating system on PC and PC-clone computing systems. PC-DOS is IBM's version of the disk operating system for PC and PC clones. DR-DOS is the Digital Research (Novell) version of this operating system. Other proprietary DOS variants such as NEC-DOS and J-DOS are included in this category.
- Also in the personal computer group are Mac OS, OS/2, Windows 3.1, and Windows 95. Mac OS is Apple's proprietary graphical user interface (GUI) operating system. OS/2 is IBM's GUI operating system for high-end PCs and PC servers. Windows 3.1 and Windows 95 are Microsoft's GUI operating systems for the PCs and PC clones. Windows 3.1 is a 16-bit operating system that runs on top of DOS. It is the dominant GUI operating system for PC and PC clones. Windows 95 is Microsoft's 32-bit version of Windows. Windows 95 is intended to replace Windows 3.1 and does not require a DOS foundation.

Chapter 6
CAD/CAM/CAE/GIS Software Applications Definitions

Dataquest segments data by application types. They are as follows:

- Mechanical—This segment refers to computer-aided tools used by engineers, designers, analysts, and drafters working predominantly in discrete manufacturing industries. Common design applications include conceptual design, industrial design, structural or thermal analysis, and detail design. Common manufacturing applications include tool and fixture design, numerical control part programming, and off-line robotics programming.
- Electronic design automation (EDA)—This segment covers computer-based tools that are used to automate the process of designing an electronic product, including printed circuit boards, ICs, and systems. EDA includes electronic CAE, IC layout, and PCB/hybrid/MCM, as follows:
  - Electronic computer-aided engineering (CAE)—These are computer-aided tools used in the engineering or design phase of electronic products (as opposed to the physical layout phase of the product). Examples of electronic CAE applications are schematic capture and simulation.
  - IC layout—This is a software applications tool that is used to create and validate the physical implementation of an integrated circuit (IC). The IC layout category comprises polygon editors, symbolic editors, placement and routing (gate array, cell, and block), design verification tools (DRC/ERC/logic-to-layout), compilers, and module development tools.
  - Printed circuit board (PCB)/hybrid/multichip module (MCM)—This segment covers products that are used to create the placement and routing of the traces and components laid out on a printed circuit board. Also included in this category are thermal analysis tools.
- Architecture, engineering, and construction (AEC)—This segment covers the use of computer-aided tools by architects, contractors, plant engineers, civil engineers, and other people associated with these disciplines to aid in designing and managing buildings, industrial plants, ships, and other types of nondiscrete entities.
- Geographic information systems (GIS)/mapping—This is a computer-based technology, composed of hardware, software, and data used to capture, edit, display, and analyze spatial (tagged by location) information.

Chapter 7
CAD/CAM/CAE Subapplications Segmentation

Additional surveys are conducted to further segment the industry with software revenue sales by subapplication. The applications are divided as follows:

Mechanical

Modeling Technology

The modeling technology applications are as follows:

- Solid modeling—The representation of a part or assembly capturing all relevant data describing solid characteristics of a project. This can include shape, weight, color, surface texture, and mass properties. Boolean operations are commonly used to add and subtract volumes together to define the final shape of the object.
- 2-D modeling—The representation of a part in two dimensions (it has an x and y coordinate). This format requires three or more views (top, front, and side) to depict all aspects of the part. 2-D is the most common geometric modeling format and is used extensively with a drafting function.
- 3-D modeling—The representation of a part in three dimensions, usually in a wire-frame format (it has an x, y, and z coordinate). This format is commonly used in high-level CAD systems to determine the placement and fit of components in an assembly. It is generally not used for final drafting, although some systems have the capability to translate the 3-D image to a 2-D standard drafting format.
- Integrated—The integration of all 3 modeling technologies

Mechanical CAD/CAM/CAE Subapplication

The mechanical CAD/CAM/CAE subapplications are as follows:

- Conceptual design
  - Industrial design—A process that provides a common environment for the entire conceptual design process, including painting, modeling, rendering, and visualization
  - Design layout—An initial design process in which the major components and part interfaces are defined
  - Styling—A detailed design process in which aesthetic considerations are foremost in importance
- Functional design
  - Component design—Design of the individual components in an assembly
  - Assembly verification—Integration of components' designs into an assembly to test the size/shape and function characteristics

- Linkage/mechanism—An assembly of components with two or more movable parts, usually providing some means of power, control, or fastening application
- Analysis—The analysis of a physical system, part, or assembly; includes structural, thermal, vibrational, composite, fatigue, stack-up, mass property, and quality-control analysis

- Drafting and documentation
  - Detail drafting—Representation of a part in standard geometric drafting format, including all part geometry dimensions and notations describing mechanical/structural, functional, and material characteristics
  - Schematic/detailed diagrams—Schematics used to describe hydraulic and pneumatic systems
  - Technical illustration—Drawing of a component or assembly that is generally intended for publication
- Manufacturing engineering
  - Tool design—The design of custom-made tooling to facilitate a manufacturing process
  - Fixture design—The design of structural aids that hold the component or assembly during the manufacturing process
  - Part processing design—The design of a series of manufacturing processes
- Manufacturing process simulation
  - Numerical control part programming—The programming of a numerical control machine tool or automated processing system
  - Coordinating measuring machines—The programming of machines used to measure the physical dimensions of a part
  - Offline robotics—A process simulation that graphically represents the sequence of steps to program a robot for a particular operation and downloads data to a robot to update its control program
- System management and other tools
  - Product data management (PDM)—Software typically used in an engineering or manufacturing environment to manage product data. Characteristics of PDM systems include product/structure management, workflow, and vault/document management capabilities.
  - Engineering data management—Software with vault management capabilities and limited workflow capabilities designed for use within an engineering environment
  - Component information systems—Software used to navigate within and manage a repository of engineering parts and associated data
  - Knowledge-based engineering tools—Tools used to capture design intent and build standard practices for controlling, modifying, and automating design and manufacturing activities. Also known as rule-based engineering.

- Applications development environments—Programming tools to aid in the generation of user-defined programs that drive or interface with CAD/CAM/CAE.

EDA

For the past few years, Dataquest has subdivided the electronic CAE market in an entirely new way. The subdivisions are based on design methodologies such as gate-level design, register transfer (RT)-level design, and electronic system (ES)-level design.

Under the methodology, a design is first entered and simulated, usually at the RT level. It is then synthesized or compiled down to the level below it. This process continues (simulation and synthesis) until the design is placed and routed at the physical design level, at which point timing information is extracted from the physical design. At this point, the verification process begins.

For verification, the process flows in an upward direction. From the physical design level, timing information is extracted, and design rule checkers and logic rule checkers are used to ensure a correct design at the physical level. Verification continues in this upward fashion until the level at which the design process originally began is reached. The electronic design automation subapplications are as follows:

CAE

The CAE subapplications are as follows:

- ES level
  - ES-level design—Design at the conceptual level, including hardware/software co-design, design partitioning, and specification; it includes neither RT- nor logic-level descriptions.
  - Behavioral simulation—Nontiming-based simulation
  - Behavioral synthesis—Synthesis of an ES-level design description to the RT level
  - Formal verification—The process of mathematically proving that an RT-level description equates to an ES-level description (or less specifically, that any design representation equates to another)
- RT level
  - RT-level design—Tools designed to assist engineers in entering a design or analyzing the simulated results of that design. This includes the use of graphical symbols to represent RT-level VHDL or Verilog.
  - RT-level simulation—Simulation at the RT level
    - VHDL—Simulation using the VHSIC Hardware Description Language
    - Verilog—Simulation using the Verilog Hardware Description Language

- Logic synthesis—Synthesis or translation of an RT-level description to a gate-level description
- Target compiler—A translation of an RT-level description to the silicon implementation
- Timing analysis—Verification of the timing of a design; the process usually involves providing inputs to a physical circuit model or computer simulation to test the nondynamic functions of a design; static-timing verification does not require the use of test vectors to determine timing violations.
- Design for test tools—Tools used to determine, improve, or add to the testability of electronic circuits
- Silicon synthesis—Tools that estimate silicon-level performance at the RT-level by synthesizing the RT-level description to a virtual silicon implementation of that code and reflecting the estimated silicon performance back up to the RT level
- PCB synthesis—A process similar to silicon synthesis but without using synthesis technology. PCB synthesis uses a virtual representation of the PCB to estimate physical effects, bringing those effects back up to the CAE level of design.

- Gate level
  - Schematic capture—A design process that consists of graphical schematic entry and net-list extraction
  - Simulation—The use of representative or artificial data to reproduce conditions in a model that could occur in the performance of a system. Simulation is used to test the behavior of a system under different operating conditions.
    - Gate-level simulation—Simulation based upon a gate-level netlist (not VHDL or Verilog)
    - Analog simulation—Simulation in which both digital and analog inputs are used
    - Mixed-signal simulation—Simulation in which both digital and analog inputs are used
    - SPICE simulation—Simulation using a derivative of the Berkeley SPICE transistor-level simulator
  - Analysis tools—Tools used for the analysis of designs
    - Signal analysis (including transmission line and cross-talk analysis)—Analysis of high-speed coupling effects between signal line and reflection/degradation of the high-speed signal on PCBs, MCMs, or ICs
    - Power analysis—Analysis of the power consumption of PCBs, ICs, MCMs, and systems
    - Electromagnetic interference—Analysis of electromagnetic generation and interference for PCBs, ICs, and cables/connectors/packaging

- Metal migration or electromigration—The unauthorized movement of metal in an IC because of excessive current density

- Miscellaneous
  - Accelerators—Dedicated hardware/software or optimized software used to speed up simulation, typically at the gate level
  - Emulators—Dedicated hardware/software that allows a designer to observe the function of a circuit or design prior to prototype
  - Fault simulation/grading—A process that determines which nodes in a design can be detected by a given set of test vectors
  - Interoperability tools—Software used for database, library, and tool management; they also include backplanes, file translators, and design environments (in general, all tools used specifically to integrate a set of EDA tools).
  - Libraries—Description of elements used in EDA designs (for example, components, simulation models, and symbols)
  - Field-programmable gate array (FPGA) toolset—Dedicated EDA software sold as a package for FPGA/complex-programmable logic device (CPLD) design
- IC CAD
  - DRC—The design rule and logic rule checkers used to perform final verification on an IC design prior to making masks
  - Floor planner—A tool that allows a designer to place elements of a design so that the designer can look at estimations of the effects of the final place and router.
  - FPGA place and route—Tools used to implement designs into the targeted FPGA or CPLD. These are also called "fitters" because they fit designs into the already existing logic structure of the targeted FPGA or CPLD.
  - IC place and route—Tools used to implement (lay out) designs into silicon
    - Gate array place and route—Tools used to lay out designs into a fixed-based array
    - Cell-based IC place and route—Tools used to lay out nonfixed, cell-based designs
    - Custom IC layout—Silicon design tools working at the transistor level. These tools can size transistors, accomplish analog design, and generally hand craft silicon implementation. Sometimes called "layout editors."
- PCB design
  - PCB design tools—Tools used to design, place, and route a PCB
  - MCM9 and hybrid design tools—Tools used to design, place, and route a multichip module or hybrid substrate

AEC/Architectural, Engineering, and Construction

The AEC, or architectural, engineering, and construction, subapplications are as follows:

- Architectural—Software used in the design and drafting of buildings and grounds
- Civil—Software for both site and structural engineering, typical for design and drafting of sites for buildings, roads, bridges, and airports and for the design of steel and concrete structures
- Facilities design/management—Software used to lay out, inventory, and manage assets such as personnel space, equipment, and utilities within a building or geographic service area
- Process plant design—Software used in design, analysis, drafting, and management of process, power, and manufacturing plants as well as ships

GIS/Mapping Software

GIS/Mapping Software is used to capture, edit, display, and analyze spatial (tagged by location) information. It can be categorized as follows:

- Base data—Software used to create baseline geographic data
  - Photogrammetry and surveying—Software used in developing original data for a GIS system based on ground surveying or on remotely sensed data. Examples include aerial photography or satellite imagery.
  - Data for resale—Includes both GIS software used to create data for resale to end users and revenue from the sale of geographic data
- Land information—Software used to gather and manage land data
  - Land records—GIS software used to manage land ownership or parcel information; the typical user is a tax assessor.
  - Planning and land use—GIS software used to manage land use; the typical user is a city planner.
- Biological—Software used to manage and analyze plant and animal life
  - Environmental public health and safety—GIS software used to manage natural resources and to monitor and analyze environmental factors that contribute to the welfare of the earth and its people
  - Forestry and agriculture—GIS software used for the management of forests and crops
- Geoscience (formerly energy exploration)—GIS software used to manage oil, gas, and mineral exploration projects. The emphasis of geoscience is typically on subsurface data.
- Infrastructure management—Management and analysis of man-made assets (not including utilities)
  - Transportation and logistics—GIS software used in transportation applications such as road or rail network modeling or route planning

- Emergency and dispatch services—GIS software used to manage emergency services such as "911" services and also for-profit dispatch management systems

- Automated mapping/facility management—GIS software used for managing utility industry networks, based on the following categories:
  - Telecommunications/telephone
  - Electric
  - Water and waste water
  - Other utilities (primarily gas)
- Business marketing and sales—GIS software used to promote and sell services and products, and to identify and evaluate opportunities in a competitive environment.
  - Demographic and location analysis—GIS software used to analyze problems in demographics or site characteristics. Examples include sales territory selection, site selection, or population analysis. Typical users are in advertising, marketing, insurance, banking, and real estate.
  - Sales and directional support—GIS software used to help salespeople locate targets of a sales effort (for example, to locate potential customers, specific properties for sale and driving routes to the properties). This also includes software used to help customers locate establishments, typically used as travelers' aids.
- Geopolitics—The sum of software used in defense/military and political districting applications
  - Defense/military—GIS software used to manage military or defense projects for the purpose of command and control
  - Political districting—GIS software used to manage the redistricting process based on census data
- Cartography—GIS software used in mapmaking applications

Chapter 8
CAD/CAM/CAE/GIS Operating System and Industry Segmentation

Additional surveys segment the software revenue by operating systems and by industry, providing yet another look at the CAD/CAM/CAE/GIS software market. These segments are as follows:

Operating Systems

- Apollo AEGIS
- Apple AUX
- Apple Macintosh/OS
- AT&T Systems V Derivatives
- CDC CYBER NOX/VE
- CONVEX UNIX
- CRAY UNIX
- Digital Equipment Corporation OSF
- Digital Equipment Corporation ULTRIX
- Digital Equipment Corporation VMS
- DOMAIN/Apollo UNIX
- DOS
- DOS with Windows
- Hewlett-Packard UX
- Hitachi HI-UX/G (UNIX)
- IBM AIX
- IBM VM/VMS
- Intergraph UNIX
- MIPS UNIX
- NEC EWS-UX (UNIX)
- OS2
- Prime PRIMOS
- Siemens-Host/Proprietary
- Siemens-UNIX
- Silicon Graphics Inc. UNIX
- Solaris
- Sony NEWS-OS (UNIX)
- Sun—UNIX/OS

- Windows
- Windows NT
- XENIX/SCO UNIX
- Others—UNIX
- Others
- All Operating Systems

Industry Sectors

- Aerospace, guided missiles, and space vehicles
- Agriculture, forestry, and fishing
- Automotive, motorcycles, and bicycles
- Chemical, allied, and petroleum products
- Computers, office equipment, and computer peripherals
- Conservation management and waste management
- Construction, contractors, and building
- Consumer electronics (TV, VCR, and CD)
- Education
- Electrical/electronic equipment (power, appliances, test, and measurement)
- Fabricated metal products, except machinery and transportation
- Finance, insurance, and real estate
- Government: environment and public health resource
- Government: general, executive, public order, and taxation
- Government: national security (defense)
- Government: public works and engineering
- Industrial and commercial machinery (engines and heavy equipment)
- Industrial controls, robotics, and AGVs
- Manufacturing not elsewhere classified (textiles, furniture, and foundries)
- Medical manufacturing (instrument/x-ray)
- Mining
- Semiconductors
- Service companies (including architecture firms, engineering consulting firms, and design services firms)
- Shipbuilding, ship repairing, and developing offshore rigs
- Telecommunications and data communications (telephone, radio, television, and cable)
- Transportation (rail, public transit, and freight transport)

- Utilities and pipelines (electric, gas, sanitary services, and water)
- Others
- All industries

Results from these surveys and the subapplications' surveys are scheduled to be published in mid-1996.

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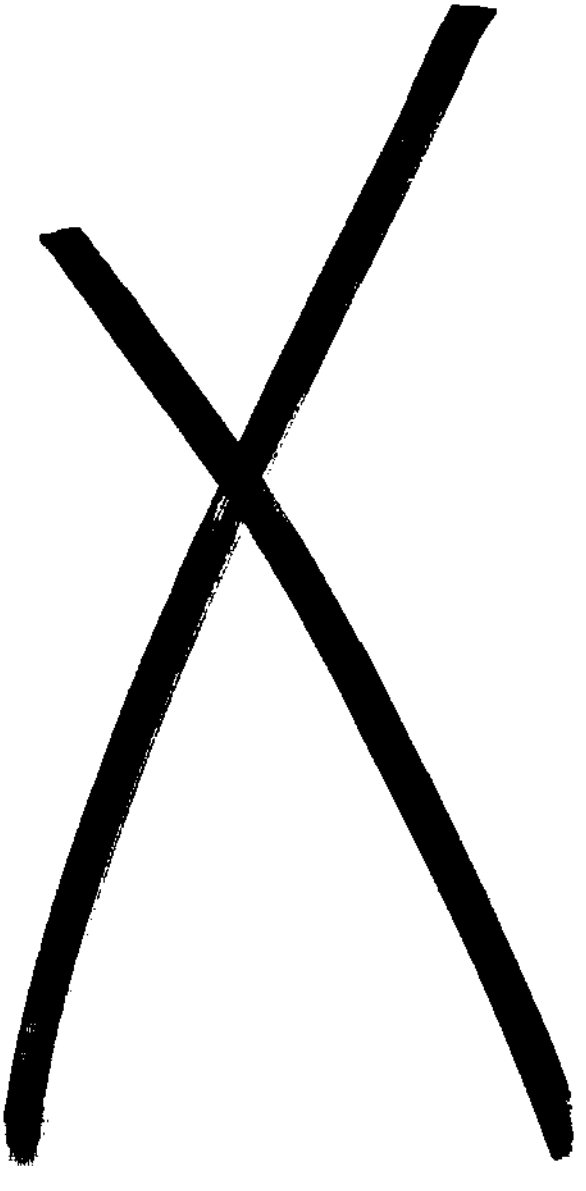

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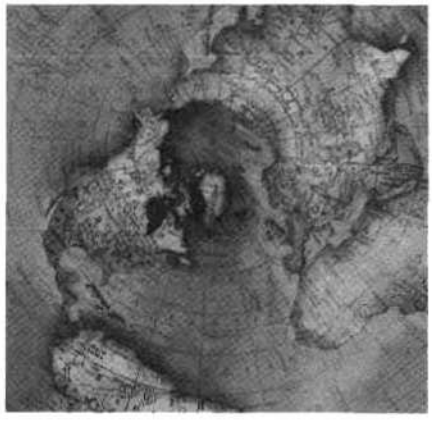

Dataquest

1995 CAD/CAM/CAE/GIS EDA Market Share

Market Statistics

Program: Electronic Design Automation Worldwide
Product Code: CEDA-WW-MS-9601
Publication Date: March 4, 1996
Filing: Market Statistics

1995 CAD/CAM/CAE/GIS EDA Market Share

Market Statistics

Program: Electronic Design Automation Worldwide
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Note: All tables show estimated data.

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Note: All tables show estimated data.

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Note: All tables show estimated data.

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Note: All tables show estimated data.

1995 CAD/CAM/CAE/GIS EDA Market Share

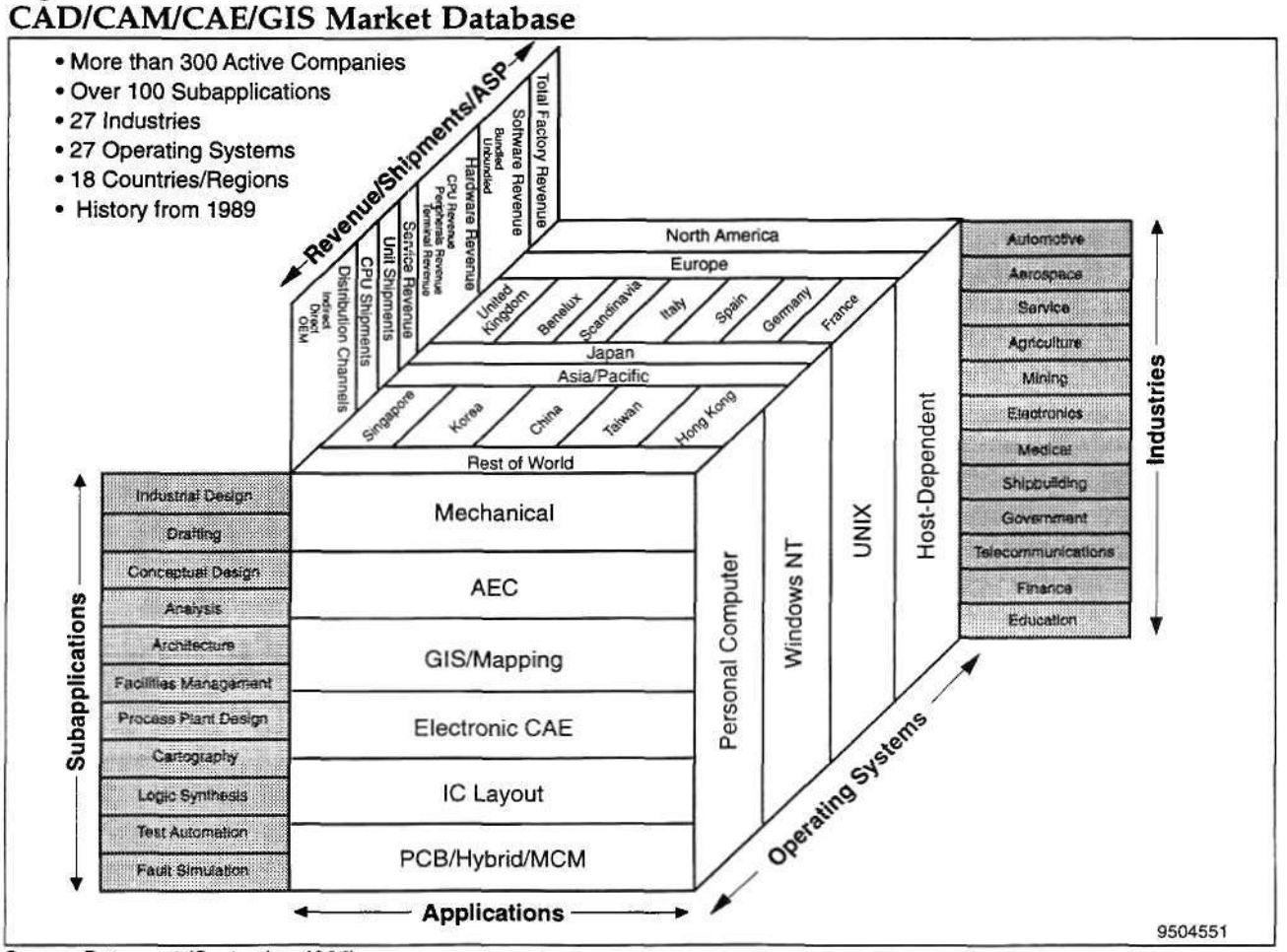
Introduction

CAD/CAM/CAE/GIS systems have dramatically changed the methods by which designers and production managers originate and implement products. CAD and CAE systems allow designers to create, draft, analyze, test, and manipulate products on a screen in two and three dimensions. As CAD/CAM/CAE/GIS systems continue to decrease in cost, they become more available and cost-justifiable to new users.

In order to provide a comprehensive view of the CAD/CAM/CAE/GIS industry, Dataquest's CAD/CAM/CAE/GIS group maintains a large database of industry information. The type of information contained in the database is depicted in Figure 1.

Table 1 summarizes the performance in various segments of the CAD/CAM/CAE/GIS markets in 1995 versus 1994.

Figure 1
CAD/CAM/CAE/GIS Market Database



Source: Dataquest (September 1995)

Table 1
CAD/CAM/CAE/GIS Market Summary, 1994 to 1995

	Software Revenue		Growth (%)	Total Factory Revenue		Growth (%)	Seat Shipments		Growth (%)
	1994	1995	1994-1995	1994	1995	1994-1995	1994	1995	1994-1995
Applications									
Mechanical	2,510.52	2,988.89	19.05	8,010.17	9,060.07	13.11	297,132.64	334,451.49	12.56
AEC	834.96	989.30	18.48	2,367.87	2,678.55	13.12	199,153.32	237,703.98	19.36
GIS/Mapping	721.30	862.40	19.56	2,205.18	2,489.80	12.91	105,647.29	123,091.84	16.51
Electronic CAE	882.74	1,030.38	16.73	2,439.73	2,870.66	17.66	96,082.76	101,478.00	5.62
IC Layout	210.69	283.99	34.79	714.89	890.07	24.50	12,443.88	14,229.17	14.35
PCB/MCM/Hybrid	255.79	266.71	4.27	797.44	823.61	3.28	28,995.23	29,755.74	2.62
Electronic Design Automation	1,349.21	1,581.08	17.19	3,952.07	4,584.34	16.00	137,521.88	145,462.92	5.77
All Applications	5,415.99	6,421.66	18.57	16,535.28	18,812.77	13.77	739,455.13	840,710.23	13.69
Regions									
North America	1,915.91	2,272.72	18.62	5,979.40	6,839.67	14.39	339,158.26	375,594.98	10.74
Europe	1,820.51	2,161.60	18.74	5,675.43	6,394.30	12.67	255,747.07	297,474.90	16.32
Japan	1,335.78	1,521.57	13.91	4,002.37	4,498.92	12.41	104,515.61	117,421.02	12.35
Asia/Pacific	253.55	362.70	43.05	657.52	834.49	26.92	33,206.83	43,463.25	30.89
Rest of World	90.24	103.06	14.20	220.57	245.38	11.25	6,827.36	6,756.09	-1.04
Worldwide	5,415.99	6,421.66	18.57	16,535.28	18,812.77	13.77	739,455.13	840,710.23	13.69
Operating Systems									
UNIX	3,815.24	4,377.90	14.75	11,971.05	13,541.52	13.12	228,682.75	247,585.92	8.27
Host/Proprietary	178.49	151.77	-14.97	1,223.20	956.17	-21.83	20,016.33	16,803.76	-16.05
NT/Hybrid	115.03	381.06	231.27	291.36	892.31	206.25	7,301.74	25,174.01	244.77
Personal Computer	1,307.23	1,510.92	15.58	3,049.66	3,422.77	12.23	483,454.31	551,146.55	14.00
All Operating Systems	5,415.99	6,421.66	18.57	16,535.28	18,812.77	13.77	739,455.13	840,710.23	13.69

Source: Dataquest (February 1996)

About This Document

This document contains Dataquest's detailed market share information on the CAD/CAM/CAE/GIS industry. The following list contains descriptions of the companies included in the Market Share books. See Tables 2, 3, 4, and 5 for changes from our 1994 report.

- Mechanical applications—All companies in database with mechanical revenue
- GIS and AEC applications—All companies in database with GIS revenue and all companies in database with AEC revenue. We also have added GIS data companies.
- Electronic design automation applications—All companies in database with EDA (electronic CAE, IC layout, PCB/hybrid/MCM) revenue
- Europe overview—All companies with European revenue
- Asia—All companies with Asian revenue

We no longer publish top-level market statistics for the entire CAD/CAM/CAE/GIS industry. This data is available by calling Suzanne Snygg at (408) 468-8124. More detailed data on these markets may be requested through our client inquiry service.

This document represents our preliminary estimates of 1995 shipments and revenue.

Dataquest's policy is to continually update its market information, for current and past years, with any new data received in order to arrive at the most accurate market representation possible.

Table 2
Companies Renamed Since 1994

Original Company Name	New Company Name
American Small Business Company	Viagrafix
SHL Systemhouse	SHL VISION Solutions
IEZ	IEZ-Speedikon

Source: Dataquest (February 1996)

Table 3
Companies (or CAD Portions of Companies) Sold/Merged in 1994

Original Company Name	Acquired by/Merged with
Exemplar Logic	Mentor Graphics
Facilities Mapping Systems	Eagle Point
Geographix	Landmark Graphics
Integrated Silicon Systems & Arcsys	Avant!
Integrity Engineering	Mentor Graphics
Neocad	Xilinx
Rasna	Parametric Technology

Source: Dataquest (February 1996)

Table 4
Companies Deleted from Database Since 1994

Company
Aucotec
INS Engineering
Micrografx

Source: Dataquest (February 1996)

Table 5
Companies Added to Database Since 1994

Company
Altair Computing Inc.
Ansoft
Bentley Systems
CAE Plus Inc.
Eagle Design Automation
Escalade
Frontline Design Automation
Logic Vision
Macon
MicroCADAM Inc.
Number One Systems
Protel Technologies
Speedsim

Source: Dataquest (February 1996)

Segmentation Definitions

This section lists the definitions specific to this document. The following paragraphs define the segments.

Applications

Mechanical

The mechanical segment refers to computer-aided tools used by engineers, designers, analysts, technicians, and draftspeople working predominantly in the discrete manufacturing industries, but includes government and education. Users of mechanical CAD/CAM/CAE tools work in all departments across the typical organization, with a majority found in product design, advanced engineering, and manufacturing engineering. Common design applications include conceptual design, industrial design, structural or thermal analysis, detail design, and electromechanical design (the mechanical part of design with electrical or electronic components and mechanisms). Common manufacturing applications include tool and fixture design, numerical control part programming, offline robotics programming, and interface to quality control systems. Management tools for database control and distribution are included in this segment, as well as user-defined application programming.

Architecture, Engineering, and Construction (AEC)

The AEC segment covers the use of computer-aided tools by architects, contractors, plant engineers, civil engineers, and other people associated with these disciplines to aid in designing and managing buildings, industrial plants, ships, and other types of nondiscrete entities.

Geographic Information Systems (GIS)/Mapping

GIS is computer-based technology, and the segment comprises hardware, software, and data used to capture, edit, display, and analyze spatial (tagged by location) information.

Electronic Design Automation (EDA)

The EDA segment covers computer-based tools used to automate the design of an electronic product, including printed circuit boards, ICs, and systems. EDA includes ECAE, IC layout, and PCB/hybrid/MCM, as follows:

- Electronic computer-aided engineering (ECAE)—These are computer-aided tools used in the engineering or design phase of electronic products (as opposed to the physical layout phase of the product). Examples of electronic CAE applications are schematic capture and simulation.
- IC layout—This is a software application tool used to create and validate the physical implementation of an IC. The IC layout category comprises polygon editors, symbolic editors, placement and routing (gate array, cell, and block), and design verification tools (DRC/ERC/logic-to-layout).
- PCB/hybrid/MCM—This segment covers products used to create the placement and routing of the traces and components laid out on a printed circuit board. Also included in this category are thermal analysis tools.

Regions

The following paragraphs define the regions.

North America

Includes Canada, Mexico, Puerto Rico, and the United States

Europe

Western Europe. Includes Austria, Benelux (Belgium, the Netherlands, Luxembourg), France, Germany (including former East Germany), Italy, Scandinavia (Denmark, Finland, Norway, Sweden), Switzerland, the United Kingdom, and the Rest of Western Europe (Andorra, Cyprus, Gibraltar, Iceland, Liechtenstein, Malta, Monaco, San Marino, Spain, Sweden, Turkey, Vatican City, and others)

Eastern Europe. Includes all countries currently categorized as Central Europe in addition to Albania, Bulgaria, the Czech Republic and Slovakia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and the republics of the former Yugoslavia. Also included in this group is Russia and the other republics of the former Soviet Union (Belarus, Ukraine, Georgia, Moldova, Armenia, Azerbaijan, Kazakhstan, Uzbekistan, Tajikistan, Kyrgyzstan, and Turkmenistan)

Japan

Asia/Pacific
Includes Hong Kong, Korea, Singapore, Taiwan, and Rest of Asia (Australia, Brunei, Cambodia, China, India, Indonesia, Laos, Malaysia, Maldives, Myanmar, Nepal, New Zealand, Pakistan, the Philippines, Sri Lanka, Thailand, and Vietnam)

Rest of World
Includes Africa, Central America, the Caribbean, the Middle East, Oceania, and South America.

Operating Systems

Dataquest defines the operating systems as follows:

- UNIX: UNIX includes all UNIX variants and older workstation operating systems.
- Host: Host includes minicomputer and mainframe operating systems in which the functions of external workstations are dependent on a host computer.
- Windows NT: Windows NT is the Microsoft operating system. We understand that code for Windows NT and Windows will be merged within the next three years. The probability is high that Microsoft will develop a client environment and a server environment. In our forecast, the future client environment is included in PC operating systems, and the future server environment is referenced as NT. Also included in NT is potential for an additional, new, high-end operating environment that could be developed by any vendor.
- PC: PC includes DOS, Windows, Windows 95, and Apple operating systems.

Metrics

The following paragraphs define measurements:

- Total factory revenue is defined as the amount of money received by a manufacturer for its goods and services measured in U.S. dollars. Total factory revenue does not include revenue that a company may receive from products that are sold to another company for resale (OEM revenue). Total factory revenue is the sum of software revenue, hardware revenue, and service revenue.
- Unit shipment is defined as the number of seats delivered (number of possible simultaneous users of product delivered) excluding OEM shipments.
- Hardware revenue is revenue derived from sales of CPUs (including operating systems), terminals (for host-dependent systems), and peripherals.
- Software revenue is revenue derived from the sale of application software that exists on a company's standard price list.

- Service revenue is defined as all revenue derived from the service and support of CAD/CAM/CAE/GIS systems. Service revenue can be calculated in the tables by subtracting hardware and software revenue from total revenue. A split by hardware service and software service is available through inquiry.
  - Maintenance fees for hardware and software
  - Management and operations services—help desk, education and training, disaster recovery, vaulting, and configuration management
  - Service bureau—project work, including construction of database, data conversion, product design, analysis, or manufacturing
  - Application development—design and development of customized software applications or the modification, enhancement of customization of existing software applications, adding new functionality
  - Consulting revenue—assessment of CAD/CAM/CAE/GIS business and information technology needs and the formulation of a plan based on needs identification
  - Implementation and integration services—planning, implementation, migration, and integration of software products (software network support and integration, account integration management, data center design, and construction)

Market Share Methodology

Dataquest uses both primary and secondary sources to produce our market share data. In the fourth quarter of each year and second quarter of the subsequent year, we survey all participants in each industry. Each vendor is offered the opportunity to self-report the information required. Although there is a primary contact for each company, large companies are surveyed across product lines and across geographic regions. Thus there is a corresponding increase in the number of contacts at large companies. (Dataquest maintains a large contact database on all sources of information.) Examples of the job titles of people contacted for information are the following:

- President and CEO
- Vice president and general manager
- Vice president of marketing
- Vice president, strategic product planning
- Director of strategic planning
- Director of marketing
- Director of market development
- Manager, CAD/CAM/CAE/GIS marketing programs
- Market research analyst

The Audit Process

Data supplied by vendors is evaluated against information drawn from many sources, including the following:

- Revenue published by major industry participants
- Estimates made by knowledgeable and reliable industry spokespersons
- Government data or trade association data
- Published product literature and price lists
- Interviews with knowledgeable manufacturers, distributors, and users
- Relevant economic data
- Information and data from online data banks
- Articles in both the general and trade press
- Annual reports, SEC documents, credit reports
- Company publications and press releases
- Reports from financial analysts
- User studies
- Reseller and supplier reports and reports from a vendor's competitors

Dataquest also sums vendor revenue across other industries covered by Dataquest to make sure that revenue is not credited twice, and checks with multiple sources at one company to cross-check data on that company.

Dataquest analysts have many years of experience in how to apply the tools described to get the most accurate information possible on a particular company (such as what to use when and what industry averages are). We believe that the estimates presented here are the most accurate and meaningful generally available today. It is the CAD/CAM/CAE/GIS group's policy to continually update our market information for any year, based on any new data received, in order to arrive at the most accurate market representation possible.

Dataquest's CAD/CAM/CAE/GIS market numbers are often higher than those reported by other sources. We survey worldwide, which involves more vendors, higher total market revenue, lower market share per vendor, and a more accurate market picture—which is particularly useful when comparing regions or applications.

Reporting Changes

Beginning with this publication, we will publish market share data that will report OEM revenue for all regions. Also, for the first time in the United States our market share tables will include companies that resell products from other vendors as well as their own products (these are primarily Japanese companies), and companies that sell products

primarily to other vendors (such as Dassault). In the past, this reporting was standard only in our products for Japan, Europe, and Asia/Pacific. We believe that this reporting accurately reflects the activity of all the vendors in the CAD/CAM/CAE and GIS market. To prevent double counting of the market, we will continue to count the total market size by excluding OEM and reseller revenue. As a result, the sum of the individual software vendors will be greater than the total market size in all market share tables. On an inquiry basis, we can produce market share tables that exclude OEM revenue, or report only OEM revenue.

We have also altered IBM's revenue to exclude revenue derived from MicroCADAM sales. We have restated history so that MicroCADAM now appears as its own company for 1994 and 1995, in much the same way that we now separately report Bentley and Intergraph. We believe this will correctly reflect both the change in IBM's ownership of MicroCADAM and a reduction of IBM's role as a reseller of this product. Also, after close examination of Fujitsu, we have restated this company's revenue split to more accurately reflect its OEM sales.

These reporting changes primarily reflect our efforts to both accurately depict markets while accounting for revenue by distribution channel. Dataquest's CAD/CAM/CAE/GIS database was first developed in the turnkey era of CAD/CAM, when channel reporting was relatively unimportant. Today, of course, worldwide distribution and PC-based products require us to better report revenue by channel. While our existing database does account for much of this information, we believe improvements are necessary.

Historically, we have focused on factory revenue; that is, revenue to a vendor's bank. In the future, we want to be able to also report end-user revenue; that is, revenue from the user's wallet. For example, this issue of market share still focuses on factory revenue even though users who buy from resellers of Autodesk or Smallworld ultimately pay far more for the products. We believe we have designed a data model that will satisfactorily answer the channel questions our clients want answered. We hope to implement those changes in a forthcoming Dataquest document, Market Share Update, due to you by July 31. In the meantime, we invite your input, and we will be happy to send an outline of our approach at your request.

Publishing Schedule

We publish market share and forecasting twice each year for each, allowing for both timely distribution of data and thorough analysis and forecasting. Our annual delivery schedule is as follows:

- Market share will be published and distributed to clients by February 28.
- Forecasting from the market share tables provides a five-year forecast period, available after April 30. The books will be shipped by May 31.

- Final updated market share tables, based on additional data collection and analysis, will be completed by June 30. At this point, the market share database is frozen and will not be changed until the end of the year. For the next six months, supplementary market data will be based on this final market data. Books will be shipped by July 31. (Unfortunately, because of our database changes, updated market share table delivery was delayed beyond this date.)
- We provide complete final forecast tables by July 31. These tables take into consideration changes in the market share during the previous six months. Books will be shipped by September 31.

Table A-1
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Worldwide, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	193.8	205.8	280.9	36.5	17.8
2	Synopsys	112.9	142.7	193.5	35.6	12.2
3	Mentor Graphics	167.0	176.6	183.0	3.6	11.6
4	Viewlogic Systems	80.2	87.3	76.8	-12.0	4.9
5	Zuken-Redac	71.0	67.0	71.9	7.4	4.5
6	Quickturn Design Systems	49.5	59.0	70.6	19.6	4.5
7	Compass Design Automation	43.7	43.7	51.0	16.7	3.2
8	Hewlett-Packard	32.4	33.6	37.9	12.6	2.4
9	Zycad	32.8	39.8	36.8	-7.6	2.3
10	Avant!	7.6	16.4	32.3	97.2	2.0
11	Marubeni Hytech*	24.7	25.7	29.7	15.4	1.9
12	Fujitsu*	21.0	23.7	27.4	15.9	1.7
13	IKOS Systems	18.1	18.6	25.7	38.1	1.6
14	Intergraph	25.0	19.9	25.1	25.9	1.6
15	EPIC Design Technology	4.8	9.7	24.8	155.5	1.6
16	Yokogawa Digital Computer	18.0	21.4	23.9	11.9	1.5
17	Seiko*	19.6	19.5	21.7	11.3	1.4
18	Harris EDA	20.6	21.3	21.7	1.9	1.4
19	Autodesk	23.9	22.8	20.9	-8.2	1.3
20	CADIX	15.5	18.3	20.3	11.1	1.3
21	Altera	14.0	16.0	20.0	25.0	1.3
22	Xilinx Inc.	14.5	16.9	19.4	15.1	1.2
23	Meta-Software	9.7	14.4	17.5	21.2	1.1
24	Okura*	10.8	14.3	17.0	18.6	1.1
25	Summitt Design	9.2	14.6	16.5	13.2	1.0
26	Analogy	11.3	12.6	16.0	26.6	1.0
27	NEC	22.7	22.4	15.6	-30.3	1.0
28	Cooper & Chyan Technology	5.8	9.3	14.6	57.2	0.9
29	Microsim	5.8	11.9	13.3	12.0	0.8
30	LSI Logic	13.8	15.6	12.9	-17.2	0.8
	All North American Companies	988.9	1,134.3	1,359.0	19.8	86.0
	All European Companies	42.2	31.6	31.7	0.5	2.0
	All Asian Companies	181.3	183.3	190.4	3.9	12.0
	All Companies	1,212.4	1,349.2	1,581.1	17.2	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table A-2
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Worldwide, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	193.8	205.8	280.9	36.5	20.8
2	Synopsys	112.7	142.7	193.5	35.6	14.3
3	Mentor Graphics	164.5	173.4	158.8	-8.4	11.7
4	Quickturn Design Systems	49.5	59.0	70.6	19.6	5.2
5	Zuken-Redac	68.2	65.0	68.9	6.0	5.1
6	Compass Design Automation	43.7	43.7	51.0	16.7	3.8
7	Viewlogic Systems	49.3	54.4	50.7	-6.8	3.7
8	Zycad	32.8	39.8	36.8	-7.6	2.7
9	Hewlett-Packard	30.3	30.1	34.1	13.1	2.5
10	Avant!	7.5	16.1	32.3	100.3	2.4
11	IKOS Systems	18.1	18.6	25.7	38.1	1.9
12	Fujitsu*	19.0	22.0	25.4	15.9	1.9
13	Marubeni Hytech*	18.7	21.2	25.0	18.0	1.9
14	EPIC Design Technology	4.8	9.7	24.8	155.5	1.8
15	Yokogawa Digital Computer	18.0	21.4	23.9	11.9	1.8
16	CADIX	15.5	18.3	20.3	11.1	1.5
17	Seiko*	19.6	18.3	19.5	6.7	1.4
18	Harris EDA	18.0	18.3	18.9	3.4	1.4
19	Okura*	10.8	14.3	17.0	18.6	1.3
20	Meta-Software	9.1	13.5	16.4	21.2	1.2
21	Analogy	11.0	12.4	16.0	29.2	1.2
22	Summitt Design	8.8	14.0	15.8	13.2	1.2
23	Xilinx Inc.	6.9	11.1	15.1	35.3	1.1
24	LSI Logic	13.8	15.6	12.9	-17.2	1.0
25	NEC	18.7	18.1	12.4	-31.2	0.9
26	C. Itoh Techno-Science*	8.7	9.8	11.3	15.4	0.8
27	Cooper & Chyan Technology	5.6	7.1	11.2	57.2	0.8
28	Cascade Design Automation	8.6	10.3	9.9	-3.8	0.7
29	High Level Design Systems	2.7	3.3	9.3	178.1	0.7
30	Minc Software	2.6	5.1	8.4	65.7	0.6
	All North American Companies	857.7	978.4	1,166.5	19.2	86.2
	All European Companies	20.2	15.3	15.0	-1.9	1.1
	All Asian Companies	159.5	163.8	171.7	4.8	12.7
	All Companies	1,037.4	1,157.5	1,353.2	16.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table A-3
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Worldwide, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	2.4	19.6	702.4	76.3
2	Seiko*	-	1.2	2.2	80.6	8.6
3	Altera	-	-	2.0	NA	7.8
4	Intusoft	-	0.9	1.4	58.8	5.5
5	Viewlogic Systems	-	-	1.2	NA	4.7
6	Ansoft	-	0.6	0.8	39.3	3.0
7	SIMUCAD	0	0.1	0.4	410.3	1.6
8	Fintronic	-	-	0.3	NA	1.0
9	PADS Software	-	0.4	0.3	-41.7	1.0
10	Frontline Design Automation	-	-	0.1	NA	0.3
11	CAD Distribution	-	0	0	197.7	0.1
12	InterHDL	-	0	0	15.4	0.1
13	Mentor Graphics	-	1.3	-	-100.0	-
	All North American Companies	0	5.7	25.7	352.8	99.9
	All European Companies	-	0	0	197.7	0.1
	All Asian Companies	-	-	-	NA	-
	All Companies	0	5.7	25.7	352.5	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

NA = Not applicable

Source: Dataquest (February 1996)

Table A-4
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Worldwide, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Viewlogic Systems	30.8	32.9	24.9	-24.4	12.5
2	Mentor Graphics	2.5	2.0	24.2	1139.7	12.1
3	Autodesk	22.5	21.5	19.7	-8.2	9.9
4	Altera	14.0	16.0	18.0	12.5	9.0
5	PADS Software	9.1	9.3	12.1	30.1	6.1
6	Microsim	4.6	10.2	11.4	12.0	5.7
7	Wacom	12.2	11.0	10.2	-7.1	5.1
8	OrCAD EDA	9.1	9.0	10.0	11.6	5.0
9	Protel Technology	-	4.5	6.0	33.3	3.0
10	Accel Technologies	3.2	4.1	6.0	46.0	3.0
11	Data I/O	5.2	5.3	5.8	9.5	2.9
12	Norlinvest Ltd.	5.0	4.6	4.7	1.9	2.3
13	Marubeni Hytech*	5.9	4.5	4.6	2.8	2.3
14	Xilinx Inc.	7.7	5.7	4.4	-24.0	2.2
15	Hewlett-Packard	2.1	3.5	3.8	8.8	1.9
16	Cooper & Chyan Technology	0.2	2.2	3.4	57.2	1.7
17	NEC	4.0	4.3	3.1	-26.6	1.6
18	Zuken-Redac	2.8	2.0	3.0	50.5	1.5
19	ACTEL	2.8	2.7	2.7	0.2	1.4
20	Intergraph	0.8	0.8	2.7	242.7	1.4
21	IBM	9.9	9.7	2.7	-72.5	1.3
22	Altium*	9.9	9.7	2.7	-72.5	1.3
23	Harris EDA	2.1	2.7	2.5	-5.4	1.3
24	ALS Design	2.2	2.3	2.5	7.6	1.3
25	CAD-UL	2.2	2.3	2.5	6.1	1.2
26	Sophia Systems*	2.7	2.8	2.4	-14.7	1.2
27	ULTImate Technology	1.8	1.9	2.1	11.4	1.0
28	ALDEC	2.3	2.7	1.9	-30.4	0.9
29	APTIX	0.9	1.6	1.6	5.0	0.8
30	Minc Software	0.5	1.0	1.6	65.7	0.8
	All North American Companies	129.3	148.0	165.0	11.5	82.7
	All European Companies	21.1	16.3	16.7	2.5	8.3
	All Asian Companies	21.1	18.7	17.9	-4.5	9.0
	All Companies	171.4	183.0	199.6	9.1	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table A-5
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Worldwide, Host/Proprietary

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	MacNeal-Schwendler	0.6	1.5	1.2	-16.4	47.0
2	Fujitsu*	0.6	0.7	0.8	15.9	32.5
3	Meta-Software	0.5	0.3	0.3	21.1	13.3
4	C. Itoh Techno-Science*	0.5	0.4	0.3	-5.9	13.0
5	Harris EDA	0.5	0.3	0.2	-24.5	9.3
6	Hitachi	0.3	0.2	0.2	-7.0	6.8
7	SIMUCAD	0.1	0.1	0.1	-33.0	2.1
8	debis Systemhaus	0	0	0	-28.8	0.3
9	Analogy	0.3	0.3	-	-100.0	-
	All North American Companies	1.9	2.3	1.8	-23.0	69.6
	All European Companies	0.9	0	0	-28.8	0.3
	All Asian Companies	0.8	0.7	0.8	7.1	30.1
	All Companies	3.5	3.1	2.6	-15.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (February 1996)

Table A-6
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, North America, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	93.9	95.7	144.9	51.5	19.4
2	Mentor Graphics	93.2	93.5	97.0	3.8	13.0
3	Synopsys	64.4	75.6	92.9	22.8	12.5
4	Viewlogic Systems	50.9	59.9	53.3	-11.0	7.1
5	Quickturn Design Systems	37.6	36.6	45.9	25.4	6.2
6	Zycad	23.6	25.9	23.9	-7.6	3.2
7	Avant!	5.8	11.2	21.6	93.1	2.9
8	Compass Design Automation	17.0	16.7	19.4	16.6	2.6
9	IKOS Systems	14.7	13.4	16.2	20.9	2.2
10	Hewlett-Packard	12.9	13.8	15.5	12.5	2.1
11	Intergraph	14.7	11.3	14.5	28.2	1.9
12	EPIC Design Technology	3.4	5.0	13.9	175.2	1.9
13	Xilinx Inc.	11.9	11.7	13.1	12.7	1.8
14	Meta-Software	5.5	8.1	10.8	34.2	1.5
15	LSI Logic	8.0	9.1	10.4	13.7	1.4
16	Harris EDA	9.5	9.4	10.1	7.0	1.4
17	Analogy	5.0	5.7	9.6	68.4	1.3
18	Minc Software	2.7	5.3	8.7	65.7	1.2
19	Summitt Design	4.6	7.3	8.3	13.2	1.1
20	Cooper & Chyan Technology	4.4	6.6	8.0	21.8	1.1
21	Microsim	5.2	7.1	8.0	12.0	1.1
22	High Level Design Systems	2.3	2.8	7.9	184.8	1.1
23	OrCAD EDA	6.3	5.6	7.3	29.3	1.0
24	Altera	7.0	8.3	6.8	-18.3	0.9
25	SES Inc.	4.8	5.8	6.5	13.2	0.9
26	PADS Software	4.7	5.6	6.5	16.7	0.9
27	Autodesk	11.5	7.7	6.4	-16.7	0.9
28	Ansoft	-	3.9	5.5	39.3	0.7
29	Accel Technologies	2.2	2.7	4.3	63.1	0.6
30	Cascade Design Automation	4.2	4.8	4.1	-16.0	0.5
	All North American Companies	559.5	610.6	738.1	20.9	99.0
	All European Companies	4.8	2.1	2.8	32.1	0.4
	All Asian Companies	5.4	5.3	4.6	-13.5	0.6
	All Companies	569.7	618.0	745.4	20.6	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (February 1996)

Table A-7
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, North America, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	93.9	95.7	144.9	51.5	22.5
2	Synopsys	64.2	75.6	92.9	22.8	14.4
3	Mentor Graphics	91.9	91.9	84.1	-8.5	13.0
4	Quickturn Design Systems	37.6	36.6	45.9	25.4	7.1
5	Viewlogic Systems	31.7	38.9	37.3	-4.2	5.8
6	Zycad	23.6	25.9	23.9	-7.6	3.7
7	Avant!	5.7	11.0	21.6	96.9	3.4
8	Compass Design Automation	17.0	16.7	19.4	16.6	3.0
9	IKOS Systems	14.7	13.4	16.2	20.9	2.5
10	Hewlett-Packard	12.1	12.4	13.9	12.8	2.2
11	EPIC Design Technology	3.4	5.0	13.9	175.2	2.2
12	LSI Logic	8.0	9.1	10.4	13.7	1.6
13	Meta-Software	5.1	7.6	10.2	34.2	1.6
14	Xilinx Inc.	4.8	7.7	10.2	32.1	1.6
15	Analogy	4.9	5.6	9.6	72.0	1.5
16	Harris EDA	7.9	7.9	8.7	10.7	1.4
17	High Level Design Systems	2.3	2.8	7.9	184.8	1.2
18	Summitt Design	4.4	7.0	7.9	13.2	1.2
19	Minc Software	2.2	4.4	7.3	65.7	1.1
20	SES Inc.	4.8	5.8	6.5	13.2	1.0
21	Cooper & Chyan Technology	4.2	5.1	6.2	21.8	1.0
22	Cascade Design Automation	4.2	4.8	4.1	-16.0	0.6
23	Ansoft	-	2.7	3.8	39.3	0.6
24	UniCAD	-	3.2	3.5	10.7	0.5
25	AT&T	2.4	2.7	3.3	24.4	0.5
26	Motorola	2.5	2.9	3.3	13.2	0.5
27	Silicon Valley Research	3.3	2.5	3.1	20.5	0.5
28	Zuken-Redac	4.5	4.7	3.0	-34.8	0.5
29	APTIX	0.5	0.9	2.7	214.2	0.4
30	Pacific Numerics	4.0	4.2	2.5	-41.2	0.4
	All North American Companies	483.9	528.7	638.2	20.7	99.0
	All European Companies	3.5	1.5	2.2	42.0	0.3
	All Asian Companies	4.7	4.9	4.3	-11.9	0.7
	All Companies	492.1	535.1	644.6	20.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (February 1996)

Table A-8
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, North America, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	1.5	11.3	660.3	76.1
2	Intusoft	-	0.7	1.0	43.4	6.6
3	Viewlogic Systems	-	-	0.8	NA	5.6
4	Altera	-	-	0.7	NA	4.6
5	Ansoft	-	0.4	0.5	39.3	3.7
6	SIMUCAD	0	0.1	0.3	509.0	2.3
7	Fintronic	-	-	0.3	NA	1.7
8	PADS Software	-	0.2	0.1	-41.7	0.9
9	Frontline Design Automation	-	-	0	NA	0.3
10	InterHDL	-	0	0	15.4	0.2
11	Mentor Graphics	-	0.6	-	-100.0	-
	All North American Companies	0	3.5	14.9	327.7	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0	3.5	14.9	327.7	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

NA = Not applicable

Source: Dataquest (February 1996)

Table A-9
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, North America, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Viewlogic Systems	19.1	21.0	15.2	-27.6	17.7
2	Mentor Graphics	1.3	1.0	12.9	1216.1	15.1
3	OrCAD EDA	6.1	5.6	7.3	29.3	8.5
4	Microsim	4.6	6.1	6.9	12.0	8.0
5	PADS Software	4.2	4.8	6.3	30.1	7.3
6	Altera	7.0	8.3	6.1	-26.4	7.2
7	Autodesk	10.8	7.2	6.0	-16.7	7.0
8	Accel Technologies	2.2	2.7	4.1	55.0	4.8
9	Xilinx Inc.	7.0	4.0	3.0	-24.9	3.5
10	Protel Technology	-	2.2	2.9	33.3	3.4
11	Data I/O	3.6	3.6	2.0	-46.0	2.3
12	Cooper & Chyan Technology	0.1	1.5	1.9	21.8	2.2
13	Hewlett-Packard	0.8	1.4	1.6	10.0	1.8
14	Intergraph	0.5	0.5	1.5	202.3	1.7
15	Minc Software	0.4	0.8	1.4	65.7	1.6
16	ALDEC	1.3	1.5	1.3	-10.0	1.6
17	Harris EDA	1.4	1.4	1.3	-9.9	1.5
18	Tanner Research	0.7	0.8	1.2	45.4	1.4
19	Ansoft	-	0.8	1.1	39.3	1.3
20	ACTEL	2.0	1.2	1.1	-12.9	1.3
21	Chronology	0.6	1.0	0.9	-5.1	1.1
22	APTIX	0.5	0.8	0.9	9.0	1.1
23	Fintronic	1.4	1.4	0.9	-40.1	1.0
24	SIMUCAD	0.9	0.8	0.7	-6.9	0.8
25	Frontline Design Automation	-	0.5	0.7	52.4	0.8
26	Intusoft	0.8	0.4	0.5	43.4	0.6
27	Norlinvest Ltd.	0.4	0.5	0.5	1.9	0.5
28	Meta-Software	0.2	0.3	0.4	34.3	0.5
29	Summitt Design	0.2	0.3	0.4	13.2	0.4
30	IBM	1.4	1.1	0.3	-72.5	0.3
	All North American Companies	75.0	77.9	84.6	8.6	98.9
	All European Companies	0.9	0.6	0.6	7.1	0.7
	All Asian Companies	0.7	0.4	0.3	-32.8	0.3
	All Companies	76.6	78.9	85.6	8.4	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (February 1996)

Table A-10
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, North America, Host/Proprietary

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Meta-Software	0.3	0.2	0.2	34.1	65.0
2	Harris EDA	0.2	0.2	0.1	-29.0	34.4
3	SIMUCAD	0	0.1	0	-35.5	11.1
4	Analogy	0.1	0.1	-	-100.0	-
	All North American Companies	0.6	0.5	0.3	-28.0	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	1.0	0.5	0.3	-28.0	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

NA = Not applicable

Source: Dataquest (February 1996)

Table A-11
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Europe, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	39.7	40.8	60.3	47.7	20.5
2	Mentor Graphics	34.8	42.2	48.0	13.8	16.4
3	Synopsys	26.6	30.0	38.1	27.2	13.0
4	Viewlogic Systems	15.6	16.8	15.1	-10.0	5.1
5	Compass Design Automation	11.8	11.4	13.3	16.5	4.5
6	Hewlett-Packard	8.9	9.6	10.8	12.5	3.7
7	Autodesk	7.9	7.8	7.8	-0.1	2.6
8	Zuken-Redac	13.4	9.3	7.1	-23.3	2.4
9	Quickturn Design Systems	4.5	11.8	7.1	-40.2	2.4
10	Intergraph	6.7	5.5	6.6	19.5	2.2
11	Harris EDA	6.4	6.5	6.3	-3.6	2.1
12	IKOS Systems	1.8	2.4	5.1	112.5	1.8
13	Sagantec	6.1	5.6	4.8	-13.3	1.6
14	Analogy	4.3	4.6	4.8	4.8	1.6
15	Cooper & Chyan Technology	0.2	0.9	3.7	293.0	1.2
16	MacNeal-Schwendler	0.8	2.8	3.5	24.2	1.2
17	Altera	3.5	3.4	3.4	1.2	1.2
18	Zycad	4.3	3.6	3.3	-7.6	1.1
19	Norlinvest Ltd.	3.9	3.1	3.2	1.9	1.1
20	Microsim	0.3	2.7	3.1	12.0	1.0
21	EPIC Design Technology	0	1.6	2.7	75.7	0.9
22	Xilinx Inc.	1.2	2.7	2.7	-0.7	0.9
23	CAD-UL	2.6	2.5	2.7	6.8	0.9
24	ALS Design	2.2	2.3	2.5	6.6	0.9
25	VEDA	2.0	1.9	2.0	4.8	0.7
26	ISDATA	2.0	1.9	1.9	-2.9	0.6
27	PADS Software	1.2	1.6	1.8	16.7	0.6
28	ULTImate Technology	1.4	1.6	1.8	11.6	0.6
29	i-Logix	1.2	1.6	1.8	11.7	0.6
30	Meta-Software	0.7	1.0	1.7	73.2	0.6
	All North American Companies	194.2	227.0	260.6	14.8	88.8
	All European Companies	33.0	27.3	25.7	-6.0	8.8
	All Asian Companies	13.4	9.3	7.1	-23.3	2.4
	All Companies	240.6	263.6	293.4	11.3	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (February 1996)

Table A-12
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Europe, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	39.7	40.8	60.3	47.7	25.9
2	Mentor Graphics	34.3	41.4	41.9	1.2	18.0
3	Synopsys	26.6	30.0	38.1	27.2	16.4
4	Compass Design Automation	11.8	11.4	13.3	16.5	5.7
5	Hewlett-Packard	8.4	8.6	9.8	12.8	4.2
6	Viewlogic Systems	9.3	8.6	7.5	-12.7	3.2
7	Quickturn Design Systems	4.5	11.8	7.1	-40.2	3.0
8	Zuken-Redac	11.3	8.1	5.9	-26.2	2.6
9	IKOS Systems	1.8	2.4	5.1	112.5	2.2
10	Harris EDA	5.5	5.2	5.0	-4.4	2.1
11	Sagantec	6.1	5.6	4.8	-13.3	2.1
12	Analogy	4.2	4.5	4.8	6.9	2.1
13	Zycad	4.3	3.6	3.3	-7.6	1.4
14	Cooper & Chyan Technology	0.2	0.7	2.8	293.0	1.2
15	EPIC Design Technology	0	1.6	2.7	75.7	1.2
16	MacNeal-Schwendler	0.2	1.3	2.3	68.2	1.0
17	Xilinx Inc.	1.1	1.8	2.1	19.7	0.9
18	VEDA	1.9	1.9	2.0	4.8	0.8
19	i-Logix	1.2	1.6	1.8	11.7	0.8
20	Meta-Software	0.6	0.9	1.6	73.2	0.7
21	Avant!	-	0.7	1.6	118.8	0.7
22	VLSI Libraries	0.3	1.3	1.4	6.5	0.6
23	Abstract Hardware	1.5	0.9	0.9	-3.9	0.4
24	Speed	0.7	0.8	0.9	16.7	0.4
25	Cascade Design Automation	0.8	0.8	0.8	-0.9	0.3
26	PROCAD GmbH	-	0.7	0.8	4.2	0.3
27	Intergraph	6.5	4.7	0.7	-84.2	0.3
28	Pacific Numerics	0.5	0.5	0.6	17.0	0.3
29	Quantic Laboratories	0.7	0.8	0.5	-29.5	0.2
30	ISDATA	0.6	0.5	0.5	-3.4	0.2
	All North American Companies	168.4	191.5	215.6	12.6	92.7
	All European Companies	14.1	13.0	11.0	-15.4	4.7
	All Asian Companies	11.3	8.1	5.9	-26.2	2.6
	All Companies	193.8	212.6	232.6	9.4	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (February 1996)

Table A-13
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Europe, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	0.6	5.1	710.9	84.2
2	Altera	-	-	0.3	NA	5.7
3	Intusoft	-	0.1	0.3	98.5	4.7
4	Viewlogic Systems	-	-	0.2	NA	4.0
5	Ansoft	-	0	0	39.3	0.6
6	PADS Software	-	0.1	0	-41.7	0.6
7	CAD Distribution	-	0	0	197.7	0.6
8	Frontline Design Automation	-	-	0	NA	0.1
9	InterHDL	-	0	0	15.4	0
10	Mentor Graphics	-	0.3	-	-100.0	-
	All North American Companies	-	1.2	6.0	403.0	99.4
	All European Companies	-	0	0	197.7	0.6
	All Asian Companies	-	-	-	NA	-
	All Companies	-	1.2	6.0	400.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-14
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Europe, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Viewlogic Systems	6.3	8.1	7.3	-10.2	13.7
2	Autodesk	7.4	7.3	7.3	-0.1	13.6
3	Mentor Graphics	0.6	0.5	6.2	1118.3	11.5
4	Norlinvest Ltd.	3.9	3.1	3.2	1.9	5.9
5	Altera	3.5	3.4	3.1	-8.9	5.7
6	Microsim	-	2.3	2.6	12.0	4.9
7	ALS Design	2.1	2.3	2.5	6.8	4.6
8	CAD-UL	2.1	2.1	2.3	7.5	4.3
9	ULTImate Technology	1.4	1.6	1.8	11.6	3.4
10	PADS Software	1.1	1.4	1.8	30.1	3.3
11	Data I/O	0.5	0.5	1.4	173.9	2.7
12	ISDATA	1.3	1.4	1.4	-2.7	2.6
13	Protel Technology	-	1.0	1.3	33.3	2.5
14	Harris EDA	0.8	1.3	1.3	-0.5	2.4
15	OrCAD EDA	1.9	2.2	1.3	-41.9	2.3
16	Zuken-Redac	2.1	1.2	1.2	-3.2	2.2
17	Hewlett-Packard	0.6	1.0	1.1	10.0	2.0
18	Serbi	0.8	0.8	0.9	13.9	1.7
19	ABB Industria*	0.8	0.8	0.9	3.5	1.6
20	Cooper & Chyan Technology	0	0.2	0.8	293.0	1.6
21	Kloeckner-Moeller	1.0	1.0	0.8	-16.9	1.6
22	Intergraph	0.2	0.2	0.8	282.7	1.4
23	Accel Technologies	0.5	0.6	0.7	16.8	1.3
24	ACTEL	-	0.5	0.7	37.1	1.3
25	Ziegler Informatics	4.7	0.7	0.7	0.6	1.2
26	CAD Distribution	0.7	0.6	0.6	12.0	1.2
27	Number One Systems	-	0.5	0.6	11.9	1.2
28	Xilinx Inc.	0.1	1.0	0.6	-38.4	1.1
29	IBM	2.0	1.7	0.5	-72.5	0.9
30	Altium*	2.0	1.7	0.5	-72.5	0.9
	All North American Companies	24.9	32.7	37.7	15.2	70.4
	All European Companies	18.6	14.3	14.6	2.4	27.4
	All Asian Companies	2.1	1.2	1.2	-3.2	2.2
	All Companies	45.7	48.2	53.5	10.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (February 1996)

Table A-15
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Europe, Host/Proprietary

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	MacNeal-Schwendler	0.6	1.5	1.2	-16.4	93.4
2	Harris EDA	0.1	0.1	0	-3.8	3.7
3	Meta-Software	0	0	0	73.0	2.7
4	debis Systemhaus	0	0	0	-28.8	0.5
5	Analogy	0.1	0.1	-	-100.0	-
	All North American Companies	0.9	1.6	1.3	-19.7	99.5
	All European Companies	0.2	0	0	-28.8	0.5
	All Asian Companies	-	-	-	NA	-
	All Companies	1.1	1.6	1.3	-19.7	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-16
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Japan, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Zuken-Redac	47.6	49.0	57.0	16.4	13.2
2	Cadence	41.8	46.9	49.4	5.3	11.4
3	Synopsys	20.2	32.8	48.0	46.2	11.1
4	Marubeni Hytech*	24.7	25.7	29.7	15.4	6.9
5	Mentor Graphics	25.8	28.3	27.7	-2.2	6.4
6	Fujitsu*	21.0	23.7	27.4	15.9	6.4
7	Yokogawa Digital Computer	17.5	20.6	23.0	11.9	5.3
8	Seiko*	19.4	19.3	21.2	9.7	4.9
9	CADIX	15.5	18.3	18.3	0	4.2
10	Okura*	10.8	14.3	17.0	18.6	3.9
11	NEC	22.7	22.4	15.6	-30.3	3.6
12	C. Itoh Techno-Science*	9.2	10.1	11.6	14.6	2.7
13	Wacom	13.2	12.1	11.5	-5.0	2.7
14	Compass Design Automation	9.2	9.6	11.2	17.1	2.6
15	Hewlett-Packard	9.9	9.6	10.8	12.5	2.5
16	Summitt Design	4.6	7.3	8.3	13.2	1.9
17	Altera	2.0	3.0	8.2	169.7	1.9
18	Quickturn Design Systems	5.4	8.9	7.1	-20.3	1.6
19	Toshiba*	5.8	6.1	6.7	11.0	1.6
20	Zycad	1.6	7.2	6.6	-7.6	1.5
21	Viewlogic Systems	11.2	8.8	6.2	-30.2	1.4
22	Harris EDA	4.1	4.7	5.3	13.1	1.2
23	CrossCheck Technology	4.1	4.3	4.9	12.9	1.1
24	Cascade Design Automation	2.7	3.6	4.9	36.2	1.1
25	Avant!	1.2	2.8	4.8	75.5	1.1
26	EPIC Design Technology	1.2	2.6	4.2	60.9	1.0
27	Autodesk	1.9	4.6	4.2	-8.2	1.0
28	Sophia Systems*	3.9	4.1	3.9	-5.2	0.9
29	IKOS Systems	1.4	2.0	3.9	88.4	0.9
30	Hitachi	3.1	3.1	3.4	7.0	0.8
	All North American Companies	173.5	224.0	258.6	15.5	59.9
	All European Companies	3.3	1.1	1.5	41.9	0.3
	All Asian Companies	156.8	163.8	171.5	4.7	39.7
	All Companies	333.6	388.8	431.6	11.0	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table A-17
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Japan, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Zuken-Redac	47.6	48.9	55.7	14.0	14.7
2	Cadence	41.8	46.9	49.4	5.3	13.0
3	Synopsys	20.2	32.8	48.0	46.2	12.7
4	Fujitsu*	19.0	22.0	25.4	15.9	6.7
5	Marubeni Hytech*	18.7	21.2	25.0	18.0	6.6
6	Mentor Graphics	25.4	27.8	24.0	-13.5	6.3
7	Yokogawa Digital Computer	17.5	20.6	23.0	11.9	6.1
8	Seiko*	19.4	18.1	19.0	4.9	5.0
9	CADIX	15.5	18.3	18.3	0	4.8
10	Okura*	10.8	14.3	17.0	18.6	4.5
11	NEC	18.7	18.1	12.4	-31.2	3.3
12	C. Itoh Techno-Science*	8.7	9.8	11.3	15.4	3.0
13	Compass Design Automation	9.2	9.6	11.2	17.1	3.0
14	Hewlett-Packard	9.3	8.6	9.8	12.8	2.6
15	Summitt Design	4.4	7.0	7.9	13.2	2.1
16	Quickturn Design Systems	5.4	8.9	7.1	-20.3	1.9
17	Toshiba*	5.8	6.1	6.7	11.0	1.8
18	Zycad	1.6	7.2	6.6	-7.6	1.7
19	Harris EDA	4.0	4.6	5.3	13.5	1.4
20	CrossCheck Technology	4.1	4.3	4.9	12.9	1.3
21	Cascade Design Automation	2.7	3.6	4.9	36.2	1.3
22	Avant!	1.2	2.7	4.8	77.5	1.3
23	Viewlogic Systems	6.8	5.7	4.3	-24.0	1.1
24	EPIC Design Technology	1.2	2.6	4.2	60.9	1.1
25	IKOS Systems	1.4	2.0	3.9	88.4	1.0
26	Meta-Software	2.7	4.5	3.0	-33.9	0.8
27	TSSI Japan*	1.6	2.2	2.5	18.6	0.7
28	Hitachi	2.1	2.2	2.5	11.0	0.7
29	Silicon Valley Research	1.8	2.0	2.4	20.5	0.6
30	Sharp*	2.3	2.3	2.4	2.6	0.6
	All North American Companies	151.9	194.7	223.1	14.6	58.9
	All European Companies	2.1	0.7	1.1	63.5	0.3
	All Asian Companies	137.8	146.3	154.6	5.7	40.8
	All Companies	291.8	341.6	378.8	10.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (February 1996)

Table A-18
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Japan, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	0.2	2.6	964.9	69.0
2	Seiko*	-	1.2	2.2	80.6	57.8
3	Altera	-	-	0.8	NA	21.6
4	Ansoft	-	0.1	0.1	39.3	3.1
5	Viewlogic Systems	-	-	0.1	NA	2.5
6	Intusoft	-	0	0.1	341.2	1.9
7	PADS Software	-	0.1	0.1	-41.7	1.6
8	SIMUCAD	0	0	0	14.8	0.5
9	Frontline Design Automation	-	-	0	NA	0.5
10	InterHDL	-	0	0	15.4	0
11	Mentor Graphics	-	0.2	-	-100.0	-
	All North American Companies	0	0.7	3.8	474.2	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0	0.7	3.8	474.2	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-19
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Japan, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Wacom	12.2	11.0	10.2	-7.1	21.3
2	Altera	2.0	3.0	7.4	142.8	15.4
3	Marubeni Hytech*	5.9	4.5	4.6	2.8	9.6
4	Autodesk	1.8	4.3	4.0	-8.2	8.3
5	Mentor Graphics	0.4	0.3	3.6	1,062.5	7.5
6	NEC	4.0	4.3	3.1	-26.6	6.5
7	PADS Software	3.3	2.2	2.9	30.1	6.0
8	Sophia Systems*	2.7	2.8	2.4	-14.7	4.9
9	Microsim	-	1.7	1.9	12.0	4.0
10	Viewlogic Systems	4.5	3.1	1.7	-44.3	3.6
11	Data I/O	0.9	0.9	1.7	82.6	3.6
12	IBM	6.0	6.2	1.7	-72.5	3.5
13	Altium*	6.0	6.2	1.7	-72.5	3.5
14	Zuken-Redac	-	0.1	1.3	1,163.9	2.6
15	TECHSPERT*	0.6	1.5	1.2	-18.9	2.5
16	Fujitsu*	1.4	1.0	1.1	15.9	2.4
17	Hewlett-Packard	0.6	1.0	1.1	10.0	2.3
18	OrCAD EDA	0.6	0.7	0.9	18.6	1.8
19	Andor*	0.8	1.0	0.8	-16.6	1.7
20	Protel Technology	-	0.5	0.7	33.3	1.5
21	Hitachi	0.7	0.7	0.7	-1.8	1.5
22	Xilinx Inc.	0.3	0.7	0.7	-3.6	1.4
23	Cooper & Chyan Technology	0	0.4	0.6	66.5	1.3
24	ACTEL	0.3	0.7	0.6	-11.8	1.2
25	APTIX	0.3	0.6	0.6	-0.6	1.2
26	ALDEC	0.5	0.5	0.5	-9.5	1.0
27	Sumisho Electronics*	0.4	0.5	0.4	-19.1	0.8
28	Summitt Design	0.2	0.3	0.4	13.2	0.7
29	Accel Technologies	0.4	0.4	0.4	-12.4	0.7
30	Intergraph	0.1	0.1	0.3	422.7	0.7
	All North American Companies	21.4	28.4	31.5	10.9	65.6
	All European Companies	0.9	0.4	0.4	3.8	0.8
	All Asian Companies	18.3	16.8	16.2	-4.1	33.6
	All Companies	40.5	45.6	48.1	5.3	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table A-20
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Japan, Host/Proprietary

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Fujitsu*	0.6	0.7	0.8	15.9	90.9
2	C. Itoh Techno-Science*	0.5	0.4	0.3	-5.9	36.5
3	Hitachi	0.3	0.2	0.2	-7.0	19.0
4	Harris EDA	0.1	0.1	0.1	-5.9	8.6
5	Meta-Software	0.1	0.1	0.1	-33.9	6.7
6	SIMUCAD	0	0	0	-6.1	1.6
7	Analogy	0	0	-	-100.0	-
	All North American Companies	0.2	0.2	0.1	-31.5	15.7
	All European Companies	-	-	-	NA	-
	All Asian Companies	0.8	0.7	0.8	7.1	84.3
	All Companies	1.2	0.9	0.9	-1.6	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-21
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Asia/Pacific, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	17.3	21.2	24.6	16.3	23.3
2	Synopsys	1.7	4.3	14.5	239.1	13.7
3	Quickturn Design Systems	2.0	1.8	10.6	497.9	10.0
4	Mentor Graphics	13.1	12.6	10.3	-18.8	9.7
5	Compass Design Automation	5.7	6.0	7.0	17.1	6.7
6	Zuken-Redac	4.8	3.7	4.5	22.1	4.3
7	Avant!	0.6	1.7	4.2	150.4	4.0
8	EPIC Design Technology	0.1	0.3	4.0	1,262.9	3.8
9	Zycad	3.3	3.2	2.9	-7.6	2.8
10	Autodesk	1.7	2.1	2.5	21.0	2.4
11	Viewlogic Systems	2.5	1.8	2.3	26.0	2.2
12	Meta-Software	0.8	0.6	1.7	203.1	1.7
13	CrossCheck Technology	0.7	1.2	1.4	12.9	1.3
14	Pacific Numerics	-	-	1.2	NA	1.2
15	Protel Technology	-	0.8	1.0	33.3	1.0
16	CADIX	-	-	1.0	NA	1.0
17	Altera	0.9	1.0	1.0	4.2	0.9
18	PADS Software	0.4	0.8	1.0	16.7	0.9
19	Silicon Valley Research	0.4	0.7	0.8	20.5	0.8
20	Ansoft	-	0.6	0.8	39.3	0.7
21	Sagantec	-	-	0.7	NA	0.7
22	Yokogawa Digital Computer	0.4	0.6	0.7	11.9	0.7
23	Norlinvest Ltd.	0.3	0.7	0.7	1.9	0.7
24	Hewlett-Packard	0.7	0.6	0.7	21.6	0.6
25	Intergraph	0.6	0.5	0.6	16.5	0.6
26	Sharp*	0.6	0.6	0.6	2.6	0.6
27	Accel Technologies	0.1	0.2	0.6	130.5	0.5
28	Seiko*	0.2	0.2	0.5	164.9	0.5
29	IKOS Systems	0.2	0.7	0.5	-30.9	0.5
30	ACTEL	0.4	0.4	0.5	10.7	0.4
	All North American Companies	56.8	68.1	97.1	42.5	91.9
	All European Companies	0.6	0.8	1.4	85.3	1.4
	All Asian Companies	5.7	4.9	7.2	45.6	6.8
	All Companies	63.1	73.8	105.7	43.2	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

NA = Not applicable

Source: Dataquest (February 1996)

Table A-22
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Asia/Pacific, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	17.3	21.2	24.6	16.3	26.1
2	Synopsys	1.7	4.3	14.5	239.1	15.4
3	Quickturn Design Systems	2.0	1.8	10.6	497.9	11.2
4	Mentor Graphics	12.9	12.4	8.8	-29.0	9.3
5	Compass Design Automation	5.7	6.0	7.0	17.1	7.5
6	Zuken-Redac	4.8	3.4	4.2	23.5	4.5
7	Avant!	0.6	1.7	4.2	151.9	4.5
8	EPIC Design Technology	0.1	0.3	4.0	1,262.9	4.2
9	Zycad	3.3	3.2	2.9	-7.6	3.1
10	Meta-Software	0.7	0.5	1.6	203.1	1.7
11	Viewlogic Systems	1.5	1.2	1.6	37.0	1.7
12	CrossCheck Technology	0.7	1.2	1.4	12.9	1.5
13	Pacific Numerics	-	-	1.2	NA	1.3
14	CADIX	-	-	1.0	NA	1.1
15	Silicon Valley Research	0.4	0.7	0.8	20.5	0.9
16	Sagantec	-	-	0.7	NA	0.8
17	Yokogawa Digital Computer	0.4	0.6	0.7	11.9	0.7
18	Hewlett-Packard	0.6	0.5	0.7	31.2	0.7
19	Sharp*	0.6	0.6	0.6	2.6	0.6
20	Ansoft	-	0.4	0.5	39.3	0.6
21	Seiko*	0.2	0.2	0.5	164.9	0.6
22	IKOS Systems	0.2	0.7	0.5	-30.9	0.5
23	VLSI Libraries	0.1	0.4	0.4	5.7	0.4
24	Quantic Laboratories	0.1	0.1	0.4	182.1	0.4
25	APTIX	0.1	0.1	0.2	116.3	0.3
26	UniCAD	-	-	0.2	NA	0.3
27	Cooper & Chyan Technology	0.1	0.1	0.2	57.2	0.2
28	Xilinx Inc.	0.1	0.1	0.2	51.5	0.2
29	Cascade Design Automation	0.9	1.1	0.2	-81.9	0.2
30	Systems Science	0	0	0.2	254.2	0.2
	All North American Companies	50.9	60.5	86.8	43.4	92.0
	All European Companies	0.2	0.1	0.7	1,045.4	0.8
	All Asian Companies	5.7	4.6	6.8	48.2	7.3
	All Companies	56.8	65.2	94.4	44.8	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-23
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Asia/Pacific, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	0.1	0.5	707.9	59.3
2	Altera	-	-	0.1	NA	12.5
3	Ansoft	-	0.1	0.1	39.3	9.8
4	Intusoft	-	0	0.1	65.4	8.9
5	SIMUCAD	0	0	0	509.9	6.1
6	Viewlogic Systems	-	-	0	NA	4.6
7	PADS Software	-	0	0	-41.7	2.4
8	InterHDL	-	0	0	15.4	0
9	Mentor Graphics	-	0.1	-	-100.0	-
	All North American Companies	0	0.3	0.8	171.9	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0	0.3	0.8	171.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-24
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Asia/Pacific, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Autodesk	1.6	2.0	2.4	21.0	22.5
2	Mentor Graphics	0.2	0.2	1.5	873.2	14.0
3	Protel Technology	-	0.8	1.0	33.3	9.7
4	PADS Software	0.4	0.7	0.9	30.1	8.7
5	Altera	0.9	1.0	0.9	-6.2	8.6
6	Norlinvest Ltd.	0.3	0.7	0.7	1.9	6.6
7	Viewlogic Systems	1.0	0.7	0.7	0.4	6.2
8	Accel Technologies	0.1	0.2	0.5	119.0	5.1
9	OrCAD EDA	0.3	0.4	0.4	11.6	3.8
10	ACTEL	0.2	0.2	0.3	33.6	3.1
11	Zuken-Redac	-	0.3	0.3	5.6	3.0
12	Data I/O	0.1	0.1	0.2	119.1	2.2
13	SIMUCAD	0.1	0.1	0.2	86.8	1.9
14	IBM	0.6	0.7	0.2	-72.5	1.8
15	Altium*	0.6	0.7	0.2	-72.5	1.8
16	Ansoft	-	0.1	0.2	39.3	1.5
17	APTIX	0.1	0.1	0.1	-25.0	0.8
18	CAD-UL	0.1	0.1	0.1	-25.1	0.8
19	Intergraph	0	0	0.1	309.9	0.7
20	Meta-Software	-	0	0.1	203.4	0.7
21	Cooper & Chyan Technology	0	0	0.1	57.2	0.6
22	Xilinx Inc.	0.1	0.1	0.1	-26.1	0.6
23	ULTImate Technology	0.1	0	0.1	35.1	0.5
24	Intusoft	-	0	0	65.4	0.3
25	Tanner Research	-	0	0	156.7	0.3
26	Hewlett-Packard	0	0.1	0	-63.4	0.2
27	Ziegler Informatics	0	0	0	-4.2	0.2
28	Minc Software	-	0	0	65.7	0.2
29	Number One Systems	-	0	0	11.9	0.1
30	Contec Microelectronics	0	0	0	100.3	0
	All North American Companies	5.8	7.3	9.5	30.0	90.2
	All European Companies	0.4	0.7	0.7	-0.4	6.8
	All Asian Companies	-	0.3	0.3	5.6	3.0
	All Companies	6.2	8.3	10.5	26.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (February 1996)

Table A-25
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Asia/Pacific, Host/Proprietary

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Meta-Software	0.1	0	0	202.8	109.6
2	SIMUCAD	0	0	0	-69.2	7.9
3	Harris EDA	0	0	-	-100.0	-
4	Analogy	0	0	-	-100.0	-
	All North American Companies	0.2	0.1	0	-39.6	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.2	0.1	0	-39.6	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

NA = Not applicable

Source: Dataquest (February 1996)

Table A-26
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Rest of World, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	1.2	1.3	1.7	34.4	35.2
2	LSI Logic	0.5	0.6	0.7	12.9	13.4
3	Altera	0.6	0.3	0.6	87.5	12.1
4	Data I/O	0.1	0.1	0.4	590.2	8.2
5	Xilinx Inc.	0.1	0.1	0.3	146.7	5.5
6	Accel Technologies	0.1	0.2	0.3	53.7	5.1
7	PADS Software	0.1	0.2	0.2	16.7	4.9
8	Norlinvest Ltd.	0.2	0.2	0.2	1.9	4.7
9	OrCAD EDA	0.1	0.1	0.2	123.2	4.0
10	Intergraph	0.2	0.2	0.1	-0.8	3.0
11	Autodesk	1.0	0.8	0.1	-86.1	2.1
12	i-Logix	0.1	0.1	0.1	12.4	1.8
13	CAD-UL	0	0	0	26.0	0.7
14	ALDEC	0	0	0	5.4	0.6
15	Number One Systems	-	0	0	11.9	0.5
16	ULTImate Technology	0	0	0	29.6	0.5
17	Intusoft	-	0	0	58.8	0.4
18	Star Informatic	-	-	0	NA	0.2
19	Ziegler Informatics	0	0	0	25.6	0.2
20	Softdesk	0	0	0	0.4	0.1
21	Analogy	0.4	0.5	-	-100.0	-
22	EPIC Design Technology	-	0.2	-	-100.0	-
23	Royal Digital Centers	0.1	0.1	-	-100.0	-
24	ACTEL	0.3	0	-	-100.0	-
25	Siemens Nixdorf Informationssysteme	0.1	0	-	-100.0	-
26	Graphsoft	-	0	-	-100.0	-
	All North American Companies	4.9	4.6	4.7	1.2	94.2
	All European Companies	0.5	0.3	0.3	-2.8	5.8
	All Asian Companies	-	-	-	NA	-
	All Companies	5.4	4.9	4.9	0.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-27
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Rest of World, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	1.2	1.3	1.7	34.4	63.6
2	LSI Logic	0.5	0.6	0.7	12.9	24.2
3	Xilinx Inc.	0	0.1	0.2	203.0	7.8
4	i-Logix	0.1	0.1	0.1	12.4	3.2
5	Intergraph	0.2	0.1	0	-85.2	0.6
6	Accel Technologies	-	-	0	NA	0.5
7	Star Informatic	-	-	0	NA	0.4
8	Autodesk	0.1	0	0	-86.1	0.2
9	PADS Software	0	0	0	-76.4	0.2
10	CAD-UL	0	0	0	6.1	0.2
11	Analogy	0.4	0.5	-	-100.0	-
12	EPIC Design Technology	-	0.2	-	-100.0	-
13	Royal Digital Centers	0.1	0.1	-	-100.0	-
14	Siemens Nixdorf Informationssysteme	0	0	-	-100.0	-
15	ACTEL	0.1	0	-	-100.0	-
16	Data I/O	0	0	-	-100.0	-
	All North American Companies	2.6	2.9	2.7	-7.7	99.5
	All European Companies	0.2	0	0	-60.9	0.5
	All Asian Companies	-	-	-	NA	-
	All Companies	2.9	3.0	2.7	-8.4	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-28
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Rest of World, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	0	0.1	381.2	58.9
2	Altera	-	-	0.1	NA	31.2
3	Intusoft	-	0	0	58.8	7.4
4	PADS Software	-	0	0	-41.7	2.5
	All North American Companies	-	0	0.2	371.8	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	0	0.2	371.8	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-29
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic Design Automation Software Companies, Rest of World, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Altera	0.6	0.3	0.5	68.8	26.8
2	Data I/O	0.1	0.1	0.4	666.8	20.0
3	Accel Technologies	0.1	0.2	0.2	46.0	11.9
4	Norlinvest Ltd.	0.2	0.2	0.2	1.9	11.6
5	PADS Software	0.1	0.2	0.2	30.1	11.5
6	OrCAD EDA	0.1	0.1	0.2	123.2	9.9
7	Autodesk	0.9	0.7	0.1	-86.1	4.9
8	Xilinx Inc.	0.1	0	0.1	47.7	2.9
9	CAD-UL	0	0	0	29.6	1.5
10	ALDEC	0	0	0	5.4	1.4
11	Number One Systems	-	0	0	11.9	1.3
12	ULTImate Technology	0	0	0	29.6	1.2
13	Intergraph	0	0	0	92.8	0.9
14	Ziegler Informatics	0	0	0	25.6	0.4
15	Intusoft	-	0	0	58.8	0.4
16	Softdesk	0	0	0	0.4	0.2
17	ACTEL	0.2	0	-	-100.0	-
18	Siemens Nixdorf Informationssysteme	0	0	-	-100.0	-
19	Graphsoft	-	0	-	-100.0	-
	All North American Companies	2.2	1.6	1.7	8.4	86.5
	All European Companies	0.3	0.3	0.3	5.7	13.5
	All Asian Companies	-	-	-	NA	-
	All Companies	2.5	1.9	2.0	8.0	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table B-1
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
All Electronic Design Automation Software Companies, Worldwide, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	3Soft	1.0	1.6	1.7	6.8	0.1
2	ABB Industria*	0.8	0.8	0.9	3.5	0.1
3	Abstract Hardware	1.5	1.1	1.1	-0.7	0.1
4	Accel Technologies	3.2	4.1	6.3	53.7	0.4
5	ACTEL	4.7	4.7	3.9	-17.0	0.2
6	ALDEC	2.3	2.7	1.9	-30.4	0.1
7	ALS Design	2.2	2.3	2.5	7.4	0.2
8	Altera	14.0	16.0	20.0	25.0	1.3
9	Altium*	9.9	9.7	2.7	-72.5	0.2
10	Analogy	11.3	12.6	16.0	26.6	1.0
11	Andor*	0.8	1.0	0.8	-16.6	0.1
12	Ansoft	-	5.6	7.8	39.3	0.5
13	APTIX	1.8	3.2	6.6	105.9	0.4
14	AT&T	2.4	3.0	3.7	24.4	0.2
15	Autodesk	23.9	22.8	20.9	-8.2	1.3
16	Avant!	7.6	16.4	32.3	97.2	2.0
17	C. Itoh Techno-Science*	9.2	10.1	11.6	14.6	0.7
18	CAD Distribution	0.8	0.6	0.7	15.6	0
19	CAD-UL	2.8	2.7	2.9	5.8	0.2
20	Cadence	193.8	205.8	280.9	36.5	17.8
21	Cadis Software	-	0.4	1.2	200.0	0.1
22	CADIX	15.5	18.3	20.3	11.1	1.3
23	CAE Plus	-	1.0	1.3	30.0	0.1
24	Cascade Design Automation	8.6	10.3	9.9	-3.8	0.6
25	Century Research Center	0.9	0.9	1.0	14.6	0.1
26	Chronology	1.4	1.9	1.9	-1.6	0.1
27	Compass Design Automation	43.7	43.7	51.0	16.7	3.2
28	Computervision	2.1	1.0	-	-100.0	-
29	Contec Microelectronics	2.7	3.0	3.4	13.8	0.2
30	Cooper & Chyan Technology	5.8	9.3	14.6	57.2	0.9
31	CrossCheck Technology	6.5	6.2	7.0	12.9	0.4
32	Data I/O	5.8	5.8	5.8	-1.4	0.4
33	debis Systemhaus	0.3	0.2	0.2	1.4	0
34	Design Acceleration	0.8	2.0	3.1	53.8	0.2
35	Eagle Design Automation	-	0.5	0.5	-	0
36	EPIC Design Technology	4.8	9.7	24.8	155.5	1.6

(Continued)

Table B-1 (Continued)
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
All Electronic Design Automation Software Companies, Worldwide,
All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
37	Fintronic	1.4	1.4	1.7	19.7	0.1
38	Frontline Design Automation	-	1.5	3.5	133.3	0.2
39	Fujitsu*	21.0	23.7	27.4	15.9	1.7
40	Graphsoft	-	0	-	-100.0	-
41	Harris EDA	20.6	21.3	21.7	1.9	1.4
42	Hewlett-Packard	32.4	33.6	37.9	12.6	2.4
43	High Level Design Systems	2.7	3.3	9.3	178.1	0.6
44	Hitachi	3.1	3.1	3.4	7.0	0.2
45	i-Logix	3.8	3.9	4.4	12.8	0.3
46	IBM	11.7	11.8	3.5	-70.1	0.2
47	ICL	0.2	0.2	0.2	11.8	0
48	IKOS Systems	18.1	18.6	25.7	38.1	1.6
49	Intergraph	25.0	19.9	25.1	25.9	1.6
50	InterHDL	0.5	1.3	1.5	15.4	0.1
51	Intusoft	0.8	1.4	2.2	58.8	0.1
52	ISD Software	0.3	0.4	0.3	-19.6	0
53	ISDATA	2.0	2.1	2.1	-1.7	0.1
54	ISKA	0.4	0.4	0.4	3.2	0
55	Kloeckner-Moeller	1.0	1.0	0.8	-16.9	0.1
56	LSI Logic	13.8	15.6	12.9	-17.2	0.8
57	LV Software	-	-	1.9	NA	0.1
58	MacNeal-Schwendler	0.8	2.8	3.5	24.2	0.2
59	Marubeni Hytech*	24.7	25.7	29.7	15.4	1.9
60	Mentor Graphics	167.0	176.6	183.0	3.6	11.6
61	Meta-Software	9.7	14.4	17.5	21.2	1.1
62	Microsim	5.8	11.9	13.3	12.0	0.8
63	Minc Software	3.1	6.0	10.0	65.7	0.6
64	Motorola	3.0	3.4	3.4	0.2	0.2
65	NEC	22.7	22.4	15.6	-30.3	1.0
66	Nextwave DA	0.4	0.5	1.5	200.0	0.1
67	Norlinvest Ltd.	5.0	4.6	4.7	1.9	0.3
68	Number One Systems	-	0.7	0.8	11.9	0
69	OEA International	0.6	0.8	0.9	22.2	0.1
70	Okura*	10.8	14.3	17.0	18.6	1.1
71	Omron	0.8	0.9	0.6	-31.4	0
72	Optem Engineering	0.4	0.5	0.6	12.4	0

(Continued)

Table B-1 (Continued)
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
All Electronic Design Automation Software Companies, Worldwide,
All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
73	OrCAD EDA	9.3	9.0	10.0	11.6	0.6
74	Pacific Numerics	4.8	5.1	6.2	22.5	0.4
75	PADS Software	10.2	10.8	12.6	16.7	0.8
76	PROCAD GmbH	5.2	0.7	0.8	4.2	0
77	Protel Technology	-	4.5	6.0	33.3	0.4
78	Quantic Laboratories	2.8	3.1	3.5	12.9	0.2
79	Quickturn Design Systems	49.5	59.0	70.6	19.6	4.5
80	Royal Digital Centers	1.5	0.9	1.0	14.1	0.1
81	Sagantec	6.1	6.2	7.1	14.7	0.4
82	Seiko*	19.6	19.5	21.7	11.3	1.4
83	Serbi	0.8	0.8	0.9	13.9	0.1
84	SES Inc.	7.0	8.5	7.7	-8.9	0.5
85	Sharp*	2.8	2.9	3.0	2.6	0.2
86	Siemens Nixdorf Informationssysteme	1.3	1.0	-	-100.0	-
87	Silicon Valley Research	5.9	5.3	6.4	20.5	0.4
88	SIMUCAD	2.5	2.6	3.2	19.3	0.2
89	Simulation Technology	0.5	0.6	0.7	13.2	0
90	Softdesk	0.3	0.3	0.2	-26.1	0
91	Softronics	0.2	0.2	0.2	2.7	0
92	Sophia Systems*	3.9	4.1	3.9	-5.2	0.2
93	Speed	1.0	1.1	1.3	13.6	0.1
94	SpeedSim	-	-	1.3	NA	0.1
95	Star Informatic	0.8	0.8	0.3	-54.8	0
96	Sumisho Electronics*	1.2	1.3	1.3	0.6	0.1
97	Summitt Design	9.2	14.6	16.5	13.2	1.0
98	Synopsys	112.9	142.7	193.5	35.6	12.2
99	Systems Science	1.8	2.3	2.7	18.1	0.2
100	T D Technology	1.8	2.0	2.3	13.2	0.1
101	Tanner Research	0.8	1.3	1.7	33.7	0.1
102	Technische Computer Systeme	1.1	1.1	0.9	-19.9	0.1
103	TECHSPERT*	0.6	1.5	1.2	-18.9	0.1
104	Toshiba*	5.8	6.1	6.7	11.0	0.4
105	TSSI Japan*	1.6	2.2	2.5	18.6	0.2
106	Uchida Yoko	2.3	1.4	1.6	12.5	0.1
107	ULTImate Technology	1.8	1.9	2.1	11.4	0.1
108	UniCAD	-	4.3	4.9	15.3	0.3

(Continued)

Table B-1 (Continued)
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
All Electronic Design Automation Software Companies, Worldwide,
All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
109	VEDA	4.7	3.1	3.3	4.8	0.2
110	Veritools	0.5	0.6	0.7	13.2	0
111	Viagrafix	0.7	0	0	-62.9	0
112	Viewlogic Systems	80.2	87.3	76.8	-12.0	4.9
113	VLSI Libraries	1.8	4.4	4.9	11.8	0.3
114	Wacom	13.2	12.1	11.5	-5.0	0.7
115	Xilinx Inc.	14.5	16.9	19.4	15.1	1.2
116	Yokogawa Digital Computer	18.0	21.4	23.9	11.9	1.5
117	Ziegler Informatics	4.8	0.7	0.7	0.6	0
118	Zuken-Redac	71.0	67.0	71.9	7.4	4.5
119	Zycad	32.8	39.8	36.8	-7.6	2.3
	All North American Companies	988.9	1,134.3	1,359.0	19.8	86.0
	All European Companies	42.2	31.6	31.7	0.5	2.0
	All Asian Companies	181.3	183.3	190.4	3.9	12.0
	All Companies	1,212.4	1,349.2	1,581.1	17.2	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table C-1
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top Electronic Design Automation Software Companies, Worldwide, All Operating Systems

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Sun Microsystems	49,059	-	848.5	291.2	1,139.7	24.9
2	Hewlett-Packard	22,483	37.9	483.9	89.8	611.6	13.3
3	Cadence	-	280.9	-	242.5	523.4	11.4
4	Mentor Graphics	517	183.0	12.8	188.6	384.5	8.4
5	Synopsys	-	193.5	-	91.1	284.6	6.2
6	Zuken-Redac	1,425	71.9	23.7	48.0	148.4	3.2
7	IBM	12,355	3.5	122.3	8.8	134.9	2.9
8	Viewlogic Systems	-	76.8	-	44.2	121.0	2.6
9	Fujitsu*	2,008	27.4	47.6	25.5	100.6	2.2
10	Quickturn Design Systems	-	70.6	-	11.2	81.8	1.8
11	Digital Equipment	3,687	-	54.1	12.8	66.9	1.5
12	NEC	3,010	15.6	25.4	9.5	64.8	1.4
13	Compass Design Automation	-	51.0	-	10.3	61.3	1.3
14	Seiko*	332	21.7	10.4	20.7	53.9	1.2
15	Zycad	147	36.8	-	14.3	51.1	1.1
16	Intergraph	1,501	25.1	9.9	9.2	47.0	1.0
17	Yokogawa Digital Computer	347	23.9	13.1	5.6	42.6	0.9
18	Avant!	-	32.3	-	5.7	38.0	0.8
19	Harris EDA	128	21.7	2.2	11.6	35.7	0.8
20	CADIX	81	20.3	4.7	5.5	35.0	0.8
21	Marubeni Hytech*	174	29.7	3.9	-	34.4	0.8
22	IKOS Systems	320	25.7	-	6.0	31.7	0.7
23	EPIC Design Technology	-	24.8	-	5.1	29.9	0.7
24	Silicon Graphics	929	-	25.7	3.6	29.2	0.6
25	Meta-Software	-	17.5	-	7.8	25.3	0.6
26	Altera	-	20.0	-	5.0	25.0	0.5
27	Xilinx Inc.	-	19.4	-	3.5	22.9	0.5
28	Autodesk	-	20.9	-	0.1	21.1	0.5
29	Analogy	-	16.0	-	4.0	20.0	0.4
30	Sony	1,020	-	9.2	-	19.7	0.4
	Other Companies	51,725	-	123.8	0.8	136.5	3.0
	All North American Companies	83,795	1,359.0	1,439.7	1,113.7	3,915.5	85.4
	All European Companies	326	31.7	2.1	4.7	38.7	0.8
	All Asian Companies	9,255	190.4	152.3	114.4	493.6	10.8
	All Companies	145,101	1,581.1	1,717.9	1,233.6	4,584.3	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

NA = Not applicable

Source: Dataquest (February 1996)

Table C-2
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top Electronic Design Automation Software Companies, Worldwide, UNIX

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Sun Microsystems	49,059	-	848.5	291.2	1,139.7	28.2
2	Hewlett-Packard	16,886	34.1	466.3	86.7	587.2	14.5
3	Cadence	-	280.9	-	242.5	523.4	12.9
4	Mentor Graphics	517	158.8	12.8	187.2	358.9	8.9
5	Synopsys	-	193.5	-	91.1	284.6	7.0
6	Zuken-Redac	1,425	68.9	23.7	44.9	142.3	3.5
7	IBM	3,629	0.9	92.3	8.6	102.1	2.5
8	Fujitsu*	1,825	25.4	46.5	23.8	95.8	2.4
9	Quickturn Design Systems	-	70.6	-	11.2	81.8	2.0
10	Viewlogic Systems	-	50.7	-	30.3	81.0	2.0
11	Compass Design Automation	-	51.0	-	10.3	61.3	1.5
12	Zycad	147	36.8	-	14.3	51.1	1.3
13	Seiko*	332	19.5	9.5	18.8	48.8	1.2
14	NEC	1,243	12.4	16.6	7.6	48.7	1.2
15	Yokogawa Digital Computer	347	23.9	13.1	5.6	42.6	1.1
16	Avant!	-	32.3	-	5.7	38.0	0.9
17	CADIX	81	20.3	4.7	5.5	35.0	0.9
18	Harris EDA	83	18.9	1.7	11.2	31.9	0.8
19	IKOS Systems	320	25.7	-	6.0	31.7	0.8
20	EPIC Design Technology	-	24.8	-	5.1	29.9	0.7
21	Marubeni Hytech*	174	25.0	3.9	-	29.8	0.7
22	Silicon Graphics	929	-	25.7	3.6	29.2	0.7
23	Meta-Software	-	16.4	-	7.4	23.8	0.6
24	Digital Equipment	912	-	17.1	4.5	21.6	0.5
25	Analogy	-	16.0	-	4.0	20.0	0.5
26	Sony	1,020	-	9.2	-	19.7	0.5
27	Xilinx Inc.	-	15.1	-	3.0	18.1	0.4
28	Cascade Design Automation	-	9.9	-	7.8	17.9	0.4
29	Summitt Design	-	15.8	-	1.5	17.3	0.4
30	Okura*	-	17.0	-	-	17.0	0.4
	All North American Companies	66,076	1,166.5	1,349.4	1,055.1	3,571.5	88.4
	All European Companies	61	15.0	1.0	3.8	19.9	0.5
	All Asian Companies	6,757	171.7	139.4	105.6	450.7	11.2
	All Companies	72,895	1,353.2	1,489.8	1,164.5	4,042.2	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table C-3
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top Electronic Design Automation Software Companies, Worldwide, Windows NT/Hybrid

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Intergraph	1,074	19.6	7.6	6.1	35.7	75.9
2	Seiko*	-	2.2	0.8	1.9	5.1	10.8
3	Altera	-	2.0	-	0.5	2.5	5.3
4	Hewlett-Packard	133	-	1.5	0.3	1.7	3.7
5	Intusoft	-	1.4	-	-	1.4	3.0
6	Viewlogic Systems	-	1.2	-	-	1.2	2.6
7	Ansoft	-	0.8	-	-	0.8	1.7
8	SIMUCAD	-	0.4	-	0	0.4	0.9
9	Digital Equipment	27	-	0.3	0.1	0.4	0.9
10	PADS Software	-	0.3	-	0.1	0.4	0.8
11	Fintronic	-	0.3	-	-	0.3	0.5
12	Frontline Design Automation	-	0.1	-	-	0.1	0.1
13	CAD Distribution	-	0	-	0	0	0.1
14	InterHDL	-	0	-	-	0	0.1
	Other Companies	252	-	2.5	-	2.5	5.3
	All North American Companies	1,234	25.7	9.3	7.1	44.5	94.6
	All European Companies	-	0	-	0	0	0.1
	All Asian Companies	-	-	-			-
	All Companies	1,486	25.7	11.8	7.1	47.0	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (February 1996)

Table C-4
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top Electronic Design Automation Software Companies, Worldwide, Personal Computer

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Viewlogic Systems	-	24.9	-	13.8	38.7	8.8
2	IBM	8,726	2.7	30.0	0.1	32.8	7.5
3	Mentor Graphics	-	24.2	-	1.4	25.6	5.8
4	Hewlett-Packard	5,464	3.8	16.1	2.8	22.7	5.2
5	Altera	-	18.0	-	4.5	22.5	5.1
6	Autodesk	-	19.7	-	0.1	19.8	4.5
7	PADS Software	-	12.1	-	5.2	17.3	3.9
8	NEC	1,766	3.1	8.8	1.9	16.2	3.7
9	Wacom	422	10.2	2.3	1.9	14.5	3.3
10	OrCAD EDA	-	10.0	-	3.5	13.5	3.1
11	Microsim	-	11.4	-	0.6	12.0	2.7
12	Accel Technologies	-	6.0	-	2.6	8.6	2.0
13	Data I/O	-	5.8	-	2.3	8.1	1.8
14	Digital Equipment	2,375	-	6.5	0.2	6.7	1.5
15	Intergraph	386	2.7	1.6	1.7	6.2	1.4
16	Altium*	1,113	2.7	3.4	0.1	6.2	1.4
17	Zuken-Redac	-	3.0	-	3.1	6.1	1.4
18	Protel Technology	-	6.0	-	-	6.0	1.4
19	Norlinvest Ltd.	37	4.7	0.2	0.4	5.2	1.2
20	Xilinx Inc.	-	4.4	-	0.5	4.8	1.1
21	Marubeni Hytech*	-	4.6	-	-	4.6	1.1
22	Cooper & Chyan Technology	-	3.4	-	0.6	3.9	0.9
23	Harris EDA	42	2.5	0.5	0.4	3.5	0.8
24	Fujitsu*	183	1.1	1.1	1.0	3.2	0.7
25	ACTEL	-	2.7	-	0.4	3.1	0.7
26	ALS Design	15	2.5	0.2	0.3	3.0	0.7
27	Sophia Systems*	34	2.4	0.7	-	3.0	0.7
28	CAD-UL	-	2.5	-	-	2.5	0.6
29	Minc Software	-	1.6	-	0.6	2.2	0.5
30	ULTImate Technology	-	2.1	-	-	2.1	0.5
	Other Companies	51,455	-	117.9	-	117.9	26.9
	All North American Companies	16,136	165.0	52.6	42.5	260.3	59.4
	All European Companies	265	16.7	1.1	0.9	18.8	4.3
	All Asian Companies	2,474	17.9	12.7	8.0	41.2	9.4
	All Companies	70,329	199.6	184.4	51.4	438.2	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table C-5
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top Electronic Design Automation Software Companies, Worldwide, Host/Proprietary

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Digital Equipment	373	-	30.2	8.0	38.2	67.2
2	Fujitsu*	-	0.8	-	0.7	1.5	2.7
3	MacNeal-Schwendler	-	1.2	-	0.1	1.4	2.4
4	Intergraph	-	-	-	0.7	0.7	1.2
5	C. Itoh Techno-Science*	5	0.3	0.2	-	0.5	0.9
6	Meta-Software	-	0.3	-	0.2	0.5	0.9
7	Hitachi	24	0.2	0.1	0	0.4	0.7
8	Harris EDA	3	0.2	0	-	0.3	0.5
9	SIMUCAD	-	0.1	-	-	0.1	0.1
10	debis Systemhaus	0	0	-	0	0	0
	Other Companies	18	-	3.3	0.8	16.1	28.2
	All North American Companies	349	1.8	28.4	9.0	39.2	68.8
	All European Companies	0	0	-	0	0	0
	All Asian Companies	24	0.8	0.1	0.7	1.7	2.9
	All Companies	391	2.6	31.8	10.5	56.9	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table A-30
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Worldwide, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Synopsys	112.9	142.7	193.5	35.6	18.8
2	Cadence	93.5	98.9	129.2	30.7	12.5
3	Mentor Graphics	100.1	100.1	108.0	7.8	10.5
4	Viewlogic Systems	80.2	87.3	76.8	-12.0	7.5
5	Quickturn Design Systems	49.5	59.0	70.6	19.6	6.8
6	Hewlett-Packard	32.4	33.6	37.9	12.6	3.7
7	Zycad	32.8	39.8	36.8	-7.6	3.6
8	Marubeni Hytech*	23.5	24.3	28.0	15.2	2.7
9	IKOS Systems	18.1	18.6	25.7	38.1	2.5
10	EPIC Design Technology	4.8	9.7	24.8	155.5	2.4
11	Compass Design Automation	24.0	20.1	23.2	15.2	2.3
12	Autodesk	23.9	22.8	20.9	-8.2	2.0
13	Altera	14.0	16.0	20.0	25.0	1.9
14	Meta-Software	9.7	14.4	17.5	21.2	1.7
15	Summitt Design	9.2	14.6	16.5	13.2	1.6
16	Analogy	11.3	12.6	16.0	26.6	1.6
17	Intergraph	13.7	11.6	14.5	25.1	1.4
18	Xilinx Inc.	9.2	11.0	13.5	23.4	1.3
19	Microsim	5.8	11.9	13.3	12.0	1.3
20	Zuken-Redac	19.0	12.3	11.8	-3.7	1.1
21	LSI Logic	12.4	14.0	11.5	-17.6	1.1
22	NEC	12.9	13.9	11.2	-19.7	1.1
23	Wacom	11.8	10.6	10.1	-4.4	1.0
24	Minc Software	3.1	6.0	10.0	65.7	1.0
25	Harris EDA	8.6	9.5	9.8	3.5	1.0
26	Seiko*	10.0	9.6	9.0	-5.7	0.9
27	Ansoft	-	5.6	7.8	39.3	0.8
28	SES Inc.	7.0	8.5	7.7	-8.9	0.8
29	C. Itoh Techno-Science*	5.7	6.2	7.3	17.0	0.7
30	CrossCheck Technology	6.5	6.2	7.0	12.9	0.7
	All North American Companies	720.7	824.9	977.0	18.4	94.8
	All European Companies	22.7	17.5	16.2	-7.6	1.6
	All Asian Companies	46.7	40.4	37.2	-7.9	3.6
	All Companies	790.1	882.7	1,030.4	16.7	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table A-31
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Worldwide, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Synopsys	112.7	142.7	193.5	35.6	22.5
2	Cadence	93.5	98.9	129.2	30.7	15.0
3	Mentor Graphics	97.6	96.9	83.8	-13.6	9.7
4	Quickturn Design Systems	49.5	59.0	70.6	19.6	8.2
5	Viewlogic Systems	49.3	54.4	50.7	-6.8	5.9
6	Zycad	32.8	39.8	36.8	-7.6	4.3
7	Hewlett-Packard	30.3	30.1	34.1	13.1	4.0
8	IKOS Systems	18.1	18.6	25.7	38.1	3.0
9	EPIC Design Technology	4.8	9.7	24.8	155.5	2.9
10	Marubeni Hytech*	17.6	19.8	23.3	18.0	2.7
11	Compass Design Automation	24.0	20.1	23.2	15.2	2.7
12	Meta-Software	9.1	13.5	16.4	21.2	1.9
13	Analogy	11.0	12.4	16.0	29.2	1.9
14	Summitt Design	8.8	14.0	15.8	13.2	1.8
15	Zuken-Redac	19.0	12.3	11.8	-3.7	1.4
16	LSI Logic	12.4	14.0	11.5	-17.6	1.3
17	Xilinx Inc.	3.4	7.0	10.6	51.5	1.2
18	NEC	10.5	11.3	8.9	-20.8	1.0
19	Minc Software	2.6	5.1	8.4	65.7	1.0
20	SES Inc.	7.0	8.5	7.7	-8.9	0.9
21	Harris EDA	6.3	6.7	7.2	7.6	0.8
22	C. Itoh Techno-Science*	5.4	6.0	7.0	17.9	0.8
23	Seiko*	10.0	8.4	7.0	-15.9	0.8
24	CrossCheck Technology	6.5	6.2	7.0	12.9	0.8
25	Ansoft	-	3.9	5.5	39.3	0.6
26	APTIX	0.9	1.6	4.9	202.8	0.6
27	VLSI Libraries	1.8	4.4	4.9	11.8	0.6
28	i-Logix	3.8	3.9	4.4	12.8	0.5
29	Fujitsu*	3.2	3.6	4.2	15.9	0.5
30	Quantic Laboratories	2.8	3.1	3.5	12.9	0.4
	All North American Companies	617.7	704.1	825.6	17.3	96.0
	All European Companies	11.1	9.8	8.7	-11.4	1.0
	All Asian Companies	33.4	28.2	26.0	-7.6	3.0
	All Companies	662.2	742.1	860.3	15.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (February 1996)

Table A-32
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Worldwide, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	1.1	11.4	899.1	66.0
2	Altera	-	-	2.0	NA	11.6
3	Seiko*	-	1.2	2.0	64.2	11.6
4	Intusoft	-	0.9	1.4	58.8	8.3
5	Viewlogic Systems	-	-	1.2	NA	7.0
6	Ansoft	-	0.6	0.8	39.3	4.5
7	SIMUCAD	0	0.1	0.4	410.3	2.4
8	Fintronic	-	-	0.3	NA	1.5
9	Frontline Design Automation	-	-	- 0.1	NA	0.4
10	CAD Distribution	-	0	0	197.7	0.2
11	InterHDL	-	0	0	15.4	0.2
12	PADS Software	-	0	0	-41.7	0.1
13	Mentor Graphics	-	1.3	-	-100.0	-
	All North American Companies	0	4.0	17.2	333.0	99.8
	All European Companies	-	0	0	197.7	0.2
	All Asian Companies	-	-	-	NA	-
	All Companies	0	4.0	17.2	332.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-33
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Worldwide, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Viewlogic Systems	30.8	32.9	24.9	-24.4	16.5
2	Mentor Graphics	2.5	2.0	24.2	1,139.7	16.0
3	Autodesk	22.5	21.5	19.7	-8.2	13.1
4	Altera	14.0	16.0	18.0	12.5	11.9
5	Microsim	4.6	10.2	11.4	12.0	7.6
6	Wacom	11.0	9.6	9.0	-6.7	5.9
7	Data I/O	5.2	5.3	5.8	9.5	3.8
8	OrCAD EDA	5.7	4.5	5.0	11.6	3.3
9	Marubeni Hytech*	5.9	4.5	4.6	2.8	3.1
10	Hewlett-Packard	2.1	3.5	3.8	8.8	2.5
11	Xilinx Inc.	5.8	4.0	2.9	-26.1	1.9
12	ACTEL	2.8	2.7	2.7	0.2	1.8
13	Harris EDA	2.1	2.7	2.5	-5.4	1.7
14	Protel Technology	-	1.8	2.4	33.3	1.6
15	NEC	2.4	2.6	2.2	-14.9	1.5
16	Sophia Systems*	2.4	2.4	2.1	-14.2	1.4
17	ALDEC	2.3	2.7	1.9	-30.4	1.2
18	ALS Design	1.4	1.7	1.7	0.4	1.2
19	APTIX	0.9	1.6	1.6	5.0	1.1
20	Minc Software	0.5	1.0	1.6	65.7	1.1
21	Ansoft	-	1.1	1.6	39.3	1.0
22	ISDATA	1.3	1.6	1.5	-1.8	1.0
23	Intergraph	-	-	1.5	NA	1.0
24	PADS Software	0.9	0.9	1.2	28.7	0.8
25	Accel Technologies	0.7	0.8	1.2	46.0	0.8
26	Chronology	0.6	1.1	1.1	-1.6	0.7
27	SIMUCAD	1.2	1.1	1.1	2.6	0.7
28	Frontline Design Automation	-	1.5	1.0	-34.7	0.6
29	Serbi	0.8	0.8	0.9	13.9	0.6
30	Fintronic	1.4	1.4	0.9	-40.1	0.6
	All North American Companies	101.4	114.7	132.6	15.6	87.7
	All European Companies	10.9	7.7	7.4	-3.0	4.9
	All Asian Companies	13.4	12.2	11.2	-8.4	7.4
	All Companies	125.7	134.5	151.2	12.4	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-34
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Worldwide, Host/Proprietary

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	MacNeal-Schwendler	0.6	1.5	1.2	-16.4	73.7
2	Meta-Software	0.5	0.3	0.3	21.1	20.9
3	C. Itoh Techno-Science*	0.3	0.2	0.2	-6.1	13.0
4	Harris EDA	0.2	0.1	0.1	-30.3	5.0
5	SIMUCAD	0.1	0.1	0.1	-33.0	3.3
6	debis Systemhaus	0	0	0	-28.8	0.4
7	Analogy	0.3	0.3	-	-100.0	-
	All North American Companies	1.5	2.1	1.7	-23.2	99.6
	All European Companies	0.6	0	0	-28.8	0.4
	All Asian Companies	-	-	-	NA	-
	All Companies	2.1	2.2	1.7	-23.2	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-35
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, North America, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Synopsys	64.4	75.6	92.9	22.8	17.3
2	Cadence	43.9	44.3	66.0	48.8	12.3
3	Mentor Graphics	52.0	50.5	57.9	14.7	10.8
4	Viewlogic Systems	50.9	59.9	53.3	-11.0	9.9
5	Quickturn Design Systems	37.6	36.6	45.9	25.4	8.6
6	Zycad	23.6	25.9	23.9	-7.6	4.5
7	IKOS Systems	14.7	13.4	16.2	20.9	3.0
8	Hewlett-Packard	12.9	13.8	15.5	12.5	2.9
9	EPIC Design Technology	3.4	5.0	13.9	175.2	2.6
10	Meta-Software	5.5	8.1	10.8	34.2	2.0
11	Compass Design Automation	10.3	8.7	10.0	15.2	1.9
12	Analogy	5.0	5.7	9.6	68.4	1.8
13	LSI Logic	7.2	8.2	9.3	13.1	1.7
14	Minc Software	2.7	5.3	8.7	65.7	1.6
15	Intergraph	8.1	6.6	8.7	32.4	1.6
16	Xilinx Inc.	7.9	7.5	8.5	14.3	1.6
17	Summitt Design	4.6	7.3	8.3	13.2	1.5
18	Microsim	5.2	7.1	8.0	12.0	1.5
19	Altera	7.0	8.3	6.8	-18.3	1.3
20	SES Inc.	4.8	5.8	6.5	13.2	1.2
21	Autodesk	11.5	7.7	6.4	-16.7	1.2
22	Ansoft	-	3.9	5.5	39.3	1.0
23	Harris EDA	4.6	4.8	5.1	5.8	0.9
24	OrCAD EDA	3.6	2.8	3.7	29.3	0.7
25	APTIX	0.9	1.7	3.6	113.7	0.7
26	Motorola	2.5	2.9	3.3	13.2	0.6
27	AT&T	2.1	2.1	2.7	24.4	0.5
28	Frontline Design Automation	-	0.5	2.5	444.4	0.5
29	T D Technology	1.8	2.0	2.3	13.2	0.4
30	i-Logix	2.1	1.9	2.2	13.2	0.4
	All North American Companies	416.4	451.6	534.7	18.4	99.7
	All European Companies	3.2	1.2	1.4	15.1	0.3
	All Asian Companies	1.8	0.8	0.2	-74.7	0
	All Companies	421.4	453.5	536.3	18.2	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (February 1996)

Table A-36
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, North America, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Synopsys	64.2	75.6	92.9	22.8	20.2
2	Cadence	43.9	44.3	66.0	48.8	14.4
3	Quickturn Design Systems	37.6	36.6	45.9	25.4	10.0
4	Mentor Graphics	50.7	48.8	44.9	-8.0	9.8
5	Viewlogic Systems	31.7	38.9	37.3	-4.2	8.1
6	Zycad	23.6	25.9	23.9	-7.6	5.2
7	IKOS Systems	14.7	13.4	16.2	20.9	3.5
8	Hewlett-Packard	12.1	12.4	13.9	12.8	3.0
9	EPIC Design Technology	3.4	5.0	13.9	175.2	3.0
10	Meta-Software	5.1	7.6	10.2	34.2	2.2
11	Compass Design Automation	10.3	8.7	10.0	15.2	2.2
12	Analogy	4.9	5.6	9.6	72.0	2.1
13	LSI Logic	7.2	8.2	9.3	13.1	2.0
14	Summitt Design	4.4	7.0	7.9	13.2	1.7
15	Minc Software	2.2	4.4	7.3	65.7	1.6
16	Xilinx Inc.	2.3	4.8	6.7	40.3	1.5
17	SES Inc.	4.8	5.8	6.5	13.2	1.4
18	Ansoft	-	2.7	3.8	39.3	0.8
19	Harris EDA	3.1	3.4	3.8	13.0	0.8
20	Motorola	2.5	2.9	3.3	13.2	0.7
21	APTIX	0.5	0.9	2.7	214.2	0.6
22	AT&T	2.1	2.1	2.7	24.4	0.6
23	T D Technology	1.8	2.0	2.3	13.2	0.5
24	i-Logix	2.1	1.9	2.2	13.2	0.5
25	Design Acceleration	0.8	1.6	2.2	36.5	0.5
26	Systems Science	1.4	1.9	2.1	15.2	0.5
27	Quantic Laboratories	1.5	1.6	2.0	21.7	0.4
28	VLSI Libraries	0.9	1.5	1.7	13.0	0.4
29	Frontline Design Automation	-	-	1.7	NA	0.4
30	Contec Microelectronics	1.2	1.4	1.5	13.2	0.3
	All North American Companies	353.4	386.0	457.9	18.6	99.7
	All European Companies	2.6	1.0	1.2	15.1	0.3
	All Asian Companies	1.8	0.8	0.2	-74.7	0
	All Companies	357.7	387.8	459.2	18.4	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-37
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, North America, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	0.7	6.8	907.8	66.5
2	Intusoft	-	0.7	1.0	43.4	9.6
3	Viewlogic Systems	-	-	0.8	NA	8.1
4	Altera	-	-	0.7	NA	6.6
5	Ansoft	-	0.4	0.5	39.3	5.3
6	SIMUCAD	0	0.1	0.3	509.0	3.3
7	Fintronic	-	-	0.3	NA	2.5
8	Frontline Design Automation	-	-	0	NA	0.5
9	InterHDL	-	0	0	15.4	0.3
10	PADS Software	-	0	0	-41.7	0.1
11	Mentor Graphics	-	0.6	-	-100.0	-
	All North American Companies	0	2.5	10.3	315.9	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0	2.5	10.3	315.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-38
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, North America, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Viewlogic Systems	19.1	21.0	15.2	-27.6	22.8
2	Mentor Graphics	1.3	1.0	12.9	1216.1	19.5
3	Microsim	4.6	6.1	6.9	12.0	10.3
4	Altera	7.0	8.3	6.1	-26.4	9.2
5	Autodesk	10.8	7.2	6.0	-16.7	9.0
6	OrCAD EDA	3.6	2.8	3.7	29.3	5.5
7	Data I/O	3.6	3.6	2.0	-46.0	2.9
8	Xilinx Inc.	5.6	2.7	1.9	-31.6	2.8
9	Hewlett-Packard	0.8	1.4	1.6	10.0	2.4
10	Minc Software	0.4	0.8	1.4	65.7	2.1
11	ALDEC	1.3	1.5	1.3	-10.0	2.0
12	Harris EDA	1.4	1.4	1.3	-9.9	1.9
13	Protel Technology	-	0.9	1.2	33.3	1.8
14	Ansoft	-	0.8	1.1	39.3	1.6
15	ACTEL	2.0	1.2	1.1	-12.9	1.6
16	Chronology	0.6	1.0	0.9	-5.1	1.4
17	APTIX	0.5	0.8	0.9	9.0	1.4
18	Fintronic	1.4	1.4	0.9	-40.1	1.3
19	Accel Technologies	0.4	0.5	0.8	55.0	1.2
20	Intergraph	-	-	0.8	NA	1.2
21	SIMUCAD	0.9	0.8	0.7	-6.9	1.1
22	Frontline Design Automation	-	0.5	0.7	52.4	1.0
23	PADS Software	0.5	0.5	0.6	28.7	0.9
24	Intusoft	0.8	0.4	0.5	43.4	0.8
25	Meta-Software	0.2	0.3	0.4	34.3	0.7
26	Tanner Research	0.2	0.2	0.4	45.4	0.5
27	Summitt Design	0.2	0.3	0.4	13.2	0.5
28	Softdesk	0.2	0.2	0.2	-16.2	0.2
29	InterHDL	-	0.1	0.1	15.4	0.2
30	Technische Computer Systeme	0.1	0.1	0.1	3.8	0.1
	All North American Companies	62.5	62.8	66.3	5.6	99.7
	All European Companies	0.4	0.2	0.2	14.9	0.3
	All Asian Companies	-	-	-	NA	-
	All Companies	62.9	63.0	66.5	5.6	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-39
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, North America, Host/Proprietary

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Meta-Software	0.3	0.2	0.2	34.1	84.0
2	Harris EDA	0.1	0.1	0	-35.4	15.2
3	SIMUCAD	0	0.1	0	-35.5	14.3
4	Analogy	0.1	0.1	-	-100.0	-
	All North American Companies	0.5	0.4	0.3	-28.7	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.7	0.4	0.3	-28.7	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-40
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Europe, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Synopsys	26.6	30.0	38.1	27.2	18.8
2	Cadence	21.9	22.4	29.0	29.8	14.4
3	Mentor Graphics	22.3	25.9	27.5	6.2	13.6
4	Viewlogic Systems	15.6	16.8	15.1	-10.0	7.5
5	Hewlett-Packard	8.9	9.6	10.8	12.5	5.4
6	Autodesk	7.9	7.8	7.8	-0.1	3.8
7	Compass Design Automation	7.4	6.2	7.2	15.2	3.6
8	Quickturn Design Systems	4.5	11.8	7.1	-40.2	3.5
9	IKOS Systems	1.8	2.4	5.1	112.5	2.5
10	Analogy	4.3	4.6	4.8	4.8	2.4
11	Intergraph	3.7	3.4	3.8	13.0	1.9
12	MacNeal-Schwendler	0.8	2.8	3.5	24.2	1.7
13	Altera	3.5	3.4	3.4	1.2	1.7
14	Zycad	4.3	3.6	3.3	-7.6	1.6
15	Microsim	0.3	2.7	3.1	12.0	1.5
16	Harris EDA	2.4	2.9	3.0	4.8	1.5
17	EPIC Design Technology	0	1.6	2.7	75.7	1.3
18	Xilinx Inc.	0.8	2.2	2.7	23.4	1.3
19	VEDA	2.0	1.9	2.0	4.8	1.0
20	ISDATA	2.0	1.9	1.9	-2.9	0.9
21	i-Logix	1.2	1.6	1.8	11.7	0.9
22	ALS Design	1.4	1.8	1.7	-0.7	0.9
23	Meta-Software	0.7	1.0	1.7	73.2	0.9
24	Data I/O	0.6	0.6	1.4	146.5	0.7
25	VLSI Libraries	0.3	1.3	1.4	6.5	0.7
26	ACTEL	0.4	0.9	1.0	13.6	0.5
27	Sagantec	-	1.1	0.9	-17.7	0.5
28	Serbi	0.8	0.8	0.9	13.9	0.5
29	Abstract Hardware	1.5	0.9	0.9	-3.9	0.4
30	Speed	0.7	0.8	0.9	16.7	0.4
	All North American Companies	146.4	171.9	188.1	9.4	93.0
	All European Companies	17.5	15.3	13.6	-11.2	6.7
	All Asian Companies	3.9	1.8	0.6	-69.8	0.3
	All Companies	167.8	189.0	202.2	7.0	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (February 1996)

Table A-41
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Europe, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Synopsys	26.6	30.0	38.1	27.2	24.2
2	Cadence	21.9	22.4	29.0	29.8	18.4
3	Mentor Graphics	21.7	25.1	21.4	-14.8	13.6
4	Hewlett-Packard	8.4	8.6	9.8	12.8	6.2
5	Viewlogic Systems	9.3	8.6	7.5	-12.7	4.8
6	Compass Design Automation	7.4	6.2	7.2	15.2	4.6
7	Quickturn Design Systems	4.5	11.8	7.1	-40.2	4.5
8	IKOS Systems	1.8	2.4	5.1	112.5	3.3
9	Analogy	4.2	4.5	4.8	6.9	3.0
10	Zycad	4.3	3.6	3.3	-7.6	2.1
11	EPIC Design Technology	0	1.6	2.7	75.7	1.7
12	MacNeal-Schwendler	0.2	1.3	2.3	68.2	1.4
13	Xilinx Inc.	0.8	1.4	2.1	51.5	1.3
14	VEDA	1.9	1.9	2.0	4.8	1.3
15	i-Logix	1.2	1.6	1.8	11.7	1.1
16	Harris EDA	1.7	1.6	1.7	9.3	1.1
17	Meta-Software	0.6	0.9	1.6	73.2	1.0
18	VLSI Libraries	0.3	1.3	1.4	6.5	0.9
19	Sagantec	-	1.1	0.9	-17.7	0.6
20	Abstract Hardware	1.5	0.9	0.9	-3.9	0.6
21	Speed	0.7	0.8	0.9	16.7	0.6
22	PROCAD GmbH	-	0.7	0.8	4.2	0.5
23	Zuken-Redac	3.9	1.8	0.6	-69.8	0.4
24	Quantic Laboratories	0.7	0.8	0.5	-29.5	0.3
25	ISDATA	0.6	0.5	0.5	-3.4	0.3
26	Minc Software	0.2	0.3	0.5	65.7	0.3
27	Design Acceleration	-	0.2	0.5	105.0	0.3
28	Autodesk	0.5	0.5	0.5	-0.1	0.3
29	Intergraph	3.7	3.1	0.4	-85.6	0.3
30	Microsim	0.3	0.4	0.4	12.0	0.3
	All North American Companies	124.9	142.5	150.4	5.5	95.5
	All European Companies	7.0	8.0	6.6	-18.4	4.2
	All Asian Companies	3.9	1.8	0.6	-69.8	0.4
	All Companies	135.9	152.4	157.5	3.3	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (February 1996)

Table A-42
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Europe, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	0.3	2.9	907.8	76.2
2	Altera	-	-	0.3	NA	8.8
3	Intusoft	-	0.1	0.3	98.5	7.4
4	Viewlogic Systems	-	-	0.2	NA	6.3
5	Ansoft	-	0	0	39.3	1.0
6	CAD Distribution	-	0	0	197.7	0.9
7	Frontline Design Automation	-	-	0	NA	0.1
8	PADS Software	-	0	0	-41.7	0.1
9	InterHDL	-	0	0	15.4	0
10	Mentor Graphics	-	0.3	-	-100.0	-
	All North American Companies	-	0.8	3.8	378.5	99.1
	All European Companies	-	0	0	197.7	0.9
	All Asian Companies	-	-	-	NA	-
	All Companies	-	0.8	3.8	375.8	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-43
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Europe, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Viewlogic Systems	6.3	8.1	7.3	-10.2	18.4
2	Autodesk	7.4	7.3	7.3	-0.1	18.4
3	Mentor Graphics	0.6	0.5	6.2	1118.3	15.5
4	Altera	3.5	3.4	3.1	-8.9	7.7
5	Microsim	-	2.3	2.6	12.0	6.6
6	ALS Design	1.4	1.7	1.7	-0.6	4.4
7	Data I/O	0.5	0.5	1.4	173.9	3.6
8	ISDATA	1.3	1.4	1.4	-2.7	3.5
9	Harris EDA	0.8	1.3	1.3	-0.5	3.2
10	Hewlett-Packard	0.6	1.0	1.1	10.0	2.8
11	Serbi	0.8	0.8	0.9	13.9	2.3
12	Kloeckner-Moeller	1.0	1.0	0.8	-16.9	2.1
13	ACTEL	-	0.5	0.7	37.1	1.8
14	CAD Distribution	0.7	0.6	0.6	12.0	1.6
15	ABB Industria*	0.6	0.6	0.6	0.8	1.6
16	OrCAD EDA	1.3	1.1	0.6	-41.9	1.6
17	Xilinx Inc.	-	0.8	0.6	-26.1	1.5
18	Protel Technology	-	0.4	0.5	33.3	1.3
19	Norlinvest Ltd.	1.1	0.4	0.4	1.9	1.1
20	Intergraph	-	-	0.4	NA	1.1
21	Ziegler Informatics	2.5	0.3	0.3	-2.2	0.8
22	ISD Software	0.3	0.4	0.3	-19.6	0.8
23	Technische Computer Systeme	0.4	0.3	0.3	-18.0	0.7
24	Number One Systems	-	0.2	0.3	11.9	0.7
25	Softronics	0.2	0.2	0.2	2.7	0.6
26	Intusoft	-	0.1	0.1	98.5	0.4
27	Accel Technologies	0.1	0.1	0.1	16.8	0.4
28	PADS Software	0.1	0.1	0.1	28.7	0.3
29	Chronology	-	0.1	0.1	23.0	0.3
30	Minc Software	0	0.1	0.1	65.7	0.2
	All North American Companies	20.7	27.0	32.7	21.1	82.4
	All European Companies	10.2	7.2	7.0	-3.6	17.6
	All Asian Companies	-	-	-	NA	-
	All Companies	30.9	34.2	39.6	15.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-44
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Europe, Host/Proprietary

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	MacNeal-Schwendler	0.6	1.5	1.2	-16.4	96.4
2	Meta-Software	0	0	0	73.0	2.7
3	Harris EDA	0	0	0	-28.7	0.6
4	debis Systemhaus	0	0	0	-28.8	0.6
5	Analogy	0.1	0.1	-	-100.0	-
	All North American Companies	0.8	1.6	1.3	-20.2	99.4
	All European Companies	0.2	0	0	-28.8	0.6
	All Asian Companies	-	-	-	NA	-
	All Companies	1.0	1.6	1.3	-20.3	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-45
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Japan, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Synopsys	20.2	32.8	48.0	46.2	21.6
2	Marubeni Hytech*	23.5	24.3	28.0	15.2	12.6
3	Cadence	19.4	21.5	22.4	4.3	10.1
4	Mentor Graphics	16.9	16.0	16.0	0.3	7.2
5	NEC	12.9	13.9	11.2	-19.7	5.0
6	Zuken-Redac	10.9	9.1	10.9	20.0	4.9
7	Hewlett-Packard	9.9	9.6	10.8	12.5	4.9
8	Wacom	11.8	10.6	10.1	-4.4	4.6
9	Seiko*	9.8	9.4	8.8	-6.0	4.0
10	Summitt Design	4.6	7.3	8.3	13.2	3.7
11	Altera	2.0	3.0	8.2	169.7	3.7
12	C. Itoh Techno-Science*	5.7	6.2	7.3	17.0	3.3
13	Quickturn Design Systems	5.4	8.9	7.1	-20.3	3.2
14	Zycad	1.6	7.2	6.6	-7.6	3.0
15	Viewlogic Systems	11.2	8.8	6.2	-30.2	2.8
16	CrossCheck Technology	4.1	4.3	4.9	12.9	2.2
17	Fujitsu*	3.2	3.6	4.2	15.9	1.9
18	EPIC Design Technology	1.2	2.6	4.2	60.9	1.9
19	Autodesk	1.9	4.6	4.2	-8.2	1.9
20	IKOS Systems	1.4	2.0	3.9	88.4	1.7
21	Compass Design Automation	3.8	3.2	3.7	15.2	1.7
22	Meta-Software	2.8	4.8	3.1	-33.9	1.4
23	Sophia Systems*	3.1	3.2	2.9	-6.6	1.3
24	APTIX	0.7	1.2	2.3	94.8	1.0
25	Microsim	0.3	2.0	2.3	12.0	1.0
26	Xilinx Inc.	0.2	1.0	1.8	78.2	0.8
27	Harris EDA	1.3	1.5	1.7	17.3	0.8
28	Data I/O	1.1	1.1	1.7	64.3	0.8
29	Contec Microelectronics	1.3	1.5	1.7	16.4	0.8
30	LSI Logic	1.2	1.4	1.6	18.1	0.7
	All North American Companies	117.5	156.0	184.8	18.5	83.3
	All European Companies	1.5	0.8	0.9	19.0	0.4
	All Asian Companies	38.7	37.2	36.3	-2.5	16.3
	All Companies	157.7	193.9	222.0	14.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table A-46
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Japan, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Synopsys	20.2	32.8	48.0	46.2	26.2
2	Marubeni Hytech*	17.6	19.8	23.3	18.0	12.8
3	Cadence	19.4	21.5	22.4	4.3	12.3
4	Mentor Graphics	16.5	15.5	12.4	-19.7	6.8
5	Zuken-Redac	10.9	9.1	10.9	20.0	5.9
6	Hewlett-Packard	9.3	8.6	9.8	12.8	5.3
7	NEC	10.5	11.3	8.9	-20.8	4.9
8	Summitt Design	4.4	7.0	7.9	13.2	4.3
9	Quickturn Design Systems	5.4	8.9	7.1	-20.3	3.9
10	C. Itoh Techno-Science*	5.4	6.0	7.0	17.9	3.9
11	Seiko*	9.8	8.2	6.8	-16.5	3.7
12	Zycad	1.6	7.2	6.6	-7.6	3.6
13	CrossCheck Technology	4.1	4.3	4.9	12.9	2.7
14	Viewlogic Systems	6.8	5.7	4.3	-24.0	2.4
15	Fujitsu*	3.2	3.6	4.2	15.9	2.3
16	EPIC Design Technology	1.2	2.6	4.2	60.9	2.3
17	IKOS Systems	1.4	2.0	3.9	88.4	2.1
18	Compass Design Automation	3.8	3.2	3.7	15.2	2.0
19	Meta-Software	2.7	4.5	3.0	-33.9	1.6
20	APTIX	0.3	0.6	1.7	186.4	0.9
21	Harris EDA	1.3	1.4	1.7	17.9	0.9
22	LSI Logic	1.2	1.4	1.6	18.1	0.9
23	Contec Microelectronics	1.3	1.4	1.6	18.1	0.9
24	Analogy	1.0	1.2	1.6	31.9	0.9
25	VLSI Libraries	0.5	1.2	1.4	17.9	0.8
26	Xilinx Inc.	0.2	0.6	1.4	118.8	0.8
27	SES Inc.	0.8	1.0	1.2	18.1	0.7
28	Wacom	0.9	1.0	1.2	17.8	0.6
29	Cascade Design Automation	0.7	0.8	1.0	20.9	0.5
30	Pacific Numerics	-	-	0.9	NA	0.5
	All North American Companies	105.8	136.8	157.0	14.8	85.9
	All European Companies	1.1	0.7	0.8	21.0	0.4
	All Asian Companies	25.3	25.0	25.1	0.4	13.7
	All Companies	132.3	162.4	182.9	12.6	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

NA = Not applicable

Source: Dataquest (February 1996)

Table A-47
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Japan, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Seiko*	-	1.2	2.0	64.2	81.3
2	Intergraph	-	0.1	1.3	883.2	54.2
3	Altera	-	-	0.8	NA	33.4
4	Ansoft	-	0.1	0.1	39.3	4.8
5	Viewlogic Systems	-	-	0.1	NA	3.9
6	Intusoft	-	0	0.1	341.2	2.9
7	SIMUCAD	0	0	0	14.8	0.7
8	Frontline Design Automation	-	-	0	NA	0.7
9	PADS Software	-	0	0	-41.7	0.3
10	InterHDL	-	0	0	15.4	0.1
11	Mentor Graphics	-	0.2	-	-100.0	-
	All North American Companies	0	0.5	2.5	434.8	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0	0.5	2.5	434.8	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-48
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Japan, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Wacom	11.0	9.6	9.0	-6.7	24.5
2	Altera	2.0	3.0	7.4	142.8	20.2
3	Marubeni Hytech*	5.9	4.5	4.6	2.8	12.7
4	Autodesk	1.8	4.3	4.0	-8.2	10.9
5	Mentor Graphics	0.4	0.3	3.6	1,062.5	9.9
6	NEC	2.4	2.6	2.2	-14.9	6.0
7	Sophia Systems*	2.4	2.4	2.1	-14.2	5.6
8	Microsim	*	1.7	1.9	12.0	5.3
9	Viewlogic Systems	4.5	3.1	1.7	-44.3	4.8
10	Data I/O	0.9	0.9	1.7	82.6	4.7
11	Hewlett-Packard	0.6	1.0	1.1	10.0	3.0
12	ACTEL	0.3	0.7	0.6	-11.8	1.6
13	APTIX	0.3	0.6	0.6	-0.6	1.6
14	ALDEC	0.5	0.5	0.5	-9.5	1.3
15	OrCAD EDA	0.4	0.4	0.4	18.6	1.2
16	Xilinx Inc.	*	0.4	0.4	6.7	1.0
17	Summitt Design	0.2	0.3	0.4	13.2	1.0
18	PADS Software	0.3	0.3	0.3	28.7	0.9
19	Protel Technology	-	0.2	0.3	33.3	0.8
20	Frontline Design Automation	*	1.1	0.2	-76.7	0.7
21	Ansoft	-	0.2	0.2	39.3	0.6
22	SIMUCAD	0.2	0.2	0.2	-6.3	0.6
23	Intergraph	-	-	0.2	NA	0.5
24	ISDATA	-	0.1	0.1	6.3	0.4
25	Meta-Software	-	0.2	0.1	-33.8	0.3
26	Chronology	*	0.1	0.1	10.7	0.3
27	Minc Software	0	0.1	0.1	65.7	0.3
28	Accel Technologies	0.1	0.1	0.1	-12.4	0.2
29	Contec Microelectronics	0.1	0.1	0.1	-15.7	0.2
30	Intusoft	-	0	0	341.2	0.1
	All North American Companies	11.6	18.6	25.2	36.0	69.1
	All European Companies	0.2	0.1	0.1	6.7	0.3
	All Asian Companies	13.4	12.2	11.2	-8.4	30.6
	All Companies	25.1	30.9	36.5	18.3	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

NA = Not applicable

Source: Dataquest (February 1996)

Table A-49
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Japan, Host/Proprietary

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	C. Itoh Techno-Science*	0.3	0.2	0.2	-6.1	208.9
2	Meta-Software	0.1	0.1	0.1	-33.9	60.4
3	Harris EDA	0	0	0	-6.0	36.4
4	SIMUCAD	0	0	0	-6.1	14.7
5	Analogy	0	0	-	-100.0	-
	All North American Companies	0.1	0.2	0.1	-38.3	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.2	0.2	0.1	-38.3	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-50
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Asia/Pacific, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Synopsys	1.7	4.3	14.5	239.1	21.7
2	Cadence	7.7	10.0	11.0	9.2	16.4
3	Quickturn Design Systems	2.0	1.8	10.6	497.9	15.8
4	Mentor Graphics	8.8	7.8	6.5	-16.0	9.8
5	EPIC Design Technology	0.1	0.3	4.0	1,262.9	5.9
6	Zycad	3.3	3.2	2.9	-7.6	4.4
7	Autodesk	1.7	2.1	2.5	21.0	3.8
8	Compass Design Automation	2.4	2.0	2.3	15.2	3.5
9	Viewlogic Systems	2.5	1.8	2.3	26.0	3.5
10	Meta-Software	0.8	0.6	1.7	203.1	2.6
11	CrossCheck Technology	0.7	1.2	1.4	12.9	2.1
12	Altera	0.9	1.0	1.0	4.2	1.5
13	Ansoft	-	0.6	0.8	39.3	1.2
14	Hewlett-Packard	0.7	0.6	0.7	21.6	1.0
15	Pacific Numerics	-	-	0.6	NA	0.9
16	IKOS Systems	0.2	0.7	0.5	-30.9	0.8
17	ACTEL	0.4	0.4	0.5	10.7	0.7
18	Protel Technology	-	0.3	0.4	33.3	0.6
19	SIMUCAD	0.2	0.3	0.4	51.6	0.6
20	VLSI Libraries	0.1	0.4	0.4	5.7	0.6
21	Quantic Laboratories	0.1	0.1	0.4	182.1	0.5
22	APTIX	0.2	0.2	0.3	47.1	0.5
23	Intergraph	0.3	0.3	0.3	14.3	0.5
24	Xilinx Inc.	0.2	0.2	0.3	23.4	0.4
25	Data I/O	0.1	0.1	0.2	97.2	0.3
26	Seiko*	0.2	0.2	0.2	5.6	0.3
27	OrCAD EDA	0.2	0.2	0.2	11.6	0.3
28	Zuken-Redac	2.3	0.6	0.2	-68.4	0.3
29	Systems Science	0	0	0.2	254.2	0.2
30	Sagantec	-	-	0.1	NA	0.2
	All North American Companies	36.6	42.1	66.4	57.7	99.4
	All European Companies	0.3	0.1	0.2	62.4	0.3
	All Asian Companies	2.3	0.6	0.2	-68.4	0.3
	All Companies	39.2	42.8	66.8	56.0	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

NA = Not applicable

Source: Dataquest (February 1996)

Table A-51
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Asia/Pacific, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Synopsys	1.7	4.3	14.5	239.1	24.6
2	Cadence	7.7	10.0	11.0	9.2	18.6
3	Quickturn Design Systems	2.0	1.8	10.6	497.9	17.9
4	Mentor Graphics	8.6	7.5	5.1	-32.8	8.6
5	EPIC Design Technology	0.1	0.3	4.0	1262.9	6.7
6	Zycad	3.3	3.2	2.9	-7.6	5.0
7	Compass Design Automation	2.4	2.0	2.3	15.2	3.9
8	Meta-Software	0.7	0.5	1.6	203.1	2.8
9	Viewlogic Systems	1.5	1.2	1.6	37.0	2.7
10	CrossCheck Technology	0.7	1.2	1.4	12.9	2.4
11	Hewlett-Packard	0.6	0.5	0.7	31.2	1.1
12	Pacific Numerics	-	-	0.6	NA	1.1
13	Ansoft	-	0.4	0.5	39.3	0.9
14	IKOS Systems	0.2	0.7	0.5	-30.9	0.9
15	VLSI Libraries	0.1	0.4	0.4	5.7	0.6
16	Quantic Laboratories	0.1	0.1	0.4	182.1	0.6
17	APTIX	0.1	0.1	0.2	116.3	0.4
18	Xilinx Inc.	0.1	0.1	0.2	51.5	0.4
19	Seiko*	0.2	0.2	0.2	5.6	0.4
20	Zuken-Redac	2.3	0.6	0.2	-68.4	0.3
21	Systems Science	0	0	0.2	254.2	0.3
22	Autodesk	0.1	0.1	0.2	21.0	0.3
23	SIMUCAD	0.1	0.1	0.1	5.0	0.2
24	ACTEL	0.1	0.2	0.1	-20.9	0.2
25	Sagantec	-	-	0.1	NA	0.2
26	i-Logix	0.1	0.1	0.1	10.4	0.2
27	Minc Software	-	0.1	0.1	65.7	0.1
28	UniCAD	-	-	0.1	NA	0.1
29	Cascade Design Automation	0.2	0.2	0	-79.8	0.1
30	Intergraph	0.3	0.2	0	-84.0	0.1
	All North American Companies	31.8	36.7	58.7	59.7	99.4
	All European Companies	0.2	0	0.1	198.3	0.2
	All Asian Companies	2.3	0.6	0.2	-68.4	0.3
	All Companies	34.3	37.4	59.0	57.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-52
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Asia/Pacific, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	0	0.2	744.8	43.9
2	Altera	-	-	0.1	NA	18.3
3	Ansoft	-	0.1	0.1	39.3	14.2
4	Intusoft	-	0	0.1	65.4	13.0
5	SIMUCAD	0	0	0	509.9	8.9
6	Viewlogic Systems	-	-	0	NA	6.6
7	PADS Software	-	0	0	-41.7	0.4
8	InterHDL	-	0	0	15.4	0.1
9	Mentor Graphics	-	0.1	-	-100.0	-
	All North American Companies	0	0.2	0.5	134.2	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0	0.2	0.5	134.2	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-53
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Asia/Pacific, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Autodesk	1.6	2.0	2.4	21.0	32.7
2	Mentor Graphics	0.2	0.2	1.5	873.2	20.4
3	Altera	0.9	1.0	0.9	-6.2	12.4
4	Viewlogic Systems	1.0	0.7	0.7	0.4	9.1
5	Protel Technology	-	0.3	0.4	33.3	5.6
6	ACTEL	0.2	0.2	0.3	33.6	4.5
7	Data I/O	0.1	0.1	0.2	119.1	3.2
8	SIMUCAD	0.1	0.1	0.2	86.8	2.8
9	OrCAD EDA	0.2	0.2	0.2	11.6	2.8
10	Ansoft	-	0.1	0.2	39.3	2.2
11	Accel Technologies	0	0	0.1	119.0	1.5
12	PADS Software	0	0.1	0.1	28.7	1.4
13	Norlinvest Ltd.	0.1	0.1	0.1	1.9	1.4
14	APTIX	0.1	0.1	0.1	-25.0	1.1
15	Meta-Software	-	0	0.1	203.4	1.0
16	Xilinx Inc.	0.1	0.1	0.1	-26.1	0.8
17	Intusoft	-	0	0	65.4	0.5
18	Intergraph	-	-	0	NA	0.5
19	Hewlett-Packard	0	0.1	0	-63.4	0.3
20	Minc Software	-	0	0	65.7	0.2
21	Tanner Research	-	0	0	156.7	0.1
22	Number One Systems	-	0	0	11.9	0.1
23	Ziegler Informatics	0	0	0	-54.0	0.1
24	Contec Microelectronics	0	0	0	100.3	0
25	Viagrafix	0	0	0	-62.9	0
26	InterHDL	-	0	0	15.4	0
27	ALDEC	0.1	0.2	-	-100.0	-
28	Softdesk	0	0	-	-100.0	-
	All North American Companies	4.6	5.1	7.1	40.0	98.8
	All European Companies	0.1	0.1	0.1	-4.5	1.2
	All Asian Companies	-	-	-	NA	-
	All Companies	4.7	5.2	7.2	39.3	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-54
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Asia/Pacific, Host/Proprietary

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Meta-Software	0.1	0	0	202.8	109.6
2	SIMUCAD	0	0	0	-69.2	7.9
3	Analogy	0	0	-	-100.0	-
4	Harris EDA	0	0	-	-100.0	-
	All North American Companies	0.2	0	0	-15.1	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.2	0	0	-15.1	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-55
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Rest of World, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	0.6	0.6	0.8	28.8	25.7
2	Altera	0.6	0.3	0.6	87.5	19.3
3	LSI Logic	0.5	0.5	0.6	12.3	19.1
4	Data I/O	0.1	0.1	0.4	590.2	13.0
5	Xilinx Inc.	0.1	0.1	0.3	146.7	8.7
6	Autodesk	1.0	0.8	0.1	-86.1	3.4
7	OrCAD EDA	0.1	0	0.1	123.2	3.2
8	i-Logix	0.1	0.1	0.1	12.4	2.8
9	Intergraph	0.1	0.1	0.1	3.3	2.2
10	Accel Technologies	0	0	0.1	53.7	1.6
11	Norlinvest Ltd.	0	0	0	1.9	1.0
12	ALDEC	0	0	0	5.4	0.9
13	PADS Software	0	0	0	16.7	0.8
14	Intusoft	-	0	0	58.8	0.7
15	Number One Systems	-	0	0	11.9	0.4
16	Star Informatic	-	-	0	NA	0.3
17	Ziegler Informatics	0	0	0	21.6	0.1
18	Softdesk	0	0	0	-1.9	0.1
19	Analogy	0.4	0.5	-	-100.0	-
20	EPIC Design Technology	-	0.2	-	-100.0	-
21	ACTEL	0.3	0	-	-100.0	-
22	Siemens Nixdorf Informationssysteme	0.1	0	-	-100.0	-
	All North American Companies	3.8	3.4	3.1	-9.4	98.3
	All European Companies	0.3	0.1	0.1	-33.9	1.7
	All Asian Companies	-	-	-	NA	-
	All Companies	4.1	3.5	3.1	-10.0	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-56
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Rest of World, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	0.6	0.6	0.8	28.8	46.8
2	LSI Logic	0.5	0.5	0.6	12.3	34.7
3	Xilinx Inc.	0	0.1	0.2	203.0	12.4
4	i-Logix	0.1	0.1	0.1	12.4	5.1
5	Star Informatic	-	-	0	NA	0.6
6	Intergraph	0.1	0.1	0	-86.3	0.5
7	Autodesk	0.1	0	0	-86.1	0.4
8	Accel Technologies	-	-	0	NA	0.1
9	PADS Software	0	0	0	-74.1	0
10	Analogy	0.4	0.5	-	-100.0	-
11	EPIC Design Technology	-	0.2	-	-100.0	-
12	Siemens Nixdorf Informationssysteme	0	0	-	-100.0	-
13	ACTEL	0.1	0	-	-100.0	-
14	Data I/O	0	0	-	-100.0	-
	All North American Companies	1.8	2.1	1.7	-18.8	99.4
	All European Companies	0.2	0	0	-69.0	0.6
	All Asian Companies	-	-	-	NA	-
	All Companies	2.0	2.1	1.7	-19.6	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-57
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Rest of World, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Altera	-	-	0.1	NA	47.3
2	Intergraph	-	0	0.1	630.0	41.1
3	Intusoft	-	0	0	58.8	11.2
4	PADS Software	-	0	0	-41.7	0.4
	All North American Companies	-	0	0.1	647.4	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	0	0.1	647.4	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-58
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top Electronic CAE Software Companies, Rest of World, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Altera	0.6	0.3	0.5	68.8	42.4
2	Data I/O	0.1	0.1	0.4	666.8	31.7
3	OrCAD EDA	0.1	0	0.1	123.2	7.9
4	Autodesk	0.9	0.7	0.1	-86.1	7.7
5	Xilinx Inc.	0.1	0	0.1	47.7	4.6
6	Accel Technologies	0	0	0	46.0	3.8
7	Norlinvest Ltd.	0	0	0	1.9	2.6
8	ALDEC	0	0	0	5.4	2.2
9	PADS Software	0	0	0	28.7	1.9
10	Number One Systems	-	0	0	11.9	0.9
11	Intergraph	-	-	0	NA	0.7
12	Intusoft	-	0	0	58.8	0.6
13	Ziegler Informatics	0	0	0	21.6	0.3
14	Softdesk	0	0	0	-1.9	0.2
15	ACTEL	0.2	0	-	-100.0	-
16	Siemens Nixdorf Informationssysteme	0	0	-	-100.0	-
	All North American Companies	2.0	1.3	1.2	-2.2	96.8
	All European Companies	0.1	0	0	-7.1	3.2
	All Asian Companies	-	-	-	NA	-
	All Companies	2.1	1.3	1.3	-2.4	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table B-2
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
All Electronic CAE Software Companies, Worldwide, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	3Soft	1.0	1.6	1.7	6.8	0.2
2	ABB Industria*	0.6	0.6	0.6	0.8	0.1
3	Abstract Hardware	1.5	1.1	1.1	-0.7	0.1
4	Accel Technologies	0.7	0.8	1.3	53.7	0.1
5	ACTEL	4.7	4.7	3.9	-17.0	0.4
6	ALDEC	2.3	2.7	1.9	-30.4	0.2
7	ALS Design	1.4	1.8	1.8	0.3	0.2
8	Altera	14.0	16.0	20.0	25.0	1.9
9	Analogy	11.3	12.6	16.0	26.6	1.6
10	Ansoft	-	5.6	7.8	39.3	0.8
11	APTIX	1.8	3.2	6.6	105.9	0.6
12	AT&T	2.1	2.4	3.0	24.4	0.3
13	Autodesk	23.9	22.8	20.9	-8.2	2.0
14	C. Itoh Techno-Science*	5.7	6.2	7.3	17.0	0.7
15	CAD Distribution	0.8	0.6	0.7	15.6	0.1
16	Cadence	93.5	98.9	129.2	30.7	12.5
17	Cadis Software	-	0.4	1.2	200.0	0.1
18	CAE Plus	-	1.0	1.3	30.0	0.1
19	Cascade Design Automation	1.9	2.2	2.0	-9.5	0.2
20	Century Research Center	0.5	0.5	0.6	17.5	0.1
21	Chronology	1.4	1.9	1.9	-1.6	0.2
22	Compass Design Automation	24.0	20.1	23.2	15.2	2.3
23	Contec Microelectronics	2.7	3.0	3.4	13.8	0.3
24	CrossCheck Technology	6.5	6.2	7.0	12.9	0.7
25	Data I/O	5.8	5.8	5.8	-1.4	0.6
26	debis Systemhaus	0.3	0.2	0.2	1.4	0
27	Design Acceleration	0.8	2.0	3.1	53.8	0.3
28	Eagle Design Automation	-	0.5	0.5	-	0
29	EPIC Design Technology	4.8	9.7	24.8	155.5	2.4
30	Fintronic	1.4	1.4	1.7	19.7	0.2
31	Frontline Design Automation	-	1.5	3.5	133.3	0.3
32	Fujitsu*	3.2	3.6	4.2	15.9	0.4
33	Harris EDA	8.6	9.5	9.8	3.5	1.0
34	Hewlett-Packard	32.4	33.6	37.9	12.6	3.7
35	i-Logix	3.8	3.9	4.4	12.8	0.4
36	IBM	1.8	2.1	0.9	-59.1	0.1
37	IKOS Systems	18.1	18.6	25.7	38.1	2.5

(Continued)

Table B-2 (Continued)
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
All Electronic CAE Software Companies, Worldwide, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
38	Intergraph	13.7	11.6	14.5	25.1	1.4
39	InterHDL	0.5	1.3	1.5	15.4	0.1
40	Intusoft	0.8	1.4	2.2	58.8	0.2
41	ISD Software	0.3	0.4	0.3	-19.6	0
42	ISDATA	2.0	2.1	2.1	-1.7	0.2
43	ISKA	0.4	0.4	0.4	3.2	0
44	Kloeckner-Moeller	1.0	1.0	0.8	-16.9	0.1
45	LSI Logic	12.4	14.0	11.5	-17.6	1.1
46	LV Software	-	-	1.9	NA	0.2
47	MacNeal-Schwendler	0.8	2.8	3.5	24.2	0.3
48	Marubeni Hytech*	23.5	24.3	28.0	15.2	2.7
49	Mentor Graphics	100.1	100.1	108.0	7.8	10.5
50	Meta-Software	9.7	14.4	17.5	21.2	1.7
51	Microsim	5.8	11.9	13.3	12.0	1.3
52	Minc Software	3.1	6.0	10.0	65.7	1.0
53	Motorola	3.0	3.4	3.4	0.2	0.3
54	NEC	12.9	13.9	11.2	-19.7	1.1
55	Nextwave DA	0.4	0.5	1.5	200.0	0.1
56	Norlinvest Ltd.	1.3	0.6	0.7	1.9	0.1
57	Number One Systems	-	0.3	0.3	11.9	0
58	OEA International	0.6	0.8	0.9	22.2	0.1
59	Optem Engineering	0.4	0.5	0.6	12.4	0.1
60	OrCAD EDA	5.7	4.5	5.0	11.6	0.5
61	Pacific Numerics	1.0	1.1	3.1	176.8	0.3
62	PADS Software	1.0	1.1	1.3	16.7	0.1
63	PROCAD GmbH	2.6	0.7	0.8	4.2	0.1
64	Protel Technology	-	1.8	2.4	33.3	0.2
65	Quantic Laboratories	2.8	3.1	3.5	12.9	0.3
66	Quickturn Design Systems	49.5	59.0	70.6	19.6	6.8
67	Sagantec	-	1.2	1.3	9.0	0.1
68	Seiko*	10.0	9.6	9.0	-5.7	0.9
69	Serbi	0.8	0.8	0.9	13.9	0.1
70	SES Inc.	7.0	8.5	7.7	-8.9	0.8
71	Siemens Nixdorf Informationssysteme	1.3	1.0	-	-100.0	-
72	SIMUCAD	2.5	2.6	3.2	19.3	0.3
73	Simulation Technology	0.5	0.6	0.7	13.2	0.1
74	Softdesk	0.2	0.2	0.2	-26.1	0

(Continued)

Table B-2 (Continued)
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
All Electronic CAE Software Companies, Worldwide, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
75	Softronics	0.2	0.2	0.2	2.7	0
76	Sophia Systems*	3.1	3.2	2.9	-6.6	0.3
77	Speed	1.0	1.1	1.3	13.6	0.1
78	SpeedSim	-	-	1.3	NA	0.1
79	Star Informatic	0.8	0.8	0.3	-54.8	0
80	Summitt Design	9.2	14.6	16.5	13.2	1.6
81	Synopsys	112.9	142.7	193.5	35.6	18.8
82	Systems Science	1.8	2.3	2.7	18.1	0.3
83	T D Technology	1.8	2.0	2.3	13.2	0.2
84	Tanner Research	0.2	0.4	0.5	33.7	0.1
85	Technische Computer Systeme	1.1	1.1	0.9	-19.9	0.1
86	UniCAD	-	1.3	1.5	15.3	0.1
87	VEDA	4.7	3.1	3.3	4.8	0.3
88	Veritools	0.5	0.6	0.7	13.2	0.1
89	Viagrafix	0.5	0	0	-62.9	0
90	Viewlogic Systems	80.2	87.3	76.8	-12.0	7.5
91	VLSI Libraries	1.8	4.4	4.9	11.8	0.5
92	Wacom	11.8	10.6	10.1	-4.4	1.0
93	Xilinx Inc.	9.2	11.0	13.5	23.4	1.3
94	Yokogawa Digital Computer	-	0.4	0.5	11.9	0
95	Ziegler Informatics	2.6	0.3	0.3	-3.6	0
96	Zuken-Redac	19.0	12.3	11.8	-3.7	1.1
97	Zycad	32.8	39.8	36.8	-7.6	3.6
	All North American Companies	720.7	824.9	977.0	18.4	94.8
	All European Companies	22.7	17.5	16.2	-7.6	1.6
	All Asian Companies	46.7	40.4	37.2	-7.9	3.6
	All Companies	790.1	882.7	1,030.4	16.7	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table C-6
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top Electronic CAE Software Companies, Worldwide, All Operating Systems

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Sun Microsystems	34,595	-	553.4	194.7	748.1	26.1
2	Hewlett-Packard	12,715	37.9	297.2	56.8	391.9	13.7
3	Synopsys	-	193.5	-	91.1	284.6	9.9
4	Cadence	-	129.2	-	111.5	240.8	8.4
5	Mentor Graphics	217	108.0	5.4	100.0	213.4	7.4
6	Viewlogic Systems	-	76.8	-	44.2	121.0	4.2
7	IBM	10,847	0.9	100.0	6.9	108.0	3.8
8	Quickturn Design Systems	-	70.6	-	11.2	81.8	2.8
9	Zycad	147	36.8	-	14.3	51.1	1.8
10	NEC	2,134	11.2	18.1	6.5	46.0	1.6
11	Marubeni Hytech*	165	28.0	3.7	-	32.5	1.1
12	IKOS Systems	320	25.7	-	6.0	31.7	1.1
13	EPIC Design Technology	-	24.8	-	5.1	29.9	1.0
14	Compass Design Automation	-	23.2	-	4.7	27.9	1.0
15	Intergraph	846	14.5	5.4	4.7	26.1	0.9
16	Zuken-Redac	254	11.8	4.5	8.3	25.4	0.9
17	Meta-Software	-	17.5	-	7.8	25.3	0.9
18	Altera	-	20.0	-	5.0	25.0	0.9
19	Silicon Graphics	781	-	21.1	3.0	24.1	0.8
20	Digital Equipment	1,619	-	19.6	4.5	24.1	0.8
21	Autodesk	-	20.9	-	0.1	21.1	0.7
22	Seiko*	94	9.0	3.5	7.8	20.7	0.7
23	Analogy	-	16.0	-	4.0	20.0	0.7
24	Summitt Design	-	16.5	-	1.5	18.0	0.6
25	Xilinx Inc.	-	13.5	-	3.5	17.0	0.6
26	Harris EDA	77	9.8	1.2	5.1	16.2	0.6
27	Fujitsu*	287	4.2	7.3	3.9	15.5	0.5
28	LSI Logic	22	11.5	0.9	2.4	14.8	0.5
29	Sony	755	-	6.8	-	14.6	0.5
30	Wacom	396	10.1	2.3	1.7	14.1	0.5
	Other Companies	38,092	-	90.1	0.3	95.0	3.3
	All North American Companies	59,097	977.0	951.1	707.2	2,637.1	91.9
	All European Companies	276	16.2	1.6	3.7	21.7	0.8
	All Asian Companies	3,844	37.2	39.8	20.7	116.9	4.1
	All Companies	101,309	1,030.4	1,082.6	731.8	2,870.7	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table C-7
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top Electronic CAE Software Companies, Worldwide, UNIX

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Sun Microsystems	34,595	-	553.4	194.7	748.1	30.0
2	Hewlett-Packard	8,137	34.1	282.6	54.3	371.0	14.9
3	Synopsys	-	193.5	-	91.1	284.6	11.4
4	Cadence	-	129.2	-	111.5	240.8	9.7
5	Mentor Graphics	217	83.8	5.4	98.6	187.8	7.5
6	Quickturn Design Systems	-	70.6	-	11.2	81.8	3.3
7	Viewlogic Systems	-	50.7	-	30.3	81.0	3.3
8	IBM	2,840	0.9	72.4	6.9	80.4	3.2
9	Zycad	147	36.8	-	14.3	51.1	2.0
10	NEC	893	8.9	11.9	5.2	34.7	1.4
11	IKOS Systems	320	25.7	-	6.0	31.7	1.3
12	EPIC Design Technology	-	24.8	-	5.1	29.9	1.2
13	Compass Design Automation	-	23.2	-	4.7	27.9	1.1
14	Marubeni Hytech*	165	23.3	3.7	-	27.8	1.1
15	Zuken-Redac	254	11.8	4.5	8.3	25.4	1.0
16	Silicon Graphics	781	-	21.1	3.0	24.1	1.0
17	Meta-Software	-	16.4	-	7.4	23.8	1.0
18	Analogy	-	16.0	-	4.0	20.0	0.8
19	Summitt Design	-	15.8	-	1.5	17.3	0.7
20	Seiko*	94	7.0	2.7	6.0	16.0	0.6
21	Fujitsu*	287	4.2	7.3	3.9	15.5	0.6
22	LSI Logic	22	11.5	0.9	2.4	14.8	0.6
23	Sony	755	-	6.8	-	14.6	0.6
24	Xilinx Inc.	-	10.6	-	3.0	13.6	0.5
25	Harris EDA	35	7.2	0.7	4.7	12.7	0.5
26	Minc Software	-	8.4	-	3.4	11.8	0.5
27	C. Itoh Techno-Science*	122	7.0	2.9	-	10.4	0.4
28	Digital Equipment	419	-	6.8	1.8	8.6	0.3
29	SES Inc.	-	7.7	-	-	7.7	0.3
30	CrossCheck Technology	-	7.0	-	-	7.0	0.3
	All North American Companies	44,827	825.6	892.2	668.3	2,386.5	95.8
	All European Companies	47	8.7	0.7	3.1	12.7	0.5
	All Asian Companies	2,232	26.0	31.5	17.8	92.9	3.7
	All Companies	47,106	860.3	924.5	689.2	2,492.1	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table C-8
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top Electronic CAE Software Companies, Worldwide, Windows NT/Hybrid

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Intergraph	612	11.4	4.1	3.0	19.9	65.0
2	Seiko*	-	2.0	0.8	1.8	4.6	15.1
3	Altera	-	2.0	-	0.5	2.5	8.2
4	Hewlett-Packard	133	-	1.5	0.3	1.7	5.6
5	Intusoft	-	1.4	-	-	1.4	4.7
6	Viewlogic Systems	-	1.2	-	-	1.2	4.0
7	Ansoft	-	0.8	-	-	0.8	2.6
8	SIMUCAD	-	0.4	-	0	0.4	1.4
9	Fintronic	-	0.3	-	-	0.3	0.8
10	Digital Equipment	16	-	0.2	0.1	0.2	0.8
11	Frontline Design Automation	-	0.1	-	-	0.1	0.2
12	CAD Distribution	-	0	-	0	0	0.1
13	PADS Software	-	0	-	0	0	0.1
14	InterHDL	-	0	-	-	0	0.1
	Other Companies	236	-	2.3	-	2.3	7.7
	All North American Companies	761	17.2	5.8	3.9	28.2	92.2
	All European Companies	-	0	-	0	0	0.1
	All Asian Companies	-	-	-			-
	All Companies	997	17.2	8.1	3.9	30.5	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table C-9
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top Electronic CAE Software Companies, Worldwide, Personal Computer

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Viewlogic Systems	-	24.9	-	13.8	38.7	11.8
2	IBM	8,007	-	27.6	-	27.6	8.4
3	Mentor Graphics	-	24.2	-	1.4	25.6	7.8
4	Altera	-	18.0	-	4.5	22.5	6.9
5	Autodesk	-	19.7	-	0.1	19.8	6.1
6	Hewlett-Packard	4,445	3.8	13.1	2.3	19.2	5.8
7	Wacom	371	9.0	2.0	1.7	12.7	3.9
8	Microsim	-	11.4	-	0.6	12.0	3.7
9	NEC	1,240	2.2	6.2	1.3	11.3	3.4
10	Data I/O	-	5.8	-	2.3	8.1	2.5
11	OrCAD EDA	-	5.0	-	1.8	6.8	2.1
12	Marubeni Hytech*	-	4.6	-	-	4.6	1.4
13	Harris EDA	42	2.5	0.5	0.4	3.5	1.1
14	Xilinx Inc.	-	2.9	-	0.5	3.4	1.0
15	Intergraph	212	1.5	0.9	0.9	3.4	1.0
16	ACTEL	-	2.7	-	0.4	3.1	0.9
17	Digital Equipment	1,063	-	2.9	0.1	3.0	0.9
18	Sophia Systems*	29	2.1	0.6	-	2.6	0.8
19	Protel Technology	-	2.4	-	-	2.4	0.7
20	Minc Software	-	1.6	-	0.6	2.2	0.7
21	ALS Design	11	1.7	0.2	0.2	2.1	0.6
22	ALDEC	-	1.9	-	0.2	2.1	0.6
23	APTIX	17	1.6	-	0.1	1.8	0.5
24	PADS Software	-	1.2	-	0.5	1.7	0.5
25	Accel Technologies	-	1.2	-	0.5	1.7	0.5
26	ISDATA	-	1.5	-	0.1	1.6	0.5
27	Ansoft	-	1.6	-	-	1.6	0.5
28	ABB Industria*	53	0.6	0.4	0.1	1.5	0.4
29	Serbi	150	0.9	0.5	-	1.4	0.4
30	Chronology	-	1.1	-	0.2	1.3	0.4
	Other Companies	37,849	-	86.5	-	86.5	26.4
	All North American Companies	13,395	132.6	44.0	31.8	208.5	63.6
	All European Companies	229	7.4	0.9	0.5	8.9	2.7
	All Asian Companies	1,612	11.2	8.2	2.9	24.0	7.3
	All Companies	53,084	151.2	139.7	35.2	327.9	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (February 1996)

Table C-10
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top Electronic CAE Software Companies, Worldwide, Host/Proprietary

Rank	Company Name	CPU Software Shipments	CPU Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Digital Equipment	121	-	9.7	2.6	12.3	61.0
2	MacNeal-Schwendler	-	1.2	-	0.1	1.4	6.7
3	Meta-Software	-	0.3	-	0.2	0.5	2.5
4	Intergraph	-	-	-	0.4	0.4	1.9
5	C. Itoh Techno-Science*	3	0.2	0.1	-	0.3	1.7
6	Harris EDA	1	0.1	0	-	0.1	0.5
7	SIMUCAD	-	0.1	-	-	0.1	0.3
8	debis Systemhaus	0	0	-	0	0	0.1
	Other Companies	8	-	1.3	0.3	6.1	30.4
	All North American Companies	113	1.7	9.1	3.3	14.0	69.6
	All European Companies	0	0	-	0	0	0.1
	All Asian Companies	-	-	-			-
	All Companies	121	1.7	10.4	3.6	20.2	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (February 1996)

Table A-59
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, Worldwide, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	83.3	90.4	134.8	49.2	47.5
2	Mentor Graphics	26.4	35.5	33.0	-7.2	11.6
3	Avant!	7.6	16.4	32.3	97.2	11.4
4	Compass Design Automation	19.7	23.5	27.8	18.0	9.8
5	Okura*	10.8	14.3	17.0	18.6	6.0
6	Seiko*	9.6	9.9	11.8	18.9	4.2
7	High Level Design Systems	2.7	3.3	9.3	178.1	3.3
8	Cascade Design Automation	6.7	8.1	7.9	-2.2	2.8
9	Silicon Valley Research	5.9	5.3	6.4	20.5	2.3
10	Fujitsu*	4.8	5.5	6.3	15.9	2.2
11	Xilinx Inc.	5.3	5.9	5.9	-0.2	2.1
12	Sagantec	6.1	5.0	5.7	16.1	2.0
13	Cooper & Chyan Technology	-	1.9	2.9	57.2	1.0
14	Intergraph	1.7	1.5	2.6	80.6	0.9
15	TSSI Japan*	1.6	2.2	2.5	18.6	0.9
16	Marubeni Hytech*	1.2	1.5	1.7	18.5	0.6
17	LSI Logic	1.4	1.6	1.3	-14.1	0.5
18	Tanner Research	0.6	0.9	1.2	33.7	0.4
19	AT&T	-	0.3	0.4	24.4	0.1
	All North American Companies	156.7	191.8	261.9	36.6	92.2
	All European Companies	6.1	5.0	5.7	16.1	2.0
	All Asian Companies	14.5	14.0	16.3	16.9	5.8
	All Companies	177.3	210.7	284.0	34.8	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (February 1996)

Table A-60
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, Worldwide, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	83.3	90.4	134.8	49.2	48.4
2	Mentor Graphics	26.4	35.5	33.0	-7.2	11.8
3	Avant!	7.5	16.1	32.3	100.3	11.6
4	Compass Design Automation	19.7	23.5	27.8	18.0	10.0
5	Okura*	10.8	14.3	17.0	18.6	6.1
6	Seiko*	9.6	9.9	11.8	18.9	4.2
7	High Level Design Systems	2.7	3.3	9.3	178.1	3.3
8	Cascade Design Automation	6.7	8.1	7.9	-2.2	2.8
9	Silicon Valley Research	5.9	5.3	6.4	20.5	2.3
10	Sagantec	6.1	5.0	5.7	16.1	2.1
11	Fujitsu*	3.5	4.5	5.2	15.9	1.9
12	Xilinx Inc.	3.4	4.1	4.5	7.9	1.6
13	Cooper & Chyan Technology	-	1.9	2.9	57.2	1.0
14	TSSI Japan*	1.6	2.2	2.5	18.6	0.9
15	Marubeni Hytech*	1.2	1.5	1.7	18.5	0.6
16	LSI Logic	1.4	1.6	1.3	-14.1	0.5
17	AT&T	-	0.3	0.4	24.4	0.1
18	Intergraph	1.7	1.5	0.3	-80.7	0.1
19	Tanner Research	0.1	0.1	0.2	64.7	0.1
	All North American Companies	154.1	189.0	257.1	36.1	92.4
	All European Companies	6.1	5.0	5.7	16.1	2.1
	All Asian Companies	13.4	13.3	15.5	17.2	5.6
	All Companies	173.7	207.2	278.4	34.4	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (February 1996)

Table A-61
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, Worldwide, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	-	2.0	NA	100.0
	All North American Companies	-	-	2.0	NA	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	-	2.0	NA	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-62
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, Worldwide, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Xilinx Inc.	1.9	1.8	1.4	-19.2	40.3
2	Fujitsu*	1.4	1.0	1.1	15.9	32.1
3	Tanner Research	0.5	0.8	1.0	28.3	28.0
4	Intergraph	-	-	0.3	NA	8.7
5	Avant!	0.1	0.3	-	-100.0	-
	All North American Companies	2.6	2.8	2.7	-2.5	77.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	1.1	0.7	0.8	12.1	23.0
	All Companies	3.6	3.5	3.6	0.6	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-63
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, North America, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	42.4	44.2	70.2	58.8	50.5
2	Avant!	5.8	11.2	21.6	93.1	15.6
3	Mentor Graphics	15.5	18.9	15.7	-16.8	11.3
4	Compass Design Automation	6.7	8.0	9.4	18.0	6.8
5	High Level Design Systems	2.3	2.8	7.9	184.8	5.7
6	Xilinx Inc.	4.0	4.2	4.6	9.9	3.3
7	Cascade Design Automation	3.3	3.8	3.3	-15.1	2.3
8	Silicon Valley Research	3.3	2.5	3.1	20.5	2.2
9	Cooper & Chyan Technology	-	1.3	1.6	21.8	1.2
10	LSI Logic	0.8	0.9	1.1	18.6	0.8
11	Tanner Research	0.6	0.7	1.0	51.5	0.7
12	Sagantec	-	0.5	1.0	97.4	0.7
13	Intergraph	0.5	0.4	0.8	84.6	0.6
14	AT&T	-	0.3	0.3	24.4	0.2
	All North American Companies	82.9	97.2	138.0	42.0	99.3
	All European Companies	-	0.5	1.0	97.4	0.7
	All Asian Companies	-	-	-	NA	-
	All Companies	82.9	97.7	139.0	42.2	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-64
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, North America, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	42.4	44.2	70.2	58.8	51.5
2	Avant!	5.7	11.0	21.6	96.9	15.9
3	Mentor Graphics	15.5	18.9	15.7	-16.8	11.5
4	Compass Design Automation	6.7	8.0	9.4	18.0	6.9
5	High Level Design Systems	2.3	2.8	7.9	184.8	5.8
6	Xilinx Inc.	2.6	2.9	3.5	18.6	2.6
7	Cascade Design Automation	3.3	3.8	3.3	-15.1	2.4
8	Silicon Valley Research	3.3	2.5	3.1	20.5	2.3
9	Cooper & Chyan Technology	-	1.3	1.6	21.8	1.2
10	LSI Logic	0.8	0.9	1.1	18.6	0.8
11	Sagantec	-	0.5	1.0	97.4	0.7
12	AT&T	-	0.3	0.3	24.4	0.2
13	Tanner Research	0.1	0.1	0.2	86.7	0.1
14	Intergraph	0.5	0.4	0.1	-80.0	0.1
	All North American Companies	80.8	95.2	135.3	42.2	99.3
	All European Companies	-	0.5	1.0	97.4	0.7
	All Asian Companies	-	-	-	NA	-
	All Companies	80.8	95.7	136.3	42.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-65
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, North America, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	-	0.6	NA	100.0
	All North American Companies	-	-	0.6	NA	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	-	0.6	NA	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-66
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, North America, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Xilinx Inc.	1.4	1.3	1.1	-10.4	54.6
2	Tanner Research	0.5	0.6	0.8	45.4	41.0
3	Intergraph	-	-	0.1	NA	4.4
4	Avant!	0.1	0.2	-	-100.0	-
	All North American Companies	2.1	2.1	2.1	0.4	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	2.1	2.1	2.1	0.4	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-67
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, Europe, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	14.5	15.4	28.3	83.9	58.4
2	Mentor Graphics	3.4	6.0	7.0	17.2	14.5
3	Compass Design Automation	4.3	5.2	6.1	18.0	12.6
4	Sagantec	6.1	4.5	3.9	-12.3	8.1
5	Avant!	-	0.7	1.6	118.8	3.3
6	Cooper & Chyan Technology	-	0.2	0.7	293.0	1.5
7	Intergraph	0.5	0.4	0.7	87.0	1.4
8	Cascade Design Automation	0.6	0.6	0.6	2.3	1.3
9	Tanner Research	0	0.1	0.1	-10.9	0.3
10	Silicon Valley Research	0.4	0.1	0.1	20.5	0.1
11	Xilinx Inc.	0.4	0.5	-	-100.0	-
12	LSI Logic	0.3	0.3	-	-100.0	-
	All North American Companies	23.6	29.2	44.5	52.6	91.9
	All European Companies	6.1	4.5	3.9	-12.3	8.1
	All Asian Companies	-	-	-	NA	-
	All Companies	29.7	33.6	48.4	44.0	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-68
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, Europe, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	14.5	15.4	28.3	83.9	59.3
2	Mentor Graphics	3.4	6.0	7.0	17.2	14.8
3	Compass Design Automation	4.3	5.2	6.1	18.0	12.8
4	Sagantec	6.1	4.5	3.9	-12.3	8.2
5	Avant!	-	0.7	1.6	118.8	3.4
6	Cooper & Chyan Technology	-	0.2	0.7	293.0	1.5
7	Cascade Design Automation	0.6	0.6	0.6	2.3	1.3
8	Intergraph	0.5	0.4	0.1	-80.0	0.2
9	Silicon Valley Research	0.4	0.1	0.1	20.5	0.1
10	Tanner Research	0	0	0	9.8	0
11	Xilinx Inc.	0.3	0.4	-	-100.0	-
12	LSI Logic	0.3	0.3	-	-100.0	-
	All North American Companies	23.4	28.9	43.8	51.6	91.8
	All European Companies	6.1	4.5	3.9	-12.3	8.2
	All Asian Companies	-	-	-	NA	-
	All Companies	29.5	33.3	47.7	43.1	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-69
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, Europe, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	-	0.5	NA	100.0
	All North American Companies	-	-	0.5	NA	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	-	0.5	NA	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-70
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, Europe, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Tanner Research	-	0.1	0.1	-14.4	53.3
2	Intergraph	-	-	0.1	NA	46.7
3	Xilinx Inc.	0.1	0.2	-	-100.0	-
	All North American Companies	0.1	0.3	0.2	-32.2	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.1	0.3	0.2	-32.2	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-71
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, Japan, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	18.1	21.0	23.4	11.3	32.7
2	Okura*	10.8	14.3	17.0	18.6	23.7
3	Seiko*	9.6	9.9	11.5	15.7	16.0
4	Mentor Graphics	6.4	9.1	9.1	0.2	12.7
5	Compass Design Automation	5.3	6.4	7.5	18.0	10.5
6	Fujitsu*	4.8	5.5	6.3	15.9	8.8
7	Avant!	1.2	2.8	4.8	75.5	6.8
8	Cascade Design Automation	2.0	2.8	3.9	40.6	5.4
9	TSSI Japan*	1.6	2.2	2.5	18.6	3.6
10	Silicon Valley Research	1.8	2.0	2.4	20.5	3.4
11	Marubeni Hytech*	1.2	1.5	1.7	18.5	2.4
12	High Level Design Systems	0.5	0.6	1.4	145.4	1.9
13	Xilinx Inc.	0.9	1.2	1.3	8.8	1.8
14	Intergraph	0.6	0.6	1.0	78.0	1.4
15	Cooper & Chyan Technology	-	0.3	0.5	66.5	0.7
16	Sagantec	-	-	0.3	NA	0.4
17	LSI Logic	0.1	0.2	0.2	18.5	0.3
18	AT&T	-	0	0	24.4	0.1
19	Tanner Research	-	0.1	0	-55.4	0.1
	All North American Companies	36.0	46.7	55.3	18.5	77.2
	All European Companies	-	-	0.3	NA	0.4
	All Asian Companies	14.5	14.0	16.0	14.6	22.4
	All Companies	50.5	60.7	71.6	18.1	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

NA = Not applicable

Source: Dataquest (February 1996)

Table A-72
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, Japan, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	18.1	21.0	23.4	11.3	33.7
2	Okura*	10.8	14.3	17.0	18.6	24.4
3	Seiko*	9.6	9.9	11.5	15.7	16.5
4	Mentor Graphics	6.4	9.1	9.1	0.2	13.1
5	Compass Design Automation	5.3	6.4	7.5	18.0	10.8
6	Fujitsu*	3.5	4.5	5.2	15.9	7.5
7	Avant!	1.2	2.7	4.8	77.5	7.0
8	Cascade Design Automation	2.0	2.8	3.9	40.6	5.6
9	TSSI Japan*	1.6	2.2	2.5	18.6	3.7
10	Silicon Valley Research	1.8	2.0	2.4	20.5	3.5
11	Marubeni Hytech*	1.2	1.5	1.7	18.5	2.5
12	High Level Design Systems	0.5	0.6	1.4	145.4	2.0
13	Xilinx Inc.	0.6	0.8	1.0	18.6	1.4
14	Cooper & Chyan Technology	-	0.3	0.5	66.5	0.8
15	Sagantec	-	-	0.3	NA	0.4
16	LSI Logic	0.1	0.2	0.2	18.5	0.3
17	Intergraph	0.6	0.6	0.1	-81.4	0.1
18	AT&T	-	0	0	24.4	0.1
19	Tanner Research	-	0	0	-45.1	0
-	All North American Companies	35.7	46.2	54.1	17.1	77.7
	All European Companies	-	-	0.3	NA	0.4
	All Asian Companies	13.4	13.3	15.2	14.8	21.9
	All Companies	49.1	59.5	69.6	17.0	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-73
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, Japan, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	-	0.8	NA	100.0
	All North American Companies	-	-	0.8	NA	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	-	0.8	NA	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-74
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, Japan, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Fujitsu*	1.4	1.0	1.1	15.9	90.2
2	Xilinx Inc.	0.3	0.4	0.3	-14.1	24.1
3	Intergraph	-	-	0.1	NA	8.8
4	Tanner Research	-	0.1	0	-57.2	2.4
5	Avant!	0	0	-	-100.0	-
	All North American Companies	0.3	0.5	0.4	-2.2	35.2
	All European Companies	-	-	-	NA	-
	All Asian Companies	1.1	0.7	0.8	12.1	64.8
	All Companies	1.4	1.2	1.3	6.6	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-75
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, Asia/Pacific, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	7.8	9.2	12.1	31.6	50.4
2	Compass Design Automation	3.3	4.0	4.7	18.0	19.6
3	Avant!	0.6	1.7	4.2	150.4	17.5
4	Mentor Graphics	1.2	1.6	1.1	-27.9	4.7
5	Silicon Valley Research	0.4	0.7	0.8	20.5	3.5
6	Sagantec	-	-	0.6	NA	2.4
7	Seiko*	-	-	0.3	NA	1.3
8	Cascade Design Automation	0.7	0.9	0.2	-82.3	0.7
9	Intergraph	0.1	0.1	0.2	54.2	0.6
10	Cooper & Chyan Technology	-	0	0.1	57.2	0.2
11	Tanner Research	-	0	0	167.4	0.1
12	LSI Logic	0.1	0.1	-	-100.0	-
	All North American Companies	13.7	18.1	23.2	28.0	96.3
	All European Companies	-	-	0.6	NA	2.4
	All Asian Companies	-	-	0.3	NA	1.3
	All Companies	13.7	18.1	24.0	33.0	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-76
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, Asia/Pacific, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	7.8	9.2	12.1	31.6	50.7
2	Compass Design Automation	3.3	4.0	4.7	18.0	19.8
3	Avant!	0.6	1.7	4.2	151.9	17.6
4	Mentor Graphics	1.2	1.6	1.1	-27.9	4.7
5	Silicon Valley Research	0.4	0.7	0.8	20.5	3.5
6	Sagantec	-	-	0.6	NA	2.4
7	Seiko*	-	-	0.3	NA	1.3
8	Cascade Design Automation	0.7	0.9	0.2	-82.3	0.7
9	Cooper & Chyan Technology	-	0	0.1	57.2	0.2
10	Intergraph	0.1	0.1	0	-82.6	0.1
11	Tanner Research	-	0	0	229.4	0
12	LSI Logic	0.1	0.1	-	-100.0	-
	All North American Companies	13.7	18.1	23.0	27.3	96.3
	All European Companies	-	-	0.6	NA	2.4
	All Asian Companies	-	-	0.3	NA	1.3
	All Companies	13.7	18.1	23.9	32.3	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-77
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, Asia/Pacific, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	-	0.1	NA	100.0
	All North American Companies	-	-	0.1	NA	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	-	0.1	NA	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-78
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, Asia/Pacific, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Tanner Research	-	0	0	156.7	50.5
2	Intergraph	-	-	0	NA	49.5
3	Avant!	0	0	-	-100.0	-
	All North American Companies	0	0	0	119.0	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0	0	0	119.0	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-79
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, Rest of World, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	0.5	0.6	0.8	46.6	93.3
2	LSI Logic	0	0.1	0.1	17.4	7.9
	All North American Companies	0.5	0.6	0.9	43.7	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.5	0.6	0.9	43.7	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-80
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top IC Layout Software Companies, Rest of World, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	0.5	0.6	0.8	46.6	93.3
2	LSI Logic	0	0.1	0.1	17.4	7.9
	All North American Companies	0.5	0.6	0.9	43.7	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.5	0.6	0.9	43.7	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table B-3
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
All IC Layout Software Companies, Worldwide, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	AT&T	-	0.3	0.4	24.4	0.1
2	Avant!	7.6	16.4	32.3	97.2	11.4
3	Cadence	83.3	90.4	134.8	49.2	47.5
4	Cascade Design Automation	6.7	8.1	7.9	-2.2	2.8
5	Compass Design Automation	19.7	23.5	27.8	18.0	9.8
6	Cooper & Chyan Technology	-	1.9	2.9	57.2	1.0
7	Fujitsu*	4.8	5.5	6.3	15.9	2.2
8	High Level Design Systems	2.7	3.3	9.3	178.1	3.3
9	Intergraph	1.7	1.5	2.6	80.6	0.9
10	LSI Logic	1.4	1.6	1.3	-14.1	0.5
11	Marubeni Hytech*	1.2	1.5	1.7	18.5	0.6
12	Mentor Graphics	26.4	35.5	33.0	-7.2	11.6
13	Okura*	10.8	14.3	17.0	18.6	6.0
14	Sagantec	6.1	5.0	5.7	16.1	2.0
15	Seiko*	9.6	9.9	11.8	18.9	4.2
16	Silicon Valley Research	5.9	5.3	6.4	20.5	2.3
17	Tanner Research	0.6	0.9	1.2	33.7	0.4
18	TSSI Japan*	1.6	2.2	2.5	18.6	0.9
19	Xilinx Inc.	5.3	5.9	5.9	-0.2	2.1
	All North American Companies	156.7	191.8	261.9	36.6	92.2
	All European Companies	6.1	5.0	5.7	16.1	2.0
	All Asian Companies	14.5	14.0	16.3	16.9	5.8
	All Companies	177.3	210.7	284.0	34.8	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (February 1996)

Table C-11
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top IC Layout Software Companies, Worldwide, All Operating Systems

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Sun Microsystems	9,278	-	201.2	71.4	272.6	30.6
2	Cadence	-	134.8	-	116.4	251.2	28.2
3	Hewlett-Packard	2,767	-	72.7	9.7	82.4	9.3
4	Mentor Graphics	85	33.0	2.2	38.9	74.0	8.3
5	Avant!	-	32.3	-	5.7	38.0	4.3
6	Compass Design Automation	-	27.8	-	5.6	33.4	3.8
7	Seiko*	228	11.8	6.6	12.2	31.2	3.5
8	Digital Equipment	453	-	21.1	5.6	26.7	3.0
9	Fujitsu*	571	6.3	11.0	5.9	23.2	2.6
10	Okura*	-	17.0	-	-	17.0	1.9
11	IBM	606	-	15.2	1.3	16.5	1.9
12	Cascade Design Automation	-	7.9	-	6.2	14.3	1.6
13	High Level Design Systems	-	9.3	-	1.7	11.0	1.2
14	Silicon Valley Research	-	6.4	-	3.6	10.0	1.1
15	Sagantec	-	5.7	-	0.6	6.3	0.7
16	Xilinx Inc.	-	5.9	-	-	5.9	0.7
17	Intergraph	120	2.6	1.2	1.1	5.2	0.6
18	Cooper & Chyan Technology	-	2.9	-	0.5	3.4	0.4
19	Silicon Graphics	89	-	2.9	0.4	3.3	0.4
20	TSSI Japan*	-	2.5	-	-	2.5	0.3
21	Marubeni Hytech*	9	1.7	0.2	-	2.0	0.2
22	LSI Logic	2	1.3	0.1	0.3	1.7	0.2
23	Tanner Research	-	1.2	-	0.2	1.4	0.2
24	Sony	30	-	0.3	-	0.6	0.1
25	AT&T	-	0.4	-	0	0.4	0
26	NEC	-	-	-	0.2	0.2	0
	Other Companies	1,062	-	2.3	-	2.3	0.3
	All North American Companies	12,498	261.9	297.2	268.6	828.0	93.0
	All European Companies	-	5.7	-	0.6	6.3	0.7
	All Asian Companies	829	16.3	17.8	18.3	53.4	6.0
	All Companies	14,389	284.0	317.3	287.5	890.1	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table C-12
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top IC Layout Software Companies, Worldwide, UNIX

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Sun Microsystems	9,278	-	201.2	71.4	272.6	31.7
2	Cadence	-	134.8	-	116.4	251.2	29.2
3	Hewlett-Packard	2,767	-	72.7	9.7	82.4	9.6
4	Mentor Graphics	85	33.0	2.2	38.9	74.0	8.6
5	Avant!	-	32.3	-	5.7	38.0	4.4
6	Compass Design Automation	-	27.8	-	5.6	33.4	3.9
7	Seiko*	228	11.8	6.6	12.2	31.2	3.6
8	Fujitsu*	388	5.2	9.9	4.9	20.0	2.3
9	Okura*	-	17.0	-	-	17.0	2.0
10	IBM	602	-	15.2	1.3	16.5	1.9
11	Cascade Design Automation	-	7.9	-	6.2	14.3	1.7
12	High Level Design Systems	-	9.3	-	1.7	11.0	1.3
13	Silicon Valley Research	-	6.4	-	3.6	10.0	1.2
14	Digital Equipment	281	-	7.0	1.9	8.8	1.0
15	Sagantec	-	5.7	-	0.6	6.3	0.7
16	Xilinx Inc.	-	4.5	-	-	4.5	0.5
17	Cooper & Chyan Technology	-	2.9	-	0.5	3.4	0.4
18	Silicon Graphics	89	-	2.9	0.4	3.3	0.4
19	TSSI Japan*	-	2.5	-	-	2.5	0.3
20	Marubeni Hytech*	9	1.7	0.2	-	2.0	0.2
21	LSI Logic	2	1.3	0.1	0.3	1.7	0.2
22	Sony	30	-	0.3	-	0.6	0.1
23	Intergraph	3	0.3	0.1	0.1	0.5	0.1
24	AT&T	-	0.4	-	0	0.4	0
25	Tanner Research	-	0.2	-	0.1	0.3	0
26	NEC	-	-	-	0.2	0.2	0
	All North American Companies	12,217	257.1	282.8	263.7	803.7	93.4
	All European Companies	-	5.7	-	0.6	6.3	0.7
	All Asian Companies	646	15.5	16.7	17.3	50.5	5.9
	All Companies	12,863	278.4	299.5	281.6	860.5	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (February 1996)

Table C-13
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top IC Layout Software Companies, Worldwide, Windows NT/Hybrid

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Intergraph	77	2.0	0.9	0.8	4.0	100.0
	All North American Companies	77	2.0	0.9	0.8	4.0	100.0
	All European Companies	-	-	-			-
	All Asian Companies	-	-	-			-
	All Companies	77	2.0	0.9	0.8	4.0	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
Source: Dataquest (February 1996)

Table C-14
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top IC Layout Software Companies, Worldwide, Personal Computer

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Fujitsu*	183	1.1	1.1	1.0	3.2	38.2
2	Xilinx Inc.	-	1.4	-	-	1.4	16.9
3	Tanner Research	-	1.0	-	0.1	1.1	13.1
4	Intergraph	40	0.3	0.2	0.2	0.7	8.3
5	IBM	4	-	0	-	0	0.2
	Other Companies	1,062	-	2.3	-	2.3	27.2
	All North American Companies	44	2.7	0.2	0.3	3.3	38.4
	All European Companies	-	-	-			-
	All Asian Companies	183	0.8	1.1	1.0	2.9	34.4
	All Companies	1,289	3.6	3.6	1.3	8.5	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (February 1996)

Table C-15
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top IC Layout Software Companies, Worldwide, Host/Proprietary

Rank	Company Name	CPU Software Shipments	CPU Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Digital Equipment	173	-	14.2	3.7	17.9	104.8
2	Intergraph	-	-	-	0.1	0.1	0.5
	All North American Companies	160	-	13.3	3.8	17.1	100.0
	All European Companies	-	-	-			-
	All Asian Companies	-	-	-			-
	All Companies	160	-	13.3	3.8	17.1	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
Source: Dataquest (February 1996)

Table A-81
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Worldwide, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Zuken-Redac	52.0	54.7	60.1	9.8	22.5
2	Mentor Graphics	40.4	41.0	42.0	2.6	15.8
3	Yokogawa Digital Computer	18.0	21.0	23.5	11.9	8.8
4	CADIX	15.5	18.3	20.3	11.1	7.6
5	Fujitsu*	12.9	14.6	16.9	15.9	6.3
6	Cadence	17.1	16.5	16.9	2.0	6.3
7	Harris EDA	12.0	11.8	11.8	0.7	4.4
8	Cooper & Chyan Technology	5.8	7.4	11.7	57.2	4.4
9	PADS Software	9.2	9.7	11.3	16.7	4.3
10	Intergraph	9.6	6.9	8.0	15.6	3.0
11	Toshiba*	5.8	6.1	6.7	11.0	2.5
12	Accel Technologies	2.6	3.3	5.0	53.7	1.9
13	OrCAD EDA	3.6	4.5	5.0	11.6	1.9
14	NEC	8.6	8.5	4.4	-47.7	1.7
15	C. Itoh Techno-Science*	3.5	3.9	4.3	10.8	1.6
16	Norlinvest Ltd.	3.7	3.9	4.0	1.9	1.5
17	Protel Technology	-	2.7	3.6	33.3	1.3
18	UniCAD	-	3.0	3.4	15.3	1.3
19	Hitachi	3.1	3.1	3.4	7.0	1.3
20	Pacific Numerics	3.9	3.9	3.1	-21.3	1.2
21	Sharp*	2.8	2.9	3.0	2.6	1.1
22	CAD-UL	2.8	2.7	2.9	5.8	1.1
23	IBM	9.9	9.7	2.7	-72.5	1.0
24	Altium*	9.9	9.7	2.7	-72.5	1.0
25	ULTImate Technology	1.8	1.9	2.1	11.4	0.8
26	Uchida Yoko	2.3	1.4	1.6	12.5	0.6
27	Wacom	1.3	1.5	1.4	-8.9	0.5
28	Sumisho Electronics*	1.2	1.3	1.3	0.6	0.5
29	TECHSPERT*	0.6	1.5	1.2	-18.9	0.4
30	Royal Digital Centers	1.5	0.9	1.0	14.1	0.4
	All North American Companies	111.5	117.7	120.1	2.0	45.0
	All European Companies	13.4	9.2	9.8	7.4	3.7
	All Asian Companies	120.1	128.9	136.8	6.1	51.3
	All Companies	245.0	255.8	266.7	4.3	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table A-82
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Worldwide, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Zuken-Redac	49.2	52.7	57.1	8.3	26.6
2	Mentor Graphics	40.4	41.0	42.0	2.6	19.6
3	Yokogawa Digital Computer	18.0	21.0	23.5	11.9	10.9
4	CADIX	15.5	18.3	20.3	11.1	9.5
5	Cadence	17.1	16.5	16.9	2.0	7.9
6	Fujitsu*	12.3	13.8	16.0	15.9	7.5
7	Harris EDA	11.7	11.6	11.7	1.1	5.5
8	Cooper & Chyan Technology	5.6	5.3	8.3	57.2	3.9
9	Toshiba*	5.8	6.1	6.7	11.0	3.1
10	C. Itoh Techno-Science*	3.3	3.8	4.2	11.4	2.0
11	NEC	7.0	6.8	3.5	-48.5	1.6
12	UniCAD	-	3.0	3.4	15.3	1.6
13	Pacific Numerics	3.6	3.6	3.1	-14.6	1.4
14	Sharp*	2.8	2.9	3.0	2.6	1.4
15	Hitachi	2.1	2.2	2.5	11.0	1.2
16	Uchida Yoko	2.0	1.4	1.6	12.5	0.8
17	Royal Digital Centers	1.5	0.9	1.0	14.1	0.5
18	Sumisho Electronics*	0.8	0.9	0.9	11.0	0.4
19	Intergraph	8.8	4.8	0.9	-82.1	0.4
20	Seiko*	-	-	0.7	NA	0.3
21	Sophia Systems*	0.5	0.6	0.6	11.2	0.3
22	Omron	0.8	0.9	0.6	-31.4	0.3
23	Century Research Center	0.4	0.4	0.4	11.0	0.2
24	CAD-UL	0.6	0.4	0.4	3.9	0.2
25	AT&T	0.2	0.3	0.4	24.4	0.2
26	Accel Technologies	-	-	0.3	NA	0.1
27	PADS Software	1.0	1.0	0.2	-76.7	0.1
28	ICL	0.2	0.2	0.2	11.8	0.1
29	Wacom	0.1	0.1	0.1	11.3	0.1
30	Computervision	2.1	1.0	-	-100.0	-
	All North American Companies	85.8	85.3	83.8	-1.8	39.1
	All European Companies	3.0	0.6	0.6	6.0	0.3
	All Asian Companies	112.7	122.4	130.1	6.3	60.7
	All Companies	201.5	208.3	214.5	3.0	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-83
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Worldwide, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	1.3	6.2	374.8	96.5
2	PADS Software	-	0.4	0.2	-41.7	3.5
3	Seiko*	-	-	0.2	NA	3.1
	All North American Companies	-	1.7	6.4	279.3	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	1.7	6.4	279.3	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-84
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Worldwide, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	PADS Software	8.2	8.4	10.9	30.2	24.3
2	OrCAD EDA	3.4	4.5	5.0	11.6	11.1
3	Accel Technologies	2.6	3.3	4.8	46.0	10.7
4	Norlinvest Ltd.	3.7	3.9	4.0	1.9	8.9
5	Protel Technology	-	2.7	3.6	33.3	8.0
6	Cooper & Chyan Technology	0.2	2.2	3.4	57.2	7.5
7	Zuken-Redac	2.8	2.0	3.0	50.5	6.7
8	IBM	9.9	9.7	2.7	-72.5	5.9
9	Altium*	9.9	9.7	2.7	-72.5	5.9
10	CAD-UL	2.2	2.3	2.5	6.1	5.5
11	ULTImate Technology	1.8	1.9	2.1	11.4	4.6
12	Wacom	1.2	1.4	1.3	-10.5	2.8
13	TECHSPERT*	0.6	1.5	1.2	-18.9	2.6
14	Intergraph	0.8	0.8	0.9	19.5	2.1
15	NEC	1.6	1.7	0.9	-44.7	2.1
16	Andor*	0.8	1.0	0.8	-16.6	1.8
17	ALS Design	0.8	0.6	0.8	29.0	1.7
18	Hitachi	0.7	0.7	0.7	-1.8	1.6
19	Number One Systems	-	0.4	0.4	11.9	1.0
20	Sumisho Electronics*	0.4	0.5	0.4	-19.1	0.8
21	Ziegler Informatics	2.2	0.3	0.4	4.9	0.8
22	Sophia Systems*	0.3	0.4	0.3	-18.1	0.7
23	ABB Industria*	0.2	0.2	0.2	12.1	0.5
24	Softdesk	0.1	0.1	0.1	-26.1	0.1
25	Pacific Numerics	0.3	0.3	-	-100.0	-
26	Graphsoft	-	0	-	-100.0	-
	All North American Companies	25.3	30.5	29.7	-2.5	66.2
	All European Companies	10.1	8.6	9.2	7.5	20.6
	All Asian Companies	6.6	5.8	5.9	1.6	13.2
	All Companies	42.1	44.9	44.9	-0.1	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table A-85
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Worldwide, Host/Proprietary

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Fujitsu*	0.6	0.7	0.8	15.9	89.7
2	Hitachi	0.3	0.2	0.2	-7.0	18.8
3	Harris EDA	0.3	0.2	0.2	-20.9	16.8
4	C. Itoh Techno-Science*	0.2	0.1	0.1	-5.5	13.1
	All North American Companies	0.3	0.2	0.2	-20.9	16.8
	All European Companies	-	-	-	NA	-
	All Asian Companies	0.8	0.7	0.8	7.1	83.2
	All Companies	1.3	0.9	0.9	1.1	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-86
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, North America, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Mentor Graphics	25.7	24.2	23.5	-2.9	33.4
2	Cadence	7.7	7.1	8.8	22.9	12.5
3	Cooper & Chyan Technology	4.4	5.3	6.4	21.8	9.2
4	PADS Software	4.2	5.0	5.9	16.7	8.4
5	Intergraph	6.0	4.3	5.0	16.2	7.2
6	Harris EDA	5.0	4.6	5.0	8.2	7.1
7	OrCAD EDA	2.6	2.8	3.7	29.3	5.2
8	Accel Technologies	1.8	2.1	3.5	63.1	5.0
9	Zuken-Redac	3.4	4.3	3.1	-27.6	4.4
10	UniCAD	-	2.2	2.5	10.7	3.5
11	Protel Technology	-	1.3	1.8	33.3	2.5
12	Pacific Numerics	3.4	3.4	1.2	-63.6	1.8
13	CADIX	-	-	1.0	NA	1.4
14	Royal Digital Centers	1.3	0.8	0.9	18.1	1.3
15	Norlinvest Ltd.	0.4	0.4	0.4	1.9	0.6
16	AT&T	0.2	0.3	0.3	24.4	0.5
17	IBM	1.4	1.1	0.3	-72.5	0.4
18	Altium*	1.4	1.1	0.3	-72.5	0.4
19	Yokogawa Digital Computer	0.2	0.2	0.2	11.9	0.3
20	Softdesk	0.1	0.1	0.1	-16.2	0.1
21	ULTImate Technology	0	0.1	0.1	6.1	0.1
22	Number One Systems	-	0	0.1	11.9	0.1
23	ALS Design	0	0	0	23.1	0
24	Computervision	1.1	0.7	-	-100.0	-
25	Graphsoft	-	0	-	-100.0	-
	All North American Companies	60.2	61.8	65.4	5.7	93.2
	All European Companies	1.6	0.4	0.4	3.8	0.6
	All Asian Companies	3.6	4.5	4.4	-3.3	6.2
	All Companies	65.5	66.8	70.2	5.1	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-87
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, North America, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Mentor Graphics	25.7	24.2	23.5	-2.9	47.8
2	Cadence	7.7	7.1	8.8	22.9	17.9
3	Harris EDA	4.9	4.5	4.9	8.9	10.0
4	Cooper & Chyan Technology	4.2	3.7	4.6	21.8	9.3
5	Zuken-Redac	2.7	3.9	2.9	-27.1	5.8
6	UniCAD	-	2.2	2.5	10.7	5.0
7	Pacific Numerics	3.1	3.1	1.2	-60.0	2.5
8	CADIX	-	-	1.0	NA	2.1
9	Royal Digital Centers	1.3	0.8	0.9	18.1	1.9
10	Intergraph	5.5	3.0	0.5	-81.9	1.1
11	AT&T	0.2	0.3	0.3	24.4	0.7
12	Yokogawa Digital Computer	0.2	0.2	0.2	11.9	0.5
13	Accel Technologies	-	-	0.2	NA	0.4
14	PADS Software	0.5	0.5	0.1	-76.7	0.2
15	Computervision	1.1	0.7	-	-100.0	-
	All North American Companies	49.7	47.6	45.0	-5.5	91.6
	All European Companies	-	-	-	NA	-
	All Asian Companies	2.9	4.1	4.1	-0.5	8.4
	All Companies	53.6	51.7	49.1	-5.1	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-88
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, North America, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	0.8	3.9	379.3	97.1
2	PADS Software	-	0.2	0.1	-41.7	2.9
	All North American Companies	-	1.0	4.0	295.7	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	1.0	4.0	295.7	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-89
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, North America, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	PADS Software	3.7	4.3	5.7	30.2	33.3
2	OrCAD EDA	2.5	2.8	3.7	29.3	21.5
3	Accel Technologies	1.8	2.1	3.3	55.0	19.4
4	Cooper & Chyan Technology	0.1	1.5	1.9	21.8	11.0
5	Protel Technology	-	1.3	1.8	33.3	10.4
6	Intergraph	0.5	0.5	0.6	17.0	3.4
7	Norlinvest Ltd.	0.4	0.4	0.4	1.9	2.4
8	IBM	1.4	1.1	0.3	-72.5	1.7
9	Altium*	1.4	1.1	0.3	-72.5	1.7
10	Zuken-Redac	0.7	0.4	0.3	-32.8	1.6
11	Softdesk	0.1	0.1	0.1	-16.2	0.4
12	ULTImate Technology	0	0.1	0.1	6.1	0.3
13	Number One Systems	-	0	0.1	11.9	0.3
14	ALS Design	0	0	0	23.1	0
15	Pacific Numerics	0.3	0.3	-	-100.0	-
16	Graphsoft	-	0	-	-100.0	-
	All North American Companies	10.4	13.1	16.3	24.1	95.9
	All European Companies	0.5	0.4	0.4	3.8	2.6
	All Asian Companies	0.7	0.4	0.3	-32.8	1.6
	All Companies	11.6	13.9	17.0	21.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (February 1996)

Table A-90
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, North America, Host/Proprietary

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Harris EDA	0.1	0.1	0.1	-25.1	100.0
	All North American Companies	0.1	0.1	0.1	-25.1	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.3	0.1	0.1	-25.1	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-91
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Europe, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Mentor Graphics	9.1	10.3	13.5	31.0	31.5
2	Zuken-Redac	9.5	7.4	6.5	-11.6	15.3
3	Harris EDA	3.9	3.6	3.3	-10.2	7.6
4	Cadence	3.3	3.1	2.9	-3.4	6.9
5	Cooper & Chyan Technology	0.2	0.7	2.9	293.0	6.8
6	Norlinvest Ltd.	2.8	2.7	2.7	1.9	6.4
7	CAD-UL	2.6	2.5	2.7	6.8	6.3
8	Intergraph	2.5	1.8	2.1	17.7	4.9
9	ULTImate Technology	1.4	1.6	1.8	11.6	4.2
10	PADS Software	1.1	1.5	1.7	16.7	4.0
11	Protel Technology	-	0.6	0.8	33.3	1.9
12	ALS Design	0.8	0.6	0.7	29.0	1.8
13	OrCAD EDA	0.6	1.1	0.6	-41.9	1.5
14	Accel Technologies	0.4	0.5	0.6	22.9	1.4
15	IBM	2.0	1.7	0.5	-72.5	1.1
16	Altium*	2.0	1.7	0.5	-72.5	1.1
17	Number One Systems	-	0.3	0.4	11.9	0.8
18	Ziegler Informatics	2.2	0.3	0.3	3.3	0.8
19	Pacific Numerics	0.5	0.5	0.3	-41.5	0.7
20	ABB Industria*	0.2	0.2	0.2	12.1	0.5
21	UniCAD	-	0.7	0.2	-76.9	0.4
22	ICL	0.2	0.2	0.2	11.8	0.4
23	Computervision	0.9	0.3	-	-100.0	-
24	Softdesk	0	0	-	-100.0	-
25	Graphsoft	-	0	-	-100.0	-
	All North American Companies	24.2	26.0	28.0	7.7	65.4
	All European Companies	9.4	7.6	8.2	8.3	19.2
	All Asian Companies	9.5	7.4	6.5	-11.6	15.3
	All Companies	43.1	41.0	42.7	4.3	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table A-92
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Europe, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Mentor Graphics	9.1	10.3	13.5	31.0	49.2
2	Zuken-Redac	7.4	6.2	5.4	-13.3	19.6
3	Harris EDA	3.8	3.6	3.2	-10.4	11.8
4	Cadence	3.3	3.1	2.9	-3.4	10.7
5	Cooper & Chyan Technology	0.2	0.5	2.1	293.0	7.6
6	CAD-UL	0.5	0.4	0.4	2.7	1.4
7	Pacific Numerics	0.5	0.5	0.3	-41.5	1.1
8	Intergraph	2.4	1.2	0.2	-81.9	0.8
9	UniCAD	-	0.7	0.2	-76.9	0.6
10	ICL	0.2	0.2	0.2	11.8	0.6
11	PADS Software	0.1	0.1	0	-76.7	0.1
12	Accel Technologies	-	-	0	NA	0.1
13	Computervision	0.9	0.3	-	-100.0	-
	All North American Companies	20.0	20.1	21.5	6.9	78.3
	All European Companies	1.0	0.5	0.6	5.3	2.0
	All Asian Companies	7.4	6.2	5.4	-13.3	19.6
	All Companies	28.4	26.8	27.4	2.2	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-93
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Europe, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	0.3	1.6	379.3	97.9
2	PADS Software	-	0.1	0	-41.7	2.1
	All North American Companies	-	0.4	1.6	316.7	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	0.4	1.6	316.7	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-94
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Europe, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Norlinvest Ltd.	2.8	2.7	2.7	1.9	20.0
2	CAD-UL	2.1	2.1	2.3	7.5	16.8
3	ULTImate Technology	1.4	1.6	1.8	11.6	13.1
4	PADS Software	1.0	1.3	1.6	30.2	12.0
5	Zuken-Redac	2.1	1.2	1.2	-3.2	8.5
6	Cooper & Chyan Technology	0	0.2	0.8	293.0	6.2
7	Protel Technology	-	0.6	0.8	33.3	5.8
8	ALS Design	0.8	0.6	0.7	29.0	5.5
9	OrCAD EDA	0.6	1.1	0.6	-41.9	4.6
10	Accel Technologies	0.4	0.5	0.6	16.8	4.2
11	IBM	2.0	1.7	0.5	-72.5	3.5
12	Altium*	2.0	1.7	0.5	-72.5	3.5
13	Number One Systems	-	0.3	0.4	11.9	2.6
14	Ziegler Informatics	2.2	0.3	0.3	3.3	2.5
15	Intergraph	0.2	0.2	0.3	30.2	1.9
16	ABB Industria*	0.2	0.2	0.2	12.1	1.6
17	Softdesk	0	0	-	-100.0	-
18	Graphsoft	-	0	-	-100.0	-
	All North American Companies	4.0	5.5	4.8	-11.7	35.3
	All European Companies	8.4	7.1	7.7	8.5	56.2
	All Asian Companies	2.1	1.2	1.2	-3.2	8.5
	All Companies	14.6	13.7	13.6	-0.6	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (February 1996)

Table A-95
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Europe, Host/Proprietary

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Harris EDA	0.1	0	0	2.5	100.0
	All North American Companies	0.1	0	0	2.5	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.1	0	0	2.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-96
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Japan, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Zuken-Redac	36.7	39.9	46.1	15.6	33.4
2	Yokogawa Digital Computer	17.5	20.1	22.5	11.9	16.3
3	CADIX	15.5	18.3	18.3	0	13.2
4	Fujitsu*	12.9	14.6	16.9	15.9	12.2
5	Toshiba*	5.8	6.1	6.7	11.0	4.9
6	NEC	8.6	8.5	4.4	-47.7	3.2
7	C. Itoh Techno-Science*	3.5	3.9	4.3	10.8	3.1
8	Harris EDA	2.8	3.2	3.6	11.2	2.6
9	Cadence	4.2	4.3	3.5	-18.7	2.5
10	Hitachi	3.1	3.1	3.4	7.0	2.4
11	PADS Software	3.4	2.3	2.7	16.7	1.9
12	Mentor Graphics	2.5	3.2	2.5	-22.0	1.8
13	Sharp*	2.3	2.3	2.4	2.6	1.7
14	Cooper & Chyan Technology	1.2	1.3	2.1	66.5	1.5
15	IBM	6.0	6.2	1.7	-72.5	1.2
16	Altium*	6.0	6.2	1.7	-72.5	1.2
17	Uchida Yoko	2.3	1.4	1.6	12.5	1.2
18	Wacom	1.3	1.5	1.4	-8.9	1.0
19	Sumisho Electronics*	1.2	1.3	1.3	0.6	0.9
20	TECHSPERT*	0.6	1.5	1.2	-18.9	0.9
21	Pacific Numerics	-	-	0.9	NA	0.7
22	Sophia Systems*	0.8	0.9	0.9	-0.4	0.7
23	Seiko*	-	-	0.9	NA	0.6
24	Andor*	0.8	1.0	0.8	-16.6	0.6
25	Intergraph	0.7	0.6	0.7	12.0	0.5
26	UniCAD	-	-	0.6	NA	0.4
27	Omron	0.8	0.9	0.6	-31.4	0.4
28	Century Research Center	0.4	0.4	0.4	11.0	0.3
29	Protel Technology	-	0.3	0.4	33.3	0.3
30	OrCAD EDA	0.2	0.4	0.4	18.6	0.3
	All North American Companies	20.0	21.3	18.5	-13.4	13.4
	All European Companies	1.8	0.3	0.3	2.8	0.2
	All Asian Companies	103.6	112.7	119.2	5.8	86.4
	All Companies	125.4	134.3	138.0	2.8	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-97
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Japan, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Zuken-Redac	36.7	39.8	44.8	12.7	35.5
2	Yokogawa Digital Computer	17.5	20.1	22.5	11.9	17.8
3	CADIX	15.5	18.3	18.3	0	14.5
4	Fujitsu*	12.3	13.8	16.0	15.9	12.7
5	Toshiba*	5.8	6.1	6.7	11.0	5.3
6	C. Itoh Techno-Science*	3.3	3.8	4.2	11.4	3.3
7	Harris EDA	2.8	3.2	3.6	11.4	2.8
8	Cadence	4.2	4.3	3.5	-18.7	2.8
9	NEC	7.0	6.8	3.5	-48.5	2.8
10	Hitachi	2.1	2.2	2.5	11.0	2.0
11	Mentor Graphics	2.5	3.2	2.5	-22.0	2.0
12	Sharp*	2.3	2.3	2.4	2.6	1.9
13	Uchida Yoko	2.0	1.4	1.6	12.5	1.3
14	Cooper & Chyan Technology	1.1	0.9	1.5	66.5	1.2
15	Sumisho Electronics*	0.8	0.9	0.9	11.0	0.7
16	Pacific Numerics	-	-	0.9	NA	0.7
17	Seiko*	-	-	0.7	NA	0.5
18	Sophia Systems*	0.5	0.6	0.6	11.2	0.5
19	UniCAD	-	-	0.6	NA	0.5
20	Omron	0.8	0.9	0.6	-31.4	0.5
21	Century Research Center	0.4	0.4	0.4	11.0	0.4
22	Wacom	0.1	0.1	0.1	11.3	0.1
23	Intergraph	0.7	0.4	0.1	-83.2	0.1
24	PADS Software	0.4	0.2	0.1	-76.7	0
25	AT&T	-	0	0	24.4	0
26	Accel Technologies	-	-	0	NA	0
27	CAD-UL	0	0	0	9.5	0
	All North American Companies	10.4	11.7	12.0	3.0	9.5
	All European Companies	1.0	0	0	9.5	0
	All Asian Companies	99.0	108.0	114.3	5.8	90.5
	All Companies	110.4	119.7	126.4	5.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-98
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Japan, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	0.1	0.5	365.9	90.6
2	Seiko*	-	-	0.2	NA	35.1
3	PADS Software	-	0.1	0.1	-41.7	9.4
	All North American Companies	-	0.2	0.6	181.2	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	0.2	0.6	181.2	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-99
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Japan, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	PADS Software	3.0	2.0	2.6	30.2	25.1
2	IBM	6.0	6.2	1.7	-72.5	16.6
3	Altium*	6.0	6.2	1.7	-72.5	16.6
4	Zuken-Redac	-	0.1	1.3	1,163.9	12.3
5	Wacom	1.2	1.4	1.3	-10.5	12.3
6	TECHSPERT*	0.6	1.5	1.2	-18.9	11.6
7	NEC	1.6	1.7	0.9	-44.7	9.1
8	Andor*	0.8	1.0	0.8	-16.6	7.8
9	Hitachi	0.7	0.7	0.7	-1.8	6.8
10	Cooper & Chyan Technology	0	0.4	0.6	66.5	5.9
11	Protel Technology	-	0.3	0.4	33.3	4.2
12	OrCAD EDA	0.2	0.4	0.4	18.6	4.1
13	Sumisho Electronics*	0.4	0.5	0.4	-19.1	3.6
14	Sophia Systems*	0.3	0.4	0.3	-18.1	3.0
15	Accel Technologies	0.3	0.3	0.3	-12.4	2.8
16	ULTImate Technology	0.4	0.1	0.2	2.7	1.5
17	Norlinvest Ltd.	0.1	0.1	0.1	1.9	0.8
18	Intergraph	0.1	0.1	0.1	10.1	0.7
19	CAD-UL	0.1	0.1	0.1	2.7	0.6
20	Number One Systems	-	0	0	11.9	0
21	Softdesk	0	0	0	-19.5	0
22	Graphsoft	-	0	-	-100.0	-
	All North American Companies	9.5	9.4	5.8	-38.1	56.7
	All European Companies	0.7	0.3	0.3	2.5	2.7
	All Asian Companies	3.8	3.9	4.2	6.3	40.6
	All Companies	14.0	13.6	10.3	-24.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (February 1996)

Table A-100
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Japan, Host/Proprietary

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Fujitsu*	0.6	0.7	0.8	15.9	102.3
2	Hitachi	0.3	0.2	0.2	-7.0	21.4
3	C. Itoh Techno-Science*	0.2	0.1	0.1	-5.5	14.9
4	Harris EDA	0.1	0	0	-5.8	5.1
	All North American Companies	0.1	0	0	-5.8	5.1
	All European Companies	-	-	-	NA	-
	All Asian Companies	0.8	0.7	0.8	7.1	94.9
	All Companies	0.9	0.8	0.8	6.4	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-101
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Asia/Pacific, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Zuken-Redac	2.5	3.1	4.3	39.5	29.2
2	Mentor Graphics	3.1	3.3	2.6	-20.9	17.5
3	Cadence	1.8	1.9	1.5	-20.2	10.2
4	CADIX	-	-	1.0	NA	6.8
5	PADS Software	0.4	0.7	0.9	16.7	5.7
6	Yokogawa Digital Computer	0.4	0.6	0.7	11.9	4.7
7	Pacific Numerics	-	-	0.6	NA	4.2
8	Protel Technology	-	0.5	0.6	33.3	4.1
9	Norlinvest Ltd.	0.2	0.6	0.6	1.9	4.0
10	Sharp*	0.6	0.6	0.6	2.6	4.0
11	Accel Technologies	0.1	0.2	0.5	130.5	3.1
12	Cooper & Chyan Technology	0.1	0.1	0.2	57.2	1.6
13	OrCAD EDA	0.1	0.2	0.2	11.6	1.3
14	IBM	0.6	0.7	0.2	-72.5	1.3
15	Altium*	0.6	0.7	0.2	-72.5	1.3
16	UniCAD	-	-	0.2	NA	1.2
17	Intergraph	0.2	0.2	0.2	-2.9	1.0
18	CAD-UL	0.1	0.1	0.1	-17.8	0.7
19	Royal Digital Centers	0.1	0.1	0.1	68.7	0.6
20	ULTImate Technology	0.1	0	0.1	35.1	0.3
21	Ziegler Informatics	0	0	0	52.3	0.1
22	Number One Systems	-	0	0	11.9	0.1
23	Harris EDA	0.3	0.3	-	-100.0	-
24	Softdesk	0	0	-	-100.0	-
	All North American Companies	6.5	8.0	7.6	-5.1	50.9
	All European Companies	0.3	0.6	0.6	0.8	4.4
	All Asian Companies	3.4	4.3	6.7	54.1	44.8
	All Companies	10.3	12.9	14.9	15.0	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-102
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Asia/Pacific, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Zuken-Redac	2.5	2.8	4.0	43.1	35.0
2	Mentor Graphics	3.1	3.3	2.6	-20.9	22.7
3	Cadence	1.8	1.9	1.5	-20.2	13.2
4	CADIX	-	-	1.0	NA	8.8
5	Yokogawa Digital Computer	0.4	0.6	0.7	11.9	6.1
6	Pacific Numerics	-	-	0.6	NA	5.4
7	Sharp*	0.6	0.6	0.6	2.6	5.2
8	UniCAD	-	-	0.2	NA	1.5
9	Cooper & Chyan Technology	0.1	0.1	0.2	57.2	1.4
10	Royal Digital Centers	0.1	0.1	0.1	68.7	0.8
11	CAD-UL	0	0	0	23.2	0.2
12	Accel Technologies	-	-	0	NA	0.2
13	Intergraph	0.2	0.1	0	-84.3	0.2
14	PADS Software	0	0.1	0	-76.7	0.1
15	Harris EDA	0.2	0.3	-	-100.0	-
	All North American Companies	5.4	5.7	5.1	-10.3	44.6
	All European Companies	0	0	0	23.2	0.2
	All Asian Companies	3.4	4.0	6.3	57.7	55.2
	All Companies	8.8	9.8	11.5	17.8	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-103
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Asia/Pacific, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	0	0.1	290.7	87.3
2	PADS Software	-	0	0	-41.7	12.7
	All North American Companies	-	0.1	0.1	126.9	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	0.1	0.1	126.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-104
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Asia/Pacific, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	PADS Software	0.3	0.6	0.8	30.2	25.2
2	Protel Technology	-	0.5	0.6	33.3	18.9
3	Norlinvest Ltd.	0.2	0.6	0.6	1.9	18.5
4	Accel Technologies	0.1	0.2	0.4	119.0	13.3
5	Zuken-Redac	-	0.3	0.3	5.6	9.8
6	OrCAD EDA	0.1	0.2	0.2	11.6	6.2
7	IBM	0.6	0.7	0.2	-72.5	5.7
8	Altium*	0.6	0.7	0.2	-72.5	5.7
9	CAD-UL	0.1	0.1	0.1	-25.1	2.5
10	Cooper & Chyan Technology	0	0	0.1	57.2	2.1
11	ULTImate Technology	0.1	0	0.1	35.1	1.6
12	Intergraph	0	0	0	10.1	0.6
13	Ziegler Informatics	0	0	0	52.3	0.5
14	Number One Systems	-	0	0	11.9	0.2
15	Softdesk	0	0	-	-100.0	-
	All North American Companies	1.1	2.2	2.3	5.8	70.9
	All European Companies	0.3	0.6	0.6	0.2	19.3
	All Asian Companies	-	0.3	0.3	5.6	9.8
	All Companies	1.5	3.1	3.2	4.7	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (February 1996)

Table A-105
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Rest of World, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	PADS Software	0.1	0.2	0.2	16.7	23.0
2	Accel Technologies	0.1	0.1	0.2	53.7	21.5
3	Norlinvest Ltd.	0.2	0.2	0.2	1.9	21.3
4	Cadence	0.1	0.1	0.1	0.8	11.1
5	OrCAD EDA	0	0	0.1	123.2	10.7
6	Intergraph	0.1	0.1	0.1	-4.1	8.6
7	CAD-UL	0	0	0	26.0	3.7
8	ULTImate Technology	0	0	0	29.6	2.6
9	Number One Systems	-	0	0	11.9	1.7
10	Ziegler Informatics	0	0	0	29.6	0.5
11	Softdesk	0	0	0	6.3	0.1
12	Royal Digital Centers	0.1	0.1	-	-100.0	-
13	Graphsoft	-	0	-	-100.0	-
	All North American Companies	0.5	0.6	0.7	16.6	74.8
	All European Companies	0.2	0.2	0.2	8.3	25.2
	All Asian Companies	-	-	-	NA	-
	All Companies	0.7	0.8	0.9	14.4	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-106
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Rest of World, UNIX

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Cadence	0.1	0.1	0.1	0.8	79.7
2	Accel Technologies	-	-	0	NA	7.7
3	Intergraph	0.1	0.1	0	-84.1	7.1
4	CAD-UL	0	0	0	6.1	3.3
5	PADS Software	0	0	0	-76.7	3.3
6	Royal Digital Centers	0.1	0.1	-	-100.0	-
	All North American Companies	0.3	0.2	0.1	-45.4	96.7
	All European Companies	0	0	0	6.1	3.3
	All Asian Companies	-	-	-	NA	-
	All Companies	0.3	0.2	0.1	-44.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-107
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Rest of World, Windows NT/Hybrid

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	Intergraph	-	0	0.1	272.6	93.4
2	PADS Software	-	0	0	-41.7	6.6
	All North American Companies	-	0	0.1	175.0	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	0	0.1	175.0	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table A-108
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top PCB/MCM/Hybrid Software Companies, Rest of World, Personal Computer

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	PADS Software	0.1	0.2	0.2	30.2	27.9
2	Norlinvest Ltd.	0.2	0.2	0.2	1.9	27.0
3	Accel Technologies	0.1	0.1	0.2	46.0	25.8
4	OrCAD EDA	0	0	0.1	123.2	13.5
5	CAD-UL	0	0	0	29.6	4.0
6	ULTImate Technology	0	0	0	29.6	3.3
7	Number One Systems	-	0	0	11.9	2.1
8	Intergraph	0	0	0	6.9	1.4
9	Ziegler Informatics	0	0	0	29.6	0.6
10	Softdesk	0	0	0	6.3	0.1
11	Graphsoft	-	0	-	-100.0	-
	All North American Companies	0.2	0.3	0.5	47.3	68.7
	All European Companies	0.2	0.2	0.2	8.4	31.3
	All Asian Companies	-	-	-	NA	-
	All Companies	0.4	0.6	0.7	32.4	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
NA = Not applicable
Source: Dataquest (February 1996)

Table B-4
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
All PCB/MCM/Hybrid Software Companies, Worldwide, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
1	ABB Industria*	0.2	0.2	0.2	12.1	0.1
2	Accel Technologies	2.6	3.3	5.0	53.7	1.9
3	ALS Design	0.8	0.6	0.8	29.0	0.3
4	Altium*	9.9	9.7	2.7	-72.5	1.0
5	Andor*	0.8	1.0	0.8	-16.6	0.3
6	AT&T	0.2	0.3	0.4	24.4	0.1
7	C. Itoh Techno-Science*	3.5	3.9	4.3	10.8	1.6
8	CAD-UL	2.8	2.7	2.9	5.8	1.1
9	Cadence	17.1	16.5	16.9	2.0	6.3
10	CADIX	15.5	18.3	20.3	11.1	7.6
11	Century Research Center	0.4	0.4	0.4	11.0	0.2
12	Computervision	2.1	1.0	-	-100.0	-
13	Cooper & Chyan Technology	5.8	7.4	11.7	57.2	4.4
14	Fujitsu*	12.9	14.6	16.9	15.9	6.3
15	Graphsoft	-	0	-	-100.0	-
16	Harris EDA	12.0	11.8	11.8	0.7	4.4
17	Hitachi	3.1	3.1	3.4	7.0	1.3
18	IBM	9.9	9.7	2.7	-72.5	1.0
19	ICL	0.2	0.2	0.2	11.8	0.1
20	Intergraph	9.6	6.9	8.0	15.6	3.0
21	Mentor Graphics	40.4	41.0	42.0	2.6	15.8
22	NEC	8.6	8.5	4.4	-47.7	1.7
23	Norlinvest Ltd.	3.7	3.9	4.0	1.9	1.5
24	Number One Systems	-	0.4	0.4	11.9	0.2
25	Omron	0.8	0.9	0.6	-31.4	0.2
26	OrCAD EDA	3.6	4.5	5.0	11.6	1.9
27	Pacific Numerics	3.9	3.9	3.1	-21.3	1.2
28	PADS Software	9.2	9.7	11.3	16.7	4.3
29	Protel Technology	-	2.7	3.6	33.3	1.3
30	Royal Digital Centers	1.5	0.9	1.0	14.1	0.4
31	Seiko*	-	-	0.9	NA	0.3
32	Sharp*	2.8	2.9	3.0	2.6	1.1
33	Softdesk	0.1	0.1	0.1	-26.1	0
34	Sophia Systems*	0.8	0.9	0.9	-0.4	0.3
35	Sumisho Electronics*	1.2	1.3	1.3	0.6	0.5
36	TECHSPERT*	0.6	1.5	1.2	-18.9	0.4
37	Toshiba*	5.8	6.1	6.7	11.0	2.5

(Continued)

Table B-4 (Continued)
1995 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
All PCB/MCM/Hybrid Software Companies, Worldwide, All Operating Systems

Rank	Company Name	1993	1994	1995	Growth (%) 1994-1995	Market Share (%) 1995
38	Uchida Yoko	2.3	1.4	1.6	12.5	0.6
39	ULTImate Technology	1.8	1.9	2.1	11.4	0.8
40	UniCAD	-	3.0	3.4	15.3	1.3
41	Wacom	1.3	1.5	1.4	-8.9	0.5
42	Yokogawa Digital Computer	18.0*	21.0	23.5	11.9	8.8
43	Ziegler Informatics	2.2	0.3	0.4	4.9	0.1
44	Zuken-Redac	52.0	54.7	60.1	9.8	22.5
	All North American Companies	111.5	117.7	120.1	2.0	45.0
	All European Companies	13.4	9.2	9.8	7.4	3.7
	All Asian Companies	120.1	128.9	136.8	6.1	51.3
	All Companies	245.0	255.8	266.7	4.3	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
NA = Not applicable
Source: Dataquest (February 1996)

Table C-16
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top PCB/MCM/Hybrid Software Companies, Worldwide, All Operating Systems

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Hewlett-Packard	7,001	-	114.0	23.3	137.3	16.7
2	Zuken-Redac	1,171	60.1	19.3	39.7	123.0	14.9
3	Sun Microsystems	5,185	-	93.9	25.0	119.0	14.4
4	Mentor Graphics	215	42.0	5.3	49.8	97.1	11.8
5	Fujitsu*	1,150	16.9	29.3	15.7	61.9	7.5
6	Yokogawa Digital Computer	340	23.5	12.8	5.5	41.8	5.1
7	CADIX	81	20.3	4.7	5.5	35.0	4.2
8	Cadence	-	16.9	-	14.6	31.4	3.8
9	Harris EDA	51	11.8	1.0	6.5	19.4	2.4
10	NEC	876	4.4	7.3	2.8	18.7	2.3
11	PADS Software	-	11.3	-	4.9	16.2	2.0
12	Digital Equipment	1,615	-	13.4	2.7	16.1	2.0
13	Intergraph	535	8.0	3.3	3.4	15.7	1.9
14	Toshiba*	177	6.7	5.9	1.5	15.4	1.9
15	Sharp*	87	3.0	8.3	3.0	14.2	1.7
16	Cooper & Chyan Technology	-	11.7	-	1.9	13.6	1.7
17	IBM	902	2.7	7.2	0.6	10.4	1.3
18	Hitachi	197	3.4	2.5	0.8	7.2	0.9
19	Accel Technologies	-	5.0	-	2.2	7.2	0.9
20	OrCAD EDA	-	5.0	-	1.8	6.8	0.8
21	Altium*	1,113	2.7	3.4	0.1	6.2	0.8
22	C. Itoh Techno-Science*	67	4.3	1.5	-	6.1	0.7
23	Pacific Numerics	-	3.1	-	0.4	5.9	0.7
24	Sony	235	-	2.1	-	4.6	0.6
25	Norlinvest Ltd.	32	4.0	0.2	0.3	4.5	0.5
26	Uchida Yoko	184	1.6	1.9	0.4	4.5	0.5
27	Sumisho Electronics*	64	1.3	2.1	-	4.3	0.5
28	UniCAD	-	3.4	-	0.7	4.1	0.5
29	Protel Technology	-	3.6	-	-	3.6	0.4
30	CAD-UL	-	2.9	-	-	2.9	0.3
	Other Companies	12,570	-	31.4	0.5	39.3	4.8
	All North American Companies	12,201	120.1	191.3	137.9	450.4	54.7
	All European Companies	50	9.8	0.5	0.4	10.7	1.3
	All Asian Companies	4,582	136.8	94.7	75.5	323.2	39.2
	All Companies	29,403	266.7	317.9	214.3	823.6	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table C-17
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top PCB/MCM/Hybrid Software Companies, Worldwide, UNIX

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Hewlett-Packard	5,983	-	111.0	22.7	133.7	19.4
2	Sun Microsystems	5,185	-	93.9	25.0	119.0	17.3
3	Zuken-Redac	1,171	57.1	19.3	36.6	116.9	17.0
4	Mentor Graphics	215	42.0	5.3	49.8	97.1	14.1
5	Fujitsu*	1,150	16.0	29.3	15.0	60.4	8.8
6	Yokogawa Digital Computer	340	23.5	12.8	5.5	41.8	6.1
7	CADIX	81	20.3	4.7	5.5	35.0	5.1
8	Cadence	-	16.9	-	14.6	31.4	4.6
9	Harris EDA	49	11.7	0.9	6.5	19.2	2.8
10	Toshiba*	177	6.7	5.9	1.5	15.4	2.2
11	Sharp*	87	3.0	8.3	3.0	14.2	2.1
12	NEC	350	3.5	4.7	2.2	13.8	2.0
13	Cooper & Chyan Technology	-	8.3	-	1.4	9.7	1.4
14	C. Itoh Techno-Science*	66	4.2	1.4	-	5.9	0.9
15	Pacific Numerics	-	3.1	-	0.4	5.7	0.8
16	Hitachi	107	2.5	1.9	0.6	5.4	0.8
17	IBM	186	-	4.8	0.4	5.2	0.8
18	Sony	235	-	2.1	-	4.6	0.7
19	Uchida Yoko	149	1.6	1.9	0.4	4.3	0.6
20	Digital Equipment	212	-	3.4	0.8	4.2	0.6
21	UniCAD	-	3.4	-	0.7	4.1	0.6
22	Sumisho Electronics*	12	0.9	1.6	-	3.2	0.5
23	Silicon Graphics	58	-	1.6	0.2	1.8	0.3
24	Seiko*	9	0.7	0.3	0.6	1.6	0.2
25	Intergraph	16	0.9	0.3	0.2	1.4	0.2
26	Royal Digital Centers	-	1.0	-	0.1	1.1	0.2
27	Century Research Center	8	0.4	0.3	0.1	1.1	0.2
28	Omron	6	0.6	0.3	0.1	1.0	0.1
29	Sophia Systems*	5	0.6	0.1	-	0.7	0.1
30	ICL	14	0.2	0.3	0	0.5	0.1
	All North American Companies	9,032	83.8	174.4	123.1	381.4	55.3
	All European Companies	14	0.6	0.3	0	0.9	0.1
	All Asian Companies	3,879	130.1	91.2	70.6	307.3	44.6
	All Companies	12,925	214.5	265.8	193.8	689.6	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table C-18
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top PCB/MCM/Hybrid Software Companies, Worldwide, Windows NT/Hybrid

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Intergraph	385	6.2	2.5	2.3	11.9	94.9
2	Seiko*	-	0.2	0.1	0.2	0.5	3.7
3	PADS Software	-	0.2	-	0.1	0.3	2.6
4	Digital Equipment	11	-	0.1	0	0.2	1.3
	Other Companies	16	-	0.2	-	0.2	1.3
	All North American Companies	396	6.4	2.7	2.5	12.4	98.7
	All European Companies	-	-	-			-
	All Asian Companies	-	-	-			-
	All Companies	412	6.4	2.8	2.5	12.5	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

Table C-19
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top PCB/MCM/Hybrid Software Companies, Worldwide, Personal Computer

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	PADS Software	-	10.9	-	4.7	15.6	15.3
2	Accel Technologies	-	4.8	-	2.1	6.8	6.7
3	OrCAD EDA	-	5.0	-	1.8	6.8	6.6
4	Altium*	1,113	2.7	3.4	0.1	6.2	6.1
5	Zuken-Redac	-	3.0	-	3.1	6.1	6.0
6	IBM	715	2.7	2.4	0.1	5.2	5.1
7	NEC	526	0.9	2.6	0.6	4.9	4.8
8	Norlinvest Ltd.	32	4.0	0.2	0.3	4.5	4.4
9	Cooper & Chyan Technology	-	3.4	-	0.6	3.9	3.9
10	Digital Equipment	1,312	-	3.6	0.1	3.7	3.6
11	Protel Technology	-	3.6	-	-	3.6	3.5
12	Hewlett-Packard	1,019	-	3.0	0.5	3.6	3.5
13	CAD-UL	-	2.5	-	-	2.5	2.4
14	Intergraph	134	0.9	0.5	0.6	2.1	2.1
15	ULTImate Technology	-	2.1	-	-	2.1	2.0
16	Wacom	51	1.3	0.3	0.2	1.8	1.8
17	Hitachi	66	0.7	0.5	0.2	1.5	1.5
18	TECHSPERT*	6	1.2	0	0.3	1.5	1.5
19	Sumisho Electronics*	52	0.4	0.5	-	1.1	1.0
20	Andor*	16	0.8	0.2	-	1.0	1.0
21	ALS Design	5	0.8	0.1	0.1	0.9	0.9
22	ABB Industria*	18	0.2	0.1	0	0.5	0.5
23	Number One Systems	-	0.4	-	-	0.4	0.4
24	Sophia Systems*	4	0.3	0.1	-	0.4	0.4
25	Ziegler Informatics	-	0.4	-	-	0.4	0.4
26	Pacific Numerics	-	-	-	-	0.3	0.3
27	Uchida Yoko	36	-	-	-	0.2	0.2
28	Softdesk	-	0.1	-	0	0.1	0.1
	Other Companies	12,544	-	29.2	-	29.2	28.6
	All North American Companies	2,697	29.7	8.3	10.4	48.5	47.7
	All European Companies	37	9.2	0.2	0.4	9.8	9.7
	All Asian Companies	679	5.9	3.4	4.1	14.3	14.0
	All Companies	15,956	44.9	41.1	14.9	101.8	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (February 1996)

Table C-20
1995 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units) Top PCB/MCM/Hybrid Software Companies, Worldwide, Host/Proprietary

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Digital Equipment	80	-	6.4	1.7	8.0	40.8
2	Fujitsu*	-	0.8	-	0.7	1.5	7.8
3	Hitachi	24	0.2	0.1	0	0.4	1.9
4	Intergraph	-	-	-	0.2	0.2	1.2
5	Harris EDA	2	0.2	0	-	0.2	0.9
6	C. Itoh Techno-Science*	1	0.1	0	-	0.2	0.9
	Other Companies	10	-	2.1	0.5	9.9	50.6
	All North American Companies	76	0.2	6.0	1.9	8.0	40.9
	All European Companies	-	-	-			-
	All Asian Companies	24	0.8	0.1	0.7	1.7	8.5
	All Companies	110	0.9	8.2	3.1	19.7	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (February 1996)

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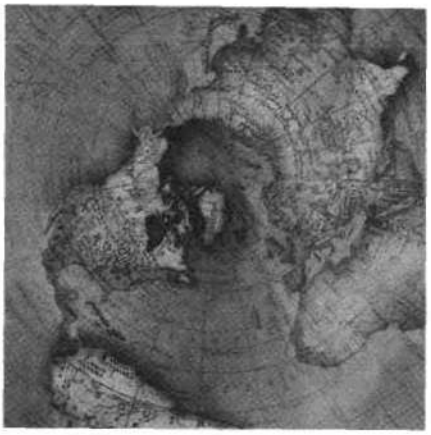

Dataquest

CAD/CAM/CAE/GIS EDA Forecast

Market Statistics

Program: Electronic Design Automation Worldwide
Product Code: CEDA-WW-MS-9602
Publication Date: May 13, 1996
Filing: Market Statistics

CAD/CAM/CAE/GIS EDA Forecast

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Note: All tables show estimated data.

CAD/CAM/CAE/GIS EDA Forecast

Introduction

Dataquest's CAD/CAM/CAE and GIS forecast is based upon market share software revenue gathered primarily during the first quarter of 1996. Dataquest's software forecast for all CAD/CAM/CAE and GIS applications includes:

- Three-year historical software and hardware revenue by region and operating system
- Five-year forecast of software, hardware, and service revenue by region and operating system
- Three-year history and five-year forecast of hardware shipments and installed base data

Although Dataquest does not forecast currency exchange rates, we do forecast with the best information available. The exchange rate is calculated as the simple arithmetic mean of the 12 average monthly rates for each country. For the purpose of this forecast, Dataquest assumes the March 1996 exchange rate will remain stable in the future (see Tables 1 and 2).

In 1995, we restructured our database in order to better serve our clients. We reiterate these changes here:

- Japan is now tracked as a region separate from Asia/Pacific.
- Asia/Pacific now includes China, Hong Kong, Korea, Singapore, Taiwan, and Rest of Asia (Australia, New Zealand, India, and Southeast Asia).
- Service is divided into Hardware Service and Software Service.
- Platforms have been replaced by Operating Systems, to include UNIX, Host, Windows NT, and PC.

Additional market statistics publications for Dataquest's CAD/CAM/CAE and GIS services for 1996 are as follows:

- Dataquest's 1995 Market Share document (published as CAEC-WW-MS-9601, CEDA-WW-MS-9601, and CMEC-WW-MS-9601) was published and sent to our clients in March.
- The market share data for 1995 is being verified and updated, and it will be available in July as a Market Share Update document. Country-level, industry, and subapplication data will be available at that time.
- Dataquest will also perform an updated forecast that will be expanded to include country-level information, additional metrics, and in-depth analysis. This Forecast Update will be available in September.

Table 1
CAD/CAM/CAE and GIS Revenue Growth Comparison (U.S. Dollars versus Local Currency for Both Europe and Japan)

	1994	1995	Forecast 2000	Growth (%) 1994-1995	CAGR (%) 1995-2000
Europe (U.S.$ Million)					
Software Revenue	1,820.18	2,161.60	3,374.47	18.8	9.3
Hardware Revenue	2,591.56	2,807.99	5,017.48	8.4	12.3
Service Revenue	1,141.83	1,274.02	1,553.54	11.6	4.0
Total Factory Revenue	5,553.57	6,243.61	9,945.49	12.4	9.8
ECU/U.S.$ Exchange Rate*	0.84	0.77	0.80	-8.6	0.7
Europe (ECU Million)					
Software Revenue	1,535.50	1,666.38	2,691.40	8.5	10.1
Hardware Revenue	2,186.24	2,164.68	4,001.82	-1.0	13.1
Service Revenue	963.25	982.14	1,239.07	2.0	4.8
Total Factory Revenue	4,684.99	4,813.20	7,932.28	2.7	10.5
Japan (U.S.$ Million)					
Software Revenue	1,335.78	1,521.57	2,680.91	13.9	12.0
Hardware Revenue	2,143.29	2,286.92	4,063.64	6.7	12.2
Service Revenue	925.74	1,044.46	1,478.93	12.8	7.2
Total Factory Revenue	4,404.81	4,852.95	8,223.49	10.2	11.1
Japan/U.S.$ Exchange Rate*	110.85	93.90	105.94	-15.3	2.4
Japan (Yen Million)					
Software Revenue	148,071.13	142,875.66	284,015.37	-3.5	14.7
Hardware Revenue	237,583.90	214,741.36	430,502.52	-9.6	14.9
Service Revenue	102,618.14	98,074.81	156,678.33	-4.4	9.8
Total Factory Revenue	488,273.16	455,691.83	871,196.22	-6.7	13.8
North America (U.S.$ Million)					
Software Revenue	1,915.91	2,272.72	4,456.45	18.6	14.4
Hardware Revenue	2,482.33	2,776.43	6,289.30	11.8	17.8
Service Revenue	1,171.94	1,385.61	2,301.71	18.2	10.7
Total Factory Revenue	5,570.18	6,434.76	13,047.45	15.5	15.2
Worldwide (U.S.$ Million)					
Software Revenue	5,415.60	6,420.61	11,855.56	18.6	13.0
Hardware Revenue	7,667.54	8,418.59	17,092.16	9.8	15.2
Service Revenue	3,451.56	3,971.80	5,966.89	15.1	8.5
Total Factory Revenue	16,534.69	18,811.00	34,914.60	13.8	13.2

*Assuming a stable currency, the 2000 exchange rate is March 1996 exchange rate.
Source: Dataquest (March 1996)

Table 2
Foreign Currency per U.S. Dollar

		Actual				Current			Year-to-Year Change (%)					
Country	Currency	1991	1992	1993	1994	1995	1996	1997	1991-1992	1992-1993	1993-1994	1994-1995	1995-1996	1996-1997
Austria	Schilling	11.67	10.95	11.65	11.40	10.06	10.38	10.39	-6.17	6.4	-2.1	-11.8	3.2	0.1
Belgium	Franc	34.13	32.02	34.67	33.66	29.42	30.33	30.37	-6.18	8.3	-2.9	-12.6	3.1	0.1
Denmark	Krone	6.39	6.02	6.49	6.35	5.59	5.70	5.71	-5.79	7.8	-2.2	-12.0	2.0	0.2
Finland	Markka	4.04	4.45	5.73	5.21	4.37	4.59	4.61	10.15	28.8	-9.1	-16.1	5.0	0.4
France	Franc	5.64	5.27	5.67	5.54	4.97	5.05	5.06	-6.56	7.6	-2.3	-10.3	1.6	0.2
Germany	D-Mark	1.66	1.56	1.66	1.62	1.43	1.48	1.48	-6.02	6.4	-2.4	-11.7	3.5	-0.2
Italy	Lira	1,238.93	1,227.75	1,577.85	1,609.34	1,628.21	1,564.93	1,562.43	-0.90	28.5	2.0	1.2	-3.9	-0.2
Netherlands	Guilder	1.87	1.75	1.86	1.82	1.60	1.65	1.65	-6.42	6.3	-2.2	-12.1	3.1	0.2
Norway	Krone	6.49	6.18	7.11	7.04	6.33	6.43	6.43	-4.78	15.0	-1.0	-10.1	1.6	0.0
Spain	Peseta	103.81	101.90	127.87	133.48	124.40	124.24	124.39	-1.84	25.5	4.4	-6.8	-0.1	0.1
Sweden	Krona	6.04	5.81	7.82	7.70	7.14	6.74	6.73	-3.81	34.6	-1.5	-7.3	-5.6	-0.1
Switzerland	Franc	1.43	1.40	1.48	1.37	1.18	1.19	1.20	-2.10	5.7	-7.4	-13.9	0.8	0.5
United Kingdom	Pound	0.57	0.57	0.67	0.65	0.63	0.65	0.65	0.00	17.5	-3.0	-3.1	3.9	0.0
Europe Average	ECU	0.81	0.77	0.86	0.84	0.77	0.80	0.80	-4.86	11.4	-1.5	-8.7	3.6	0.0
China	Renminbi	5.33	5.51	5.76	8.54	8.35	8.35	8.35	3.38	4.5	48.3	-2.2	0.0	0.0
Hong Kong	Dollar	7.77	7.74	7.74	7.73	7.74	7.73	7.73	-0.39	0.0	-0.1	0.1	-0.1	0.0
Japan	Yen	134.59	126.34	110.85	101.56	93.90	105.91	105.94	-6.13	-12.3	-8.4	-7.5	12.8	0.0
Korea	Won	730.67	782.41	799.42	805.80	770.57	781.70	781.31	7.08	2.2	0.8	-4.4	1.4	0.0
Singapore	Dollar	1.73	1.63	1.62	1.53	1.43	1.41	1.41	-5.78	-0.9	-5.3	-6.5	-1.4	0.0
Taiwan	Dollar	26.49	24.93	26.15	26.45	26.48	27.41	27.40	-5.89	4.9	1.1	0.1	3.5	0.0

Source: Dataquest (March 1996)

Worldwide Forecast Assumptions

The following sections describe the main forces driving the CAD/CAM/CAE and GIS worldwide software forecast.

All Applications

As CAD/CAM/CAE/GIS becomes more of a replacement market, market leaders would appear to have the upper hand; the cost of switching is high. However, software that lets users get a better product to market faster and software that helps eliminate business risks will always be in demand—regardless of market share. Thus there is always an opportunity for new vendors in technical markets.

The primary trend in design software function is toward operating at a higher level of abstraction. In all applications, we have seen an evolution of focus from "electronic paper" to component modeling and now to system modeling with the eventual goal being to fully simulate, evaluate, redesign, and test the design inside the computer prior to manufacture. At the same time, increased computing power is allowing the nature of design to evolve to include constituencies in manufacturing, product support, and from users themselves. Thus the engineering process is being expanded to include input from a broader base.

At the same time, the nature of design data itself is expanding from a focus on geometry to include multiple data types—making the challenge of system modeling even more complex. Also, the World Wide Web holds the potential to expand the nature of collaborative design by harnessing the joint power of anticipated increases in both computing power and communications bandwidth. Thus there is little limit to the problems that design or GIS software can tackle. The primary challenge will continue to be developing robust, leading-edge software ahead of competitors. During the forecast period we anticipate significant, but not revolutionary, advances in the ability of the existing programmer pool to produce new software.

Mechanical Forecast Assumptions

New Interest in Mechanical CAD Technology

In 1995 we saw a mix of replacement business and new purchases for mechanical CAD technology, particularly in Europe and North America. Growth is picking up in nontraditional industries (those industries outside of aerospace, automotive, and industrial machinery). We expect this trend to continue, as mechanical modeling, analysis, design, and simulation software become more user friendly. Closely linked to the use of mechanical CAD in new arenas is the availability of software on lower-cost platforms and the potential use of object technology to create customized industry- or applications-specific solutions.

The product data management market has clearly found a worldwide interest. Within the past year, we have seen pilot programs move to full-scale production, support for new client platforms (Windows NT,

Windows), integration with manufacturing resource planning systems, and an emergence of a parts/component management software. Product data management will be one of the significant drivers of the mechanical CAD market through 2000.

Ground Shifts in Japan

Mechanical CAD/CAM/CAE growth in Japan is expected to undergo a significant shift in platform usage over our forecast period. The UNIX platform dominates the mechanical sector in Japan despite the fact that the Japanese mechanical market still places a heavy emphasis on 2-D drafting instead of 3-D/solid modeling. We expect this drafting orientation to persist, and in the next five years we anticipate a significant shift to more Windows NT and PC-based operating systems at the expense of UNIX. This shift will not begin in earnest until late 1996, when Japan-specific versions of mechanical software on Windows NT are more widely available.

Windows NT

As of today not all of the major mechanical CAD vendors have ported their products to the Windows NT platform. The lack of availability of Windows NT versions of some of the market-share-leading mechanical CAD packages will mean that Windows NT will not begin to impact UNIX-based sales for at least a few more years.

AEC Forecast Assumptions

The Impact of Windows NT

Intergraph's shift to Windows NT has initiated the collapse of UNIX sales in North America, a trend expected to increase broadly in this cost-conscious application. At the same time, we expect growth in Windows NT from DOS-based users who find Windows 95 and successors less than reliable. The primary factor holding up growth in the large installed base of DOS users is their reluctance to buy the new hardware required for either Windows 95 or Windows NT.

The factors that should contribute to the long-term expansion of the AEC CAD are noted in the following sections.

CAD Is Becoming a Business Requirement

Large design firms are growing at the expense of smaller firms. These large end users increasingly require their employees and suppliers to adopt automation tools in the design and construction process. Smaller design firms must increasingly buy CAD systems or risk being dropped from consideration as a partner.

CAD purchases are increasingly justified as a competitive advantage in both sales and design reviews. Electronic design data is also required downstream by the designer's client, from the federal government down to the small commercial developer. Also, a significant pool of untapped users still exists. The relatively low market penetration of AEC CAD systems should allow steady worldwide growth during the next five years despite constant volatility in demand for the buildings and infrastructure to be designed.

New Features in AEC CAD Products Are Achievable

Better, lower-cost visualization tools will be in increasing demand as sales and communications tools. Data and database functions (versus graphics functions) are increasing in importance in AEC design systems, creating opportunities to sell users significant new functionality. Some vendors will create products that foster communications in the entire design, construction, and maintenance process, products that will increase the payoff in CAD investments.

The three trends that will inhibit growth in the AEC CAD industry are noted in the following sections.

Design Is Only Part of the Problem

AEC's one-design-one-build structure means CAD provides fewer economic benefits to these users than does the one-design-build-many structure of manufacturing. Construction, which is essentially a prototype build, is fraught with uncertainties and delays that are not well-addressed by AEC systems as they exist today. Design tools can only thrive in the AEC structure when they support more of the entire business problem. Based on Autodesk's increased commitment to progress in this arena, we have increased our forecast modestly; commitment to and cooperation on the problem from multiple vendors will allow us to increase the forecast growth rate further.

Poor Cooperation among Users

Users are poorly organized to take advantage of improved products, partly because of competition between engineering constructors and partly because designs are often split among several different companies representing different and competing aspects of the design process. New approaches to the design and construction process are appearing that allow users to take full advantage of CAD tools. Still, many users in AEC will need to be shown leadership in working together, both from the very large, most-competitive users and from CAD vendors themselves.

Downturn in Germany

The German construction industry, which has been the driving force behind the high growth of the recent years, has come to an abrupt halt. Although other regions such as Italy are investing, Germany plays such a dominant role that it will drag down the overall European growth for AEC. The applications that are still growing even in Germany are facilities design/management because these are not dependent on the construction industry.

GIS/Mapping Forecast Assumptions

The Impact of Windows NT

Intergraph's move to Windows NT at the expense of UNIX will quickly make PC-based operating systems the dominant revenue stream in North America. In the long term, the GIS UNIX market is highly subject to erosion by Windows NT because of the appeal of better integration of GIS and Windows-based productivity tools, an appealing prospect to many GIS users.

The factors that should contribute to the long-term expansion of the GIS market are noted in the following sections.

"Open GIS"

The thrust of the Open GIS Foundation has been to allow some fresh air into a market that was getting a bit inbred. The nature of GIS data is under greater scrutiny, and several vendors are embarking in different, creative directions. Ultimately, much of "spatial analysis" will be embedded into other applications rather than known as a GIS. Nonetheless, a fresh approach to spatial analysis is creating new opportunities for more useful solutions in traditional GIS environments.

There Exists an Abundant Supply of Prospective Buyers

Penetration is still moderately low among core users. Bread-and-butter prospects in government and utilities are charged with maintaining information on land and assets in perpetuity. Many of these prospective buyers are still using paper maps, which will degrade over time, or have only entry-level systems in terms of value delivered. This creates a certain inevitability to moving from paper maps computer-based models.

New Technologies Will Drive Growth

Faster, cheaper computers will be continually leveraged to support new software products. Widespread computer industry developments in open, distributed systems supporting high-speed networking will make it possible for GIS technology to broadly expand the user base. Lower-cost, higher resolution satellite imagery holds the potential to drive another explosion in GIS market growth among users who cannot afford aerial photography. Advances in aerial photography, global positioning systems (GPSs), and laser range finders are making it possible to create GISs significantly cheaper, more accurate, and more complete than existing paper maps, giving experienced users some compelling reasons to reinvest. Portable and pen-based computers are bringing GIS to new users in field operations. Finally, database companies themselves are gaining a better understanding of spatial analysis, a key factor in spreading use of GIS systems more broadly.

Data Will Drive Growth

The GIS business market is driving high growth on PCs. However, we see a wide band of uncertainty surrounding the clearly growing revenue opportunity from new applications. Several new applications in GIS are destined to become a relatively low revenue-producing feature in another software program (and market) rather than a standalone product in the GIS market. At the same time, data is increasing in value relative to software in this low-end market.

GIS has attained a certain indispensability, particularly among federal users and in utilities. As a result, users are beginning to expect to share the data that lies in their various GIS systems. Within three years, we expect data to be readily exchangeable across different systems. At that point, shareable data will help drive market growth.

The several factors seriously constraining the long-term expansion of the GIS market are noted in the following sections.

High Cost of Entry Remains a Barrier

There will remain an uncertain, but certainly high, cost of creating a working GIS system in traditional environments. No magic will emerge to create a low-cost, meaningful data set for mainstream customers in government and utilities. Data conversion will remain costly because the significant cost of correcting prior errors and omissions on paper maps is inevitably bundled into the cost of "conversion."

Price Pressures Inhibit Growth

Price pressure will hold down total revenue. Innovation is the only way to maintain prices in any software industry, and GIS vendors will struggle in their attempt to create compelling new applications and improved investment payoff for customers.

Electronic Design Automation Forecast Assumptions

The EDA software market grew 17.2 percent in 1995. Over the next five years, growth will continue to be fueled by continuing increasing design complexity and ever-higher speeds.

Electronic CAE

Design complexity is forcing a large-scale swap: Gate-level users are swapping up to register-transfer level RTL while RTL users are swapping up to electronic-system level (ESL) tools. RTL tools are beginning to appear on Windows NT, competing with UNIX-based tools, while the ESL tools will remain UNIX-based. The second wave, those FPGA/CPLD designers moving up to the RTL, are starting to make an impact on the numbers. The full impact of Windows NT in the CAE market will not be felt until Synopsys ports the design compiler onto that operating system.

IC Layout

The IC layout market grew an astonishing 34.8 percent in 1995. Design complexity and high speed is forcing replacement of obsolete tools, driving this high growth. This is primarily a replacement market of very high-cost tools and very few players. The ensuing frenzy for market share is the result. The few PC-based tools in this market are being replaced by UNIX-class tools in North America, and Windows NT will not be a factor in this market. In fact, this is the market that is demanding a "standard" 64-bit operating system. If UNIX repeats its 32-bit performance, these users could wait for a 64-bit Windows NT.

PCB/MCM/Hybrid

The printed circuit board (PCB) market grew 4 percent in 1995. The swap out of old tools continues for the second year. The most significant shift has been the acceptance of Windows NT as the operating system of choice in the PCB design world. It will not happen overnight, as swap out in this segment is slower than in CAE and IC layout, but it will happen.

Table 3 shows the history and forecast of all applications.

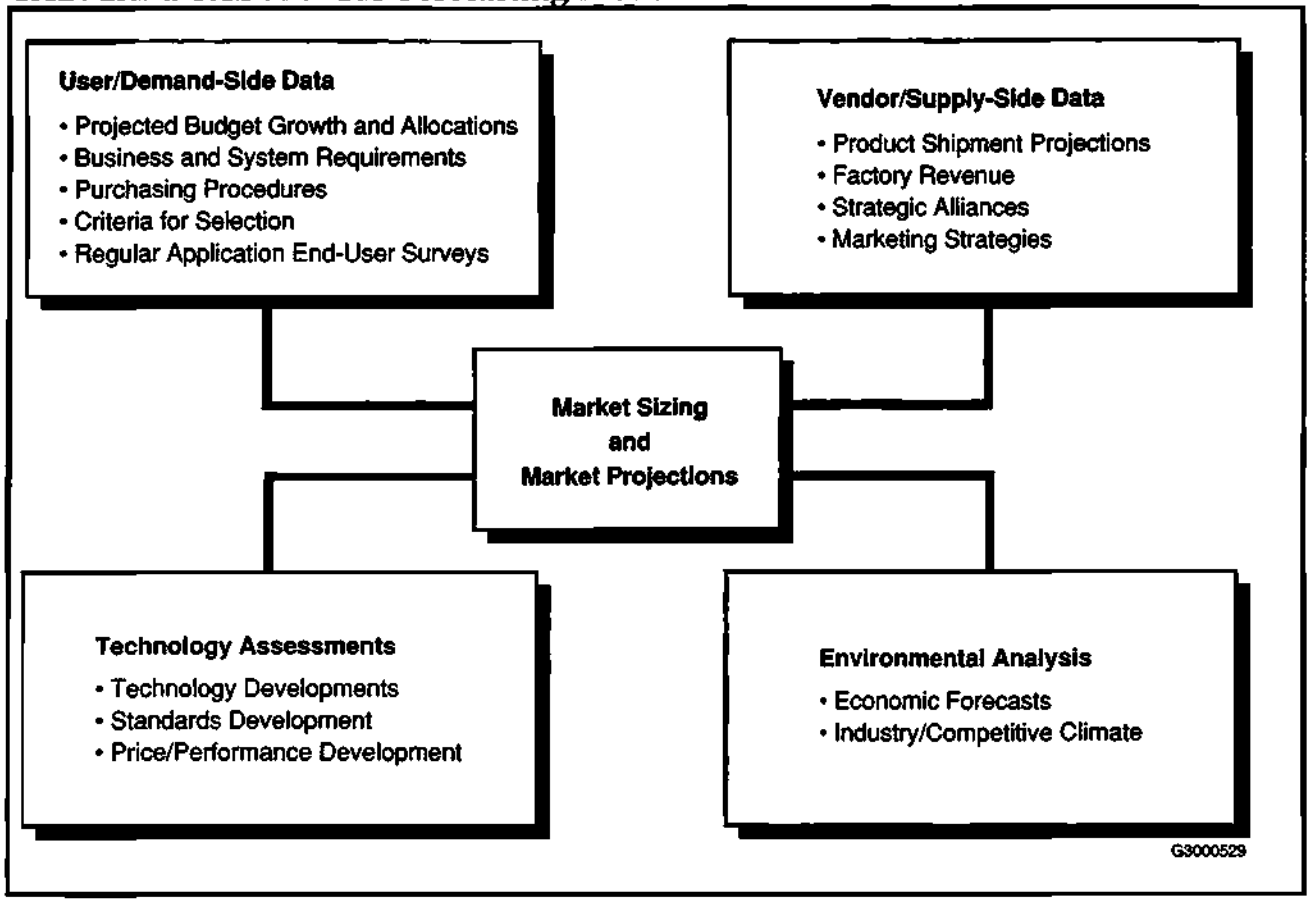
Forecast Methodology

Fundamental to the way Dataquest conducts its research is the underlying philosophy that the best data and analyses come from a well-balanced program. This program includes the following: balance between primary and secondary collection techniques; balance between supply-side and demand-side analysis; balance between focused, industry-specific research and coordinated, "big-picture" analysis aided by integration of data from the more than 25 separate high-technology industries Dataquest covers; and balance between the perspectives of experienced industry professionals and rigorous, disciplined techniques of seasoned market researchers.

Dataquest also analyzes trends in the macro environment, which can have major influences on both supply-side and demand-side forecasting. In addition to demographics, analysts look at gross national product (GNP) growth, interest rate fluctuation, business expectations, and capital spending plans. In the geopolitical arena, the group looks at trade issues, political stability or lack thereof, tariffs, nontariff barriers, and such factors as the effect on Europe of the events of 1995.

Figure 1 shows the CAD/CAM/CAE and GIS forecasting model. The overall forecasting process uses a combination of techniques such as

Figure 1
CAD/CAM/CAE and GIS Forecasting Model



Source: Dataquest (May 1996)

time series and technological modeling. Market estimates and forecasts are derived using the following research techniques:

- Segment forecasting—Individual forecasts are derived for each application segment tracked by the CAD/CAM/CAE and GIS group. Specifically, each application, segmented by region and platform, is forecast and rolled up. In this way, each application segment incorporates its own set of unique assumptions.
- Demand-based analysis—Market growth is tracked and forecast in terms of the present and anticipated demand of current and future users. This requires the development of a total available market model and a satisfied available market figure to assess the levels of penetration accurately. Dataquest analysts also factor in the acceptance or ability for users to consume new technology.
- Capacity-based analysis—This method involves identifying future shipment volume constraints. These constraints, or "ceilings," can be the result of component availability, manufacturing capacity, or distribution capacity. In any case, capacity limitations are capable of keeping shipments below the demand level.

Segmentation Definitions

Operating Systems

The following defines the operating systems:

- UNIX—UNIX includes all UNIX variants and older workstation operating systems.
- Host—Host includes minicomputer and mainframe operating systems in which external workstations' functions are dependent on a host computer.
- Windows NT—Windows NT is the Microsoft operating system. PCPC includes DOS, Windows, Windows 95, OS/2, and Apple operating systems.

Line Items

Line item definitions are as follows:

- Average selling price (ASP) is defined as the average price of a product, inclusive of any discounts.
- CPU revenue is the portion of revenue derived from a system sale that is related to the value of the CPU.
- CPU shipment is defined as the number of CPUs delivered.
- CPU installed base is defined as the total number of CPUs in active, day-to-day use.
- Unit shipment is defined as the number of products delivered (that is, seats).
- Seats are defined as the number of possible simultaneous users.

- Installed seats are defined as the total number of seats in active, day-to-day use.
- Hardware revenue is defined as the sum of the revenue from the hardware system components: CPU revenue, terminal revenue, and peripherals revenue.
- Peripherals revenue is defined as the value of all the peripherals from turnkey sale. (Peripherals in this category typically are input and output devices.)
- Terminal revenue is defined as revenue derived from the sale of terminals used to graphically create, analyze, or manipulate designs. The term is applicable only to the host systems.
- Software revenue is revenue derived from the sale of application software.
- Service revenue is defined as revenue derived from the service and support of CAD/CAM/CAE or GIS systems. Service is followed as software service and hardware service.
- Total factory revenue is defined as the amount of money received for goods measured in U.S. dollars and is the sum of hardware, software, and service revenue.

Table 3
CAD/CAM/CAE/GIS Software History and Forecast
Top-Level Worldwide Forecast, All Applications, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue ($M)									
Worldwide, All Operating Systems	4,881	5,416	6,421	7,446	8,419	9,500	10,664	11,856	13.0
Worldwide									
UNIX	3,371	3,815	4,377	4,901	5,351	5,751	6,181	6,607	8.6
Windows NT	5	115	381	724	1,087	1,595	2,160	2,762	48.6
Personal Computer	1,188	1,307	1,511	1,710	1,908	2,107	2,292	2,464	10.3
Host/Proprietary	317	178	152	111	73	47	32	22	-31.9
All Operating Systems									
North America	1,749	1,916	2,273	2,684	3,096	3,548	4,006	4,456	14.4
Europe	1,598	1,820	2,162	2,385	2,605	2,855	3,105	3,374	9.3
Japan	1,234	1,336	1,522	1,773	1,948	2,164	2,429	2,681	12.0
Asia/Pacific	208	253	362	484	631	770	930	1,095	24.8
Rest of World	93	90	103	120	139	162	195	249	19.3
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		10.9	18.6	16.0	13.1	12.8	12.3	11.2	
Worldwide									
UNIX		13.2	14.7	12.0	9.2	7.5	7.5	6.9	
Windows NT		2116.0	231.4	90.1	50.1	46.7	35.4	27.9	
Personal Computer		10.0	15.6	13.2	11.6	10.4	8.8	7.5	
Host/Proprietary		-43.7	-15.0	-26.8	-34.1	-35.7	-32.6	-29.8	
All Operating Systems									
North America		9.5	18.6	18.1	15.3	14.6	12.9	11.2	
Europe		13.9	18.8	10.3	9.2	9.6	8.7	8.7	
Japan		8.3	13.9	16.5	9.9	11.1	12.2	10.4	
Asia/Pacific		22.1	42.7	33.9	30.4	22.0	20.7	17.8	
Rest of World		-3.0	14.2	16.8	15.4	16.4	20.8	27.5	

NA = Not applicable

Source: Dataquest (April 1996)

Table A-1
CAD/CAM/CAE/GIS Software History and Forecast
Top-Level EDA Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue ($M)									
Worldwide, All Operating Systems	1,212	1,349	1,580	1,891	2,252	2,679	3,169	3,632	18.1
Worldwide									
UNIX	1,037	1,157	1,352	1,586	1,813	2,030	2,262	2,478	12.9
Windows NT	0	6	26	87	198	387	622	846	101.1
Personal Computer	171	183	200	217	240	262	284	307	9.0
Host/Proprietary	3	3	3	1	1	0	0	0	-40.1
All Operating Systems									
North America	570	618	745	921	1,104	1,310	1,512	1,678	17.6
Europe	240	263	293	322	355	388	419	455	9.2
Japan	334	389	432	489	557	679	852	1,008	18.5
Asia/Pacific	63	74	105	153	224	281	351	421	32.0
Rest of World	5	5	5	6	11	19	35	68	69.1
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		11.3	17.2	19.7	19.1	19.0	18.3	14.6	
Worldwide									
UNIX		11.6	16.8	17.3	14.3	12.0	11.4	9.6	
Windows NT		23,087.2	357.2	238.5	127.5	95.4	60.9	35.9	
Personal Computer		6.7	9.3	8.6	10.9	8.8	8.6	8.2	
Host/Proprietary		-10.8	-16.4	-62.4	-28.3	-33.1	-36.5	-32.6	
All Operating Systems									
North America		8.5	20.6	23.5	19.9	18.7	15.3	11.0	
Europe		9.5	11.4	9.6	10.4	9.3	7.9	8.6	
Japan		16.6	11.0	13.3	13.9	22.0	25.3	18.4	
Asia/Pacific		16.9	42.3	46.0	46.3	25.6	24.9	19.9	
Rest of World		-8.7	0.9	31.4	73.5	70.8	83.7	93.6	

Source: Dataquest (April 1996)

Table B-1
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	128,775	135,220	148,292	181,500	224,500	267,300	319,800	375,100	20
Seats	128,827	135,500	148,653	181,900	224,700	267,500	320,000	375,200	20
Year-to-Year Increase (%)	8	5	10	22	24	19	20	17	
Installed Base									
CPUs	595,359	639,879	695,545	778,700	907,500	1,058,100	1,208,800	1,339,100	14
Seats	603,168	645,432	699,314	781,300	909,500	1,059,700	1,210,500	1,340,800	14
Year-to-Year Increase (%)	10	7	8	12	16	17	14	11	
REVENUE DATA ($M)									
CPU Revenue	1,637	1,706	1,915	2,367	2,943	3,435	4,060	4,698	20
Terminal Revenue	22	16	12	7	6	5	4	4	-20
Peripheral Revenue	40	47	40	48	58	69	79	88	17
Hardware Revenue	1,700	1,769	1,967	2,422	3,007	3,508	4,143	4,789	19
Year-to-Year Increase (%)	1	4	11	23	24	17	18	16	
Software Revenue	1,212	1,349	1,580	1,891	2,252	2,679	3,169	3,632	18
Year-to-Year Increase (%)	2	11	17	20	19	19	18	15	
Software Service	504	617	798	891	1,001	1,092	1,196	1,274	10
Hardware Service	403	386	435	514	620	699	798	889	15
Service Revenue	908	1,004	1,233	1,405	1,621	1,791	1,994	2,163	12
Year-to-Year Increase (%)	19	11	23	14	15	10	11	8	
Total Factory Revenue	3,819	4,121	4,780	5,719	6,880	7,978	9,305	10,584	17
Year-to-Year Increase (%)	5	8	16	20	20	16	17	14	

Source: Dataquest (April 1996)

Table B-2
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Worldwide, UNIX

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	62,272	69,032	76,090	91,800	109,200	119,500	132,700	145,600	14
Seats	62,272	69,032	76,090	91,800	109,200	119,500	132,700	145,600	14
Year-to-Year Increase (%)	13	11	10	21	19	9	11	10	
Installed Base									
CPUs	268,879	313,184	363,893	427,200	509,600	598,200	665,600	703,000	14
Seats	268,879	313,184	363,893	427,200	509,600	598,200	665,600	703,000	14
Year-to-Year Increase (%)	19	16	16	17	19	17	11	6	
REVENUE DATA ($M)									
CPU Revenue	1,376	1,482	1,687	2,102	2,586	2,950	3,424	3,901	18
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	37	43	35	38	41	41	41	41	4
Hardware Revenue	1,412	1,526	1,722	2,140	2,626	2,991	3,465	3,942	18
Year-to-Year Increase (%)	4	8	13	24	23	14	16	14	
Software Revenue	1,037	1,157	1,352	1,586	1,813	2,030	2,262	2,478	13
Year-to-Year Increase (%)	2	12	17	17	14	12	11	10	
Software Service	485	585	749	836	930	997	1,065	1,103	8
Hardware Service	373	365	414	492	584	643	718	787	14
Service Revenue	857	950	1,164	1,328	1,514	1,639	1,783	1,890	10
Year-to-Year Increase (%)	20	11	22	14	14	8	9	6	
Total Factory Revenue	3,307	3,633	4,238	5,054	5,953	6,660	7,511	8,310	14
Year-to-Year Increase (%)	7	10	17	19	18	12	13	11	

NA = Not applicable

Source: Dataquest (April 1996)

Table B-3
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Worldwide, NT/Hybrid

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	1	384	1,486	5,300	12,200	23,900	37,700	49,600	102
Seats	1	384	1,486	5,300	12,200	23,900	37,700	49,600	102
Year-to-Year Increase (%)	NA	32,086	287	257	131	95	58	32	
Installed Base									
CPUs	1	384	1,857	7,200	19,400	40,300	67,700	100,500	122
Seats	1	384	1,857	7,200	19,400	40,300	67,700	100,500	122
Year-to-Year Increase (%)	NA	32,072	383	286	171	108	68	48	
REVENUE DATA ($M)									
CPU Revenue	0	4	12	37	82	156	241	323	94
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	2	7	14	23	32	40	75
Hardware Revenue	0	5	14	44	96	179	273	363	91
Year-to-Year Increase (%)	NA	34,684	201	207	120	86	52	33	
Software Revenue	0	6	26	87	198	387	622	846	101
Year-to-Year Increase (%)	NA	23,087	357	238	127	95	61	36	
Software Service	0	1	3	9	22	45	78	116	111
Hardware Service	-	2	4	12	24	43	63	83	80
Service Revenue	0	3	7	21	46	87	142	199	95
Year-to-Year Increase (%)	NA	456,793	125	196	120	89	62	40	
Total Factory Revenue	0	14	47	152	340	653	1,036	1,407	97
Year-to-Year Increase (%)	NA	34,944	248	222	124	92	59	36	

NA = Not applicable

Source: Dataquest (April 1996)

Table B-4
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Worldwide, Personal Computer

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	65,365	65,219	70,324	84,300	102,900	123,900	149,400	179,900	21
Seats	65,365	65,220	70,362	84,300	102,900	123,900	149,400	179,900	21
Year-to-Year Increase (%)	5	0	8	20	22	20	21	20	
Installed Base									
CPUs	319,061	320,108	324,942	340,900	376,100	417,700	474,000	534,300	10
Seats	319,061	320,108	324,942	340,900	376,100	417,700	474,000	534,300	10
Year-to-Year Increase (%)	5	0	2	5	10	11	13	13	
REVENUE DATA ($M)									
CPU Revenue	169	171	184	220	269	325	392	471	21
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	4	4	3	3	4	5	6	7	19
Hardware Revenue	173	175	187	223	273	330	397	478	21
Year-to-Year Increase (%)	-5	1	7	19	22	21	21	20	
Software Revenue	171	183	200	217	240	262	284	307	9
Year-to-Year Increase (%)	6	7	9	9	11	9	9	8	
Software Service	18	30	45	46	48	51	53	55	4
Hardware Service	5	6	7	8	10	13	15	19	23
Service Revenue	23	36	51	54	59	63	68	74	8
Year-to-Year Increase (%)	16	54	44	5	9	8	8	8	
Total Factory Revenue	367	393	438	494	572	654	750	859	14
Year-to-Year Increase (%)	1	7	12	13	16	14	15	15	

NA = Not applicable
Source: Dataquest (April 1996)

Table B-5
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Worldwide, Host/Proprietary

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	1,137	585	391	100	100	100	100	100	-31
Seats	1,189	864	715	500	400	300	200	200	-22
Year-to-Year Increase (%)	-45	-27	-17	-36	-22	-20	-17	-13	
Installed Base									
CPUs	7,418	6,203	4,853	3,500	2,500	1,900	1,600	1,300	-23
Seats	15,228	11,755	8,623	6,000	4,400	3,500	3,300	3,000	-19
Year-to-Year Increase (%)	-18	-23	-27	-30	-27	-19	-8	-9	
REVENUE DATA ($M)									
CPU Revenue	92	48	32	8	5	4	3	3	-39
Terminal Revenue	22	16	12	7	6	5	4	4	-20
Peripheral Revenue	0	0	0	0	0	0	0	0	34
Hardware Revenue	115	64	44	15	11	9	7	7	-31
Year-to-Year Increase (%)	-26	-44	-31	-65	-27	-19	-17	-10	
Software Revenue	3	3	3	1	1	0	0	0	-40
Year-to-Year Increase (%)	-76	-11	-16	-62	-28	-33	-36	-33	
Software Service	1	1	1	1	1	0	0	0	-32
Hardware Service	26	14	9	2	1	1	1	1	-42
Service Revenue	27	15	11	3	2	1	1	1	-40
Year-to-Year Increase (%)	-11	-46	-28	-73	-30	-28	-28	-21	
Total Factory Revenue	145	82	57	19	14	11	9	8	-33
Year-to-Year Increase (%)	-27	-44	-30	-67	-28	-21	-19	-12	

Source: Dataquest (April 1996)

Table B-6
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, North America, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	72,196	75,165	83,270	102,400	124,800	147,300	172,300	196,300	19
Seats	72,044	75,168	83,274	102,500	124,800	147,300	172,300	196,300	19
Year-to-Year Increase (%)	10	4	11	23	22	18	17	14	
Installed Base									
CPUs	328,982	351,609	382,760	429,400	500,200	580,300	656,600	717,100	13
Seats	332,305	353,741	383,911	429,900	500,400	580,300	656,600	717,100	13
Year-to-Year Increase (%)	10	6	9	12	16	16	13	9	
REVENUE DATA ($M)									
CPU Revenue	738	757	878	1,125	1,403	1,625	1,893	2,171	20
Terminal Revenue	6	4	2	1	1	0	0	0	-38
Peripheral Revenue	3	3	2	6	10	16	21	23	62
Hardware Revenue	747	764	882	1,132	1,414	1,642	1,914	2,194	20
Year-to-Year Increase (%)	6	2	16	28	25	16	17	15	
Software Revenue	570	618	745	921	1,104	1,310	1,512	1,678	18
Year-to-Year Increase (%)	3	8	21	24	20	19	15	11	
Software Service	248	294	384	444	501	538	576	604	9
Hardware Service	179	167	196	242	294	330	371	410	16
Service Revenue	426	461	580	686	795	868	947	1,014	12
Year-to-Year Increase (%)	21	8	26	18	16	9	9	7	
Total Factory Revenue	1,743	1,843	2,208	2,739	3,313	3,820	4,373	4,886	17
Year-to-Year Increase (%)	8	6	20	24	21	15	14	12	

Source: Dataquest (April 1996)

Table B-7
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	29,646	31,146	33,512	37,700	45,500	53,700	63,300	73,900	17
Seats	29,680	31,305	33,689	37,800	45,700	53,900	63,400	74,000	17
Year-to-Year Increase (%)	-1	5	8	12	21	18	18	17	
Installed Base									
CPUs	152,818	160,347	168,197	180,100	200,500	224,000	247,400	265,800	10
Seats	155,241	162,248	169,681	181,300	201,500	225,000	248,400	266,900	9
Year-to-Year Increase (%)	7	5	5	7	11	12	10	7	
REVENUE DATA ($M)									
CPU Revenue	335	336	355	381	443	492	550	616	12
Terminal Revenue	9	8	6	4	3	3	3	3	-12
Peripheral Revenue	1	2	1	2	3	4	4	5	31
Hardware Revenue	344	346	363	387	450	499	557	624	11
Year-to-Year Increase (%)	-9	1	5	7	16	11	12	12	
Software Revenue	240	263	293	322	355	388	419	455	9
Year-to-Year Increase (%)	-8	10	11	10	10	9	8	9	
Software Service	99	120	162	159	164	166	167	167	1
Hardware Service	78	71	75	75	84	88	93	99	6
Service Revenue	176	191	237	234	248	254	260	266	2
Year-to-Year Increase (%)	1	8	24	-1	6	3	2	2	
Total Factory Revenue	761	800	893	942	1,053	1,141	1,236	1,345	9
Year-to-Year Increase (%)	-7	5	12	5	12	8	8	9	

Source: Dataquest (April 1996)

Table B-8
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Japan, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	20,121	21,183	21,411	25,200	29,800	35,300	43,400	51,200	19
Seats	20,321	21,328	21,619	25,300	29,900	35,300	43,400	51,200	19
Year-to-Year Increase (%)	2	5	1	17	18	18	23	18	
Installed Base									
CPUs	93,779	102,633	111,487	123,000	139,800	161,100	182,600	200,700	12
Seats	95,237	103,786	112,476	123,900	140,600	161,800	183,300	201,300	12
Year-to-Year Increase (%)	12	9	8	10	13	15	13	10	
REVENUE DATA ($M)									
CPU Revenue	468	510	543	645	758	891	1,072	1,235	18
Terminal Revenue	6	4	3	2	1	1	1	0	-33
Peripheral Revenue	36	41	36	40	44	47	50	54	8
Hardware Revenue	510	555	582	687	804	939	1,123	1,289	17
Year-to-Year Increase (%)	-2	9	5	18	17	17	20	15	
Software Revenue	334	389	432	489	557	679	852	1,008	18
Year-to-Year Increase (%)	5	17	11	13	14	22	25	18	
Software Service	129	165	198	214	231	263	305	333	11
Hardware Service	122	124	132	149	170	193	227	253	14
Service Revenue	251	289	330	363	400	456	531	586	12
Year-to-Year Increase (%)	28	15	14	10	10	14	16	10	
Total Factory Revenue	1,094	1,232	1,344	1,539	1,761	2,074	2,506	2,883	16
Year-to-Year Increase (%)	6	13	9	15	14	18	21	15	

Source: Dataquest (April 1996)

Table B-9
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Asia/Pacific, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	6,175	7,300	9,693	15,700	23,500	29,800	38,700	49,800	39
Seats	6,129	7,254	9,661	15,700	23,500	29,800	38,700	49,800	39
Year-to-Year Increase (%)	56	18	33	63	50	27	30	29	
Installed Base									
CPUs	16,032	21,899	29,951	43,100	63,600	88,400	116,500	147,000	37
Seats	16,310	22,019	29,940	43,000	63,500	88,400	116,400	146,900	37
Year-to-Year Increase (%)	45	35	36	44	48	39	32	26	
REVENUE DATA ($M)									
CPU Revenue	91	98	134	210	329	414	526	645	37
Terminal Revenue	1	0	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	1	1	1	2	3	48
Hardware Revenue	92	98	134	210	330	416	528	648	37
Year-to-Year Increase (%)	20	6	37	56	57	26	27	23	
Software Revenue	63	74	105	153	224	281	351	421	32
Year-to-Year Increase (%)	19	17	42	46	46	26	25	20	
Software Service	28	37	51	72	102	120	139	154	25
Hardware Service	23	23	31	46	70	85	103	120	31
Service Revenue	51	60	82	118	172	204	242	274	27
Year-to-Year Increase (%)	32	17	37	44	46	19	18	13	
Total Factory Revenue	207	232	321	482	726	901	1,122	1,343	33
Year-to-Year Increase (%)	23	12	38	50	51	24	24	20	

NA = Not applicable

Source: Dataquest (April 1996)

Table B-10
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Rest of World, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	637	427	405	500	800	1,300	2,200	3,900	57
Seats	653	446	411	500	800	1,300	2,200	3,900	57
Year-to-Year Increase (%)	37	-32	-8	27	57	56	69	79	
Installed Base									
CPUs	3,748	3,391	3,149	3,100	3,400	4,200	5,700	8,500	22
Seats	4,075	3,637	3,306	3,200	3,400	4,200	5,800	8,600	21
Year-to-Year Increase (%)	-3	-11	-9	-4	7	25	35	49	
REVENUE DATA ($M)									
CPU Revenue	6	5	5	6	9	12	19	32	47
Terminal Revenue	0	1	0	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	1	2	3	166
Hardware Revenue	6	6	5	6	9	13	21	35	49
Year-to-Year Increase (%)	-15	-10	-17	22	55	45	57	70	
Software Revenue	5	5	5	6	11	19	35	68	69
Year-to-Year Increase (%)	-13	-9	1	31	73	71	84	94	
Software Service	1	2	2	3	4	6	9	16	46
Hardware Service	1	1	1	1	2	3	4	8	47
Service Revenue	3	3	3	4	6	8	13	23	46
Year-to-Year Increase (%)	-4	0	23	20	44	42	57	73	
Total Factory Revenue	15	13	13	16	26	41	69	127	57
Year-to-Year Increase (%)	-12	-8	-2	25	59	56	70	83	

NA = Not applicable

Source: Dataquest (April 1996)

Table A-2
CAD/CAM/CAE/GIS Software History and Forecast
Top-Level ECAE Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue ($M)									
Worldwide, All Operating Systems	790	883	1,030	1,236	1,478	1,764	2,081	2,383	18.3
Worldwide									
UNIX	662	742	860	1,005	1,134	1,237	1,340	1,443	10.9
Windows NT	0	4	17	60	151	313	506	682	108.6
Personal Computer	126	135	151	170	193	213	235	258	11.2
Host/Proprietary	2	2	2	0	0	0	0	0	-42.8
All Operating Systems									
North America	421	454	536	639	745	886	1,008	1,089	15.2
Europe	168	189	202	224	251	278	302	331	10.4
Japan	158	194	222	263	310	384	493	603	22.1
Asia/Pacific	39	43	67	106	164	202	248	299	35.0
Rest of World	4	3	3	4	8	15	29	61	81.2
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		11.7	16.7	20.0	19.6	19.3	18.0	14.5	
Worldwide									
UNIX		12.0	15.9	16.9	12.7	9.1	8.3	7.7	
Windows NT		16338.9	332.5	248.5	151.2	107.4	61.6	34.7	
Personal Computer		7.0	12.4	12.6	13.4	10.4	10.2	9.7	
Host/Proprietary		1.2	-24.6	-86.9	-25.7	-18.1	-16.3	-8.2	
All Operating Systems									
North America		7.6	18.2	19.2	16.6	18.8	13.8	8.0	
Europe		12.6	7.0	10.9	12.1	10.6	8.8	9.5	
Japan		23.0	14.5	18.4	17.9	23.9	28.5	22.3	
Asia/Pacific		9.1	55.7	58.6	55.0	23.1	23.0	20.6	
Rest of World		-15.6	-10.0	28.4	94.9	88.7	100.3	106.4	

Source: Dataquest (April 1996)

Table B-11
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	93,329	97,563	107,205	132,900	166,000	199,300	239,700	282,600	21
Seats	93,143	97,754	107,374	133,000	166,000	199,400	239,700	282,600	21
Year-to-Year Increase (%)	12	5	10	24	25	20	20	18	
Installed Base									
CPUs	402,296	439,892	483,227	546,300	644,000	758,200	874,200	976,500	15
Seats	404,205	441,241	484,156	546,900	644,500	758,600	874,700	976,900	15
Year-to-Year Increase (%)	13	9	10	13	18	18	15	12	
REVENUE DATA ($M)									
CPU Revenue	1,071	1,111	1,245	1,549	1,915	2,203	2,554	2,927	19
Terminal Revenue	9	7	5	1	1	1	1	1	-34
Peripheral Revenue	21	24	21	27	34	42	50	57	22
Hardware Revenue	1,101	1,142	1,271	1,577	1,950	2,247	2,605	2,985	19
Year-to-Year Increase (%)	9	4	11	24	24	15	16	15	
Software Revenue	790	883	1,030	1,236	1,478	1,764	2,081	2,383	18
Year-to-Year Increase (%)	7	12	17	20	20	19	18	15	
Software Service	294	362	464	518	576	616	659	695	8
Hardware Service	260	246	277	329	393	435	485	533	14
Service Revenue	554	608	741	847	969	1,051	1,143	1,228	11
Year-to-Year Increase (%)	21	10	22	14	14	8	9	7	
Total Factory Revenue	2,445	2,632	3,043	3,660	4,397	5,061	5,829	6,596	17
Year-to-Year Increase (%)	11	8	16	20	20	15	15	13	

Source: Dataquest (April 1996)

Table B-12
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Worldwide, UNIX

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	43,067	48,051	53,004	64,100	75,800	81,700	89,300	97,100	13
Seats	43,067	48,051	53,004	64,100	75,800	81,700	89,300	97,100	13
Year-to-Year Increase (%)	19	12	10	21	18	8	9	9	
Installed Base									
CPUs	169,194	202,356	239,546	285,400	343,700	404,400	448,800	471,000	14
Seats	169,194	202,356	239,546	285,400	343,700	404,400	448,800	471,000	14
Year-to-Year Increase (%)	24	20	18	19	20	18	11	5	
REVENUE DATA ($M)									
CPU Revenue	893	964	1,087	1,349	1,636	1,814	2,038	2,280	16
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	19	22	18	21	22	23	23	24	6
Hardware Revenue	911	987	1,105	1,369	1,658	1,836	2,062	2,304	16
Year-to-Year Increase (%)	13	8	12	24	21	11	12	12	
Software Revenue	662	742	860	1,005	1,134	1,237	1,340	1,443	11
Year-to-Year Increase (%)	9	12	16	17	13	9	8	8	
Software Service	282	339	432	480	525	545	561	568	6
Hardware Service	242	237	267	315	369	395	428	460	11
Service Revenue	524	576	699	795	895	940	988	1,028	8
Year-to-Year Increase (%)	22	10	21	14	13	5	5	4	
Total Factory Revenue	2,098	2,305	2,664	3,170	3,686	4,013	4,389	4,776	12
Year-to-Year Increase (%)	14	10	16	19	16	9	9	9	

NA = Not applicable
Source: Dataquest (April 1996)

Table B-13
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Worldwide, NT/Hybrid

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	1	264	997	3,500	9,000	18,600	29,400	38,000	107
Seats	1	264	997	3,500	9,000	18,600	29,400	38,000	107
Year-to-Year Increase (%)	NA	22,043	277	252	155	108	58	29	
Installed Base									
CPUs	1	265	1,252	4,800	13,700	30,400	52,400	77,600	128
Seats	1	265	1,252	4,800	13,700	30,400	52,400	77,600	128
Year-to-Year Increase (%)	NA	22,074	373	281	188	121	72	48	
REVENUE DATA ($M)									
CPU Revenue	0	3	8	26	63	127	195	257	100
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	1	4	9	16	22	27	83
Hardware Revenue	0	3	9	30	72	143	217	284	98
Year-to-Year Increase (%)	NA	22,480	207	215	143	98	52	31	
Software Revenue	0	4	17	60	151	313	506	682	109
Year-to-Year Increase (%)	NA	16,339	333	248	151	107	62	35	
Software Service	0	1	1	5	14	32	57	85	125
Hardware Service	-	1	2	7	16	30	45	58	89
Service Revenue	0	2	4	12	30	63	103	143	106
Year-to-Year Increase (%)	NA	220,975	154	209	154	107	64	39	
Total Factory Revenue	0	9	31	102	253	518	825	1,108	105
Year-to-Year Increase (%)	NA	22,170	256	233	149	105	59	34	

NA = Not applicable
Source: Dataquest (April 1996)

Table B-14
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Worldwide, Personal Computer

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	49,622	49,063	53,084	65,300	81,200	99,000	120,900	147,400	23
Seats	49,622	49,063	53,103	65,300	81,200	99,000	120,900	147,400	23
Year-to-Year Increase (%)	8	-1	8	23	24	22	22	22	
Installed Base									
CPUs	229,627	234,405	240,217	254,500	285,600	322,700	372,500	427,400	12
Seats	229,627	234,405	240,217	254,500	285,600	322,700	372,500	427,400	12
Year-to-Year Increase (%)	8	2	2	6	12	13	15	15	
REVENUE DATA ($M)									
CPU Revenue	126	128	140	171	214	262	320	390	23
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	2	2	2	2	3	4	5	6	26
Hardware Revenue	127	130	141	174	217	266	325	395	23
Year-to-Year Increase (%)	-1	2	9	23	25	22	22	22	
Software Revenue	126	135	151	170	193	213	235	258	11
Year-to-Year Increase (%)	4	7	12	13	13	10	10	10	
Software Service	12	22	31	33	36	38	41	43	7
Hardware Service	3	3	4	6	7	9	11	14	28
Service Revenue	15	25	35	39	43	48	52	57	10
Year-to-Year Increase (%)	10	70	39	10	12	10	10	10	
Total Factory Revenue	268	290	328	383	454	526	612	710	17
Year-to-Year Increase (%)	2	8	13	17	19	16	16	16	

NA = Not applicable

Source: Dataquest (April 1996)

Table B-15
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Worldwide, Host/Proprietary

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	639	185	121	0	0	0	0	0	-26
Seats	453	376	271	100	100	0	0	0	-34
Year-to-Year Increase (%)	-46	-17	-28	-68	-30	-19	-18	-12	
Installed Base									
CPUs	3,474	2,866	2,212	1,600	1,000	700	600	400	-28
Seats	5,383	4,215	3,141	2,200	1,500	1,200	1,000	900	-23
Year-to-Year Increase (%)	-19	-22	-25	-31	-30	-23	-13	-15	
REVENUE DATA ($M)									
CPU Revenue	53	16	10	3	2	1	1	1	-38
Terminal Revenue	9	7	5	1	1	1	1	1	-34
Peripheral Revenue	0	0	0	-	-	-	-	-	NA
Hardware Revenue	62	23	15	4	3	2	2	2	-37
Year-to-Year Increase (%)	-17	-64	-34	-71	-35	-22	-21	-12	
Software Revenue	2	2	2	0	0	0	0	0	-43
Year-to-Year Increase (%)	-77	1	-25	-87	-26	-18	-16	-8	
Software Service	0	0	0	0	0	0	0	0	-27
Hardware Service	15	4	3	1	1	0	0	0	-40
Service Revenue	15	5	4	1	1	0	0	0	-38
Year-to-Year Increase (%)	-8	-69	-24	-74	-34	-23	-21	-11	
Total Factory Revenue	80	30	20	5	4	3	2	2	-37
Year-to-Year Increase (%)	-21	-63	-32	-73	-35	-22	-21	-12	

NA = Not applicable

Source: Dataquest (April 1996)

Table B-16
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, North America, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	57,460	58,849	64,142	78,000	94,100	111,200	129,400	146,000	18
Seats	57,317	58,880	64,164	78,000	94,100	111,200	129,400	146,000	18
Year-to-Year Increase (%)	14	3	9	22	21	18	16	13	
Installed Base									
CPUs	247,417	267,898	292,502	326,700	378,500	437,100	492,700	534,300	13
Seats	248,332	268,442	292,771	326,800	378,600	437,100	492,800	534,300	13
Year-to-Year Increase (%)	13	8	9	12	16	15	13	8	
REVENUE DATA ($M)									
CPU Revenue	548	556	635	791	952	1,092	1,246	1,393	17
Terminal Revenue	3	1	1	0	0	0	0	0	-27
Peripheral Revenue	2	2	1	3	6	11	13	14	67
Hardware Revenue	553	559	637	794	958	1,102	1,260	1,407	17
Year-to-Year Increase (%)	13	1	14	25	21	15	14	12	
Software Revenue	421	454	536	639	745	886	1,008	1,089	15
Year-to-Year Increase (%)	9	8	18	19	17	19	14	8	
Software Service	157	187	243	271	292	309	322	328	6
Hardware Service	131	121	140	167	195	215	236	253	13
Service Revenue	288	308	383	438	486	524	558	580	9
Year-to-Year Increase (%)	25	7	24	14	11	8	7	4	
Total Factory Revenue	1,262	1,321	1,556	1,871	2,190	2,512	2,826	3,076	15
Year-to-Year Increase (%)	14	5	18	20	17	15	13	9	

Source: Dataquest (April 1996)

Table B-17
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	20,750	22,677	24,596	28,200	34,800	41,900	50,200	59,400	19
Seats	20,714	22,789	24,667	28,200	34,800	41,900	50,200	59,400	19
Year-to-Year Increase (%)	4	10	8	14	23	20	20	18	
Installed Base									
CPUs	95,691	104,692	113,016	124,400	142,500	163,100	184,000	202,500	12
Seats	96,254	105,170	113,408	124,600	142,800	163,300	184,200	202,600	12
Year-to-Year Increase (%)	12	9	8	10	15	14	13	10	
REVENUE DATA ($M)									
CPU Revenue	234	238	244	269	316	354	399	449	13
Terminal Revenue	4	3	2	-	-	-	-	-	NA
Peripheral Revenue	1	1	1	1	2	3	3	4	42
Hardware Revenue	238	243	247	270	317	356	402	453	13
Year-to-Year Increase (%)	-2	2	2	9	18	12	13	13	
Software Revenue	168	189	202	224	251	278	302	331	10
Year-to-Year Increase (%)	-1	13	7	11	12	11	9	10	
Software Service	63	79	97	96	101	103	104	104	1
Hardware Service	54	50	50	52	58	61	64	68	6
Service Revenue	117	129	147	148	158	164	168	173	3
Year-to-Year Increase (%)	5	10	14	1	7	3	3	3	
Total Factory Revenue	523	561	596	642	727	798	872	957	10
Year-to-Year Increase (%)	0	7	6	8	13	10	9	10	

NA = Not applicable

Source: Dataquest (April 1996)

Table B-18
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Japan, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	10,490	11,378	11,842	14,700	18,000	21,800	27,400	33,300	23
Seats	10,511	11,428	11,917	14,700	18,000	21,800	27,500	33,300	23
Year-to-Year Increase (%)	5	9	4	24	22	21	26	21	
Installed Base									
CPUs	46,565	51,489	56,737	64,300	75,300	89,200	104,000	117,500	16
Seats	46,855	51,738	56,979	64,500	75,500	89,400	104,200	117,700	16
Year-to-Year Increase (%)	13	10	10	13	17	18	16	13	
REVENUE DATA ($M)									
CPU Revenue	229	257	278	340	400	453	525	604	17
Terminal Revenue	2	2	2	1	1	0	0	0	-25
Peripheral Revenue	18	21	19	23	26	28	32	35	12
Hardware Revenue	250	280	300	363	426	482	557	639	16
Year-to-Year Increase (%)	9	12	7	21	17	13	16	15	
Software Revenue	158	194	222	263	310	384	493	603	22
Year-to-Year Increase (%)	10	23	14	18	18	24	28	22	
Software Service	58	74	93	103	111	121	136	151	10
Hardware Service	59	61	67	77	88	97	110	123	13
Service Revenue	117	136	160	180	199	218	246	274	11
Year-to-Year Increase (%)	26	16	18	13	11	10	13	11	
Total Factory Revenue	525	610	681	806	935	1,084	1,296	1,516	17
Year-to-Year Increase (%)	13	16	12	18	16	16	20	17	

Source: Dataquest (April 1996)

Table B-19
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Asia/Pacific, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	4,142	4,334	6,321	11,600	18,400	23,500	30,800	40,600	45
Seats	4,112	4,325	6,313	11,600	18,400	23,500	30,800	40,600	45
Year-to-Year Increase (%)	70	5	46	84	58	27	31	32	
Installed Base									
CPUs	10,081	13,488	18,783	28,800	45,300	65,800	89,300	115,500	44
Seats	10,129	13,498	18,760	28,700	45,300	65,700	89,300	115,500	44
Year-to-Year Increase (%)	52	33	39	53	58	45	36	29	
REVENUE DATA ($M)									
CPU Revenue	56	56	85	146	242	297	370	457	40
Terminal Revenue	0	0	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	1	1	2	106
Hardware Revenue	56	56	85	146	243	298	371	459	40
Year-to-Year Increase (%)	26	0	51	73	66	23	25	24	
Software Revenue	39	43	67	106	164	202	248	299	35
Year-to-Year Increase (%)	28	9	56	59	55	23	23	21	
Software Service	15	20	30	47	70	80	90	100	27
Hardware Service	14	13	20	32	51	60	71	83	33
Service Revenue	30	33	50	79	122	140	161	183	30
Year-to-Year Increase (%)	27	12	49	58	55	15	15	13	
Total Factory Revenue	125	132	201	330	528	639	780	940	36
Year-to-Year Increase (%)	27	6	52	64	60	21	22	21	

NA = Not applicable
Source: Dataquest (April 1996)

Table B-20
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Rest of World, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	486	325	304	400	600	1,000	1,700	3,300	61
Seats	490	332	312	400	600	1,000	1,700	3,300	60
Year-to-Year Increase (%)	44	-32	-6	21	59	61	79	89	
Installed Base									
CPUs	2,544	2,326	2,189	2,200	2,400	3,000	4,200	6,700	25
Seats	2,636	2,393	2,238	2,200	2,400	3,000	4,300	6,700	25
Year-to-Year Increase (%)	0	-9	-6	-2	8	28	40	58	
REVENUE DATA ($M)									
CPU Revenue	4	4	3	4	5	8	14	25	53
Terminal Revenue	0	0	0	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	1	1	3	203
Hardware Revenue	4	4	3	4	6	9	15	28	55
Year-to-Year Increase (%)	-13	-14	-16	16	59	55	69	84	
Software Revenue	4	3	3	4	8	15	29	61	81
Year-to-Year Increase (%)	-9	-16	-10	28	95	89	100	106	
Software Service	1	1	1	1	2	3	6	13	57
Hardware Service	1	1	1	1	1	2	3	6	55
Service Revenue	2	2	2	2	3	5	10	19	57
Year-to-Year Increase (%)	-5	-6	13	14	53	58	78	94	
Total Factory Revenue	10	9	8	10	17	29	54	107	67
Year-to-Year Increase (%)	-10	-13	-8	20	72	71	86	98	

NA = Not applicable
Source: Dataquest (April 1996)

Table A-3
CAD/CAM/CAE/GIS Software History and Forecast
Top-Level IC Layout Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue ($M)									
Worldwide, All Operating Systems	177	210	283	366	461	573	714	840	24.3
Worldwide									
UNIX	174	207	278	361	455	567	708	833	24.6
Windows NT	-	-	2	2	2	2	2	2	0
Personal Computer	3	3	4	4	4	4	4	4	4.7
Host/Proprietary	-	-	-	-	-	-	-	-	NA
All Operating Systems									
North America	83	98	139	198	262	312	372	438	25.8
Europe	30	33	48	53	57	61	66	71	8.0
Japan	50	61	72	84	100	142	198	237	27.0
Asia/Pacific	14	18	23	30	40	57	76	91	31.1
Rest of World	1	1	1	1	2	2	2	3	25.4
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		18.8	34.7	29.3	25.8	24.4	24.6	17.6	
Worldwide									
UNIX		19.3	34.1	29.8	26.1	24.7	24.8	17.8	
Windows NT		NA	NA	0.1	0	0	0	0	
Personal Computer		-5.9	9.1	7.2	6.5	5.3	2.8	2.1	
Host/Proprietary		NA	NA	NA	NA	NA	NA	NA	
All Operating Systems									
North America		17.9	42.2	42.3	32.6	18.8	19.3	17.9	
Europe		13.0	45.2	8.9	7.6	7.9	7.4	8.1	
Japan		20.1	18.1	17.6	18.4	42.1	39.4	19.8	
Asia/Pacific		32.1	29.8	29.8	32.8	39.8	34.9	19.0	
Rest of World		15.1	43.7	42.0	33.0	18.5	18.0	17.4	

NA = Not applicable

Source: Dataquest (April 1996)

Table B-21
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	9,037	10,245	12,828	16,900	22,200	27,000	33,400	39,500	25
Seats	8,905	10,017	12,668	16,900	22,200	27,000	33,400	39,500	26
Year-to-Year Increase (%)	-9	12	26	33	31	22	24	18	
Installed Base									
CPUs	46,084	50,991	58,744	70,200	87,000	108,300	130,900	150,700	21
Seats	46,119	50,702	58,278	69,700	86,600	107,900	130,500	150,300	21
Year-to-Year Increase (%)	10	10	15	20	24	25	21	15	
REVENUE DATA ($M)									
CPU Revenue	262	297	372	490	661	842	1,096	1,340	29
Terminal Revenue	2	0	-	-	-	-	-	-	NA
Peripheral Revenue	3	2	1	1	2	2	3	3	21
Hardware Revenue	267	300	373	492	663	844	1,099	1,343	29
Year-to-Year Increase (%)	-15	12	25	32	35	27	30	22	
Software Revenue	177	210	283	366	461	573	714	840	24
Year-to-Year Increase (%)	-17	19	35	29	26	24	25	18	
Software Service	104	139	192	236	287	340	404	447	18
Hardware Service	70	73	91	114	149	183	229	269	24
Service Revenue	174	212	284	350	436	523	633	716	20
Year-to-Year Increase (%)	12	22	34	23	25	20	21	13	
Total Factory Revenue	618	722	940	1,208	1,560	1,941	2,446	2,899	25
Year-to-Year Increase (%)	-9	17	30	28	29	24	26	19	

NA = Not applicable

Source: Dataquest (April 1996)

Table B-22
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Worldwide, UNIX

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	7,382	8,824	11,302	15,300	20,300	24,700	30,900	36,700	27
Seats	7,382	8,824	11,302	15,300	20,300	24,700	30,900	36,700	27
Year-to-Year Increase (%)	-9	20	28	35	33	22	25	19	
Installed Base									
CPUs	38,333	43,725	51,284	62,500	79,000	99,700	121,700	140,900	22
Seats	38,333	43,725	51,284	62,500	79,000	99,700	121,700	140,900	22
Year-to-Year Increase (%)	15	14	17	22	26	26	22	16	
REVENUE DATA ($M)									
CPU Revenue	238	273	354	485	655	835	1,089	1,332	30
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	3	2	1	1	1	2	3	3	25
Hardware Revenue	241	275	355	486	657	837	1,091	1,335	30
Year-to-Year Increase (%)	-14	14	29	37	35	27	30	22	
Software Revenue	174	207	278	361	455	567	708	833	25
Year-to-Year Increase (%)	-16	19	34	30	26	25	25	18	
Software Service	103	138	191	234	286	339	402	445	18
Hardware Service	65	67	87	113	148	182	228	269	25
Service Revenue	167	205	278	348	434	521	630	714	21
Year-to-Year Increase (%)	12	23	35	25	25	20	21	13	
Total Factory Revenue	582	688	911	1,194	1,546	1,925	2,429	2,882	26
Year-to-Year Increase (%)	-9	18	32	31	29	25	26	19	

NA = Not applicable

Source: Dataquest (April 1996)

Table B-23
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Worldwide, NT/Hybrid

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	-	-	77	100	100	100	100	100	2
Seats	-	-	77	100	100	100	100	100	2
Year-to-Year Increase (%)	NA	NA	NA	3	4	2	2	0	
Installed Base									
CPUs	-	-	76	200	200	300	300	200	26
Seats	-	-	76	200	200	300	300	200	26
Year-to-Year Increase (%)	NA	NA	NA	104	53	14	-7	-6	
REVENUE DATA ($M)									
CPU Revenue	-	-	1	1	1	1	1	1	-3
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	-	0	0	0	0	0	0	-9
Hardware Revenue	-	-	1	1	1	1	1	1	-4
Year-to-Year Increase (%)	NA	NA	NA	-8	-2	-4	-4	-1	
Software Revenue	-	-	2	2	2	2	2	2	0
Year-to-Year Increase (%)	NA	NA	NA	0	0	0	0	0	
Software Service	-	-	0	0	0	0	0	0	3
Hardware Service	-	-	0	0	0	0	0	0	-8
Service Revenue	-	-	1	1	1	1	1	1	-3
Year-to-Year Increase (%)	NA	NA	NA	-12	-1	-2	-1	0	
Total Factory Revenue	-	-	4	4	4	4	4	4	-2
Year-to-Year Increase (%)	NA	NA	NA	-5	-1	-1	-1	0	

NA = Not applicable
Source: Dataquest (April 1996)

Table B-24
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Worldwide, Personal Computer

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	1,420	1,173	1,289	1,500	1,800	2,100	2,500	2,800	17
Seats	1,420	1,173	1,289	1,500	1,800	2,100	2,500	2,800	17
Year-to-Year Increase (%)	7	-17	10	20	19	17	14	13	
Installed Base									
CPUs	6,334	5,938	6,234	6,600	7,200	7,800	8,600	9,100	8
Seats	6,334	5,938	6,234	6,600	7,200	7,800	8,600	9,100	8
Year-to-Year Increase (%)	-3	-6	5	6	8	9	9	7	
REVENUE DATA ($M)									
CPU Revenue	4	3	4	4	5	6	7	8	16
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	-	0	0	0	0	0	0	15
Hardware Revenue	4	3	4	4	5	6	7	8	16
Year-to-Year Increase (%)	15	-31	18	19	18	17	14	13	
Software Revenue	3	3	4	4	4	4	4	4	5
Year-to-Year Increase (%)	21	-6	9	7	6	5	3	2	
Software Service	1	1	1	1	1	1	1	1	1
Hardware Service	0	0	0	0	0	0	0	0	20
Service Revenue	1	1	1	1	1	2	2	2	5
Year-to-Year Increase (%)	203	-27	34	5	6	5	4	4	
Total Factory Revenue	9	7	8	9	11	12	13	14	10
Year-to-Year Increase (%)	29	-21	16	12	12	11	9	8	

NA = Not applicable

Source: Dataquest (April 1996)

Table B-25
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Worldwide, Host/Proprietary

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	235	248	160	-	-	-	-	-	NA
Seats	103	20	-	-	-	-	-	-	NA
Year-to-Year Increase (%)	-70	-81	NA	NA	NA	NA	NA	NA	
Installed Base									
CPUs	1,418	1,328	1,149	900	700	500	400	400	-21
Seats	1,453	1,039	684	400	200	100	100	0	-52
Year-to-Year Increase (%)	-28	-28	-34	-39	-47	-51	-53	-67	
REVENUE DATA ($M)									
CPU Revenue	20	21	13	-	-	-	-	-	NA
Terminal Revenue	2	0	-	-	-	-	-	-	NA
Peripheral Revenue	-	-	-	-	-	-	-	-	NA
Hardware Revenue	22	21	13	-	-	-	-	-	NA
Year-to-Year Increase (%)	-21	-5	-37	NA	NA	NA	NA	NA	
Software Revenue	-	0	0	-	-	-	-	-	NA
Year-to-Year Increase (%)	NA	NA	NA	NA	NA	NA	NA	NA	
Software Service	-	0	0	-	-	-	-	-	NA
Hardware Service	6	6	4	-	-	-	-	-	NA
Service Revenue	6	6	4	-	-	-	-	-	NA
Year-to-Year Increase (%)	-3	5	-34	NA	NA	NA	NA	NA	
Total Factory Revenue	28	27	17	-	-	-	-	-	NA
Year-to-Year Increase (%)	-24	-3	-36	NA	NA	NA	NA	NA	

NA = Not applicable

Source: Dataquest (April 1996)

Table B-26
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, North America, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	4,976	5,662	7,244	10,400	14,100	16,600	19,900	23,500	27
Seats	4,940	5,594	7,189	10,400	14,100	16,600	19,900	23,500	27
Year-to-Year Increase (%)	-10	13	29	45	36	17	20	18	
Installed Base									
CPUs	24,278	27,097	31,766	39,200	50,400	63,700	77,300	89,100	23
Seats	24,303	27,001	31,610	39,100	50,300	63,500	77,200	89,000	23
Year-to-Year Increase (%)	11	11	17	24	29	26	21	15	
REVENUE DATA ($M)									
CPU Revenue	112	126	170	253	361	435	539	660	31
Terminal Revenue	1	0	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	-3
Hardware Revenue	113	127	170	253	361	436	539	660	31
Year-to-Year Increase (%)	-11	13	34	49	42	21	24	22	
Software Revenue	83	98	139	198	262	312	372	438	26
Year-to-Year Increase (%)	-16	18	42	42	33	19	19	18	
Software Service	51	67	91	125	161	182	206	229	20
Hardware Service	30	31	42	59	81	94	112	132	26
Service Revenue	81	98	132	183	242	276	319	361	22
Year-to-Year Increase (%)	12	21	35	39	32	14	15	13	
Total Factory Revenue	277	323	442	635	865	1,023	1,230	1,459	27
Year-to-Year Increase (%)	-7	17	37	44	36	18	20	19	

NA = Not applicable

Source: Dataquest (April 1996)

Table B-27
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	1,259	1,418	1,945	2,000	2,200	2,400	2,600	2,800	8
Seats	1,197	1,331	1,889	2,000	2,200	2,400	2,600	2,800	8
Year-to-Year Increase (%)	-19	11	42	6	12	7	8	9	
Installed Base									
CPUs	8,075	8,573	9,523	10,600	12,100	13,600	14,700	14,700	9
Seats	8,002	8,416	9,327	10,500	11,900	13,500	14,500	14,600	9
Year-to-Year Increase (%)	4	5	11	12	14	13	8	0	
REVENUE DATA ($M)									
CPU Revenue	46	50	64	64	74	81	90	101	10
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	0	0	0	0	0	-5
Hardware Revenue	46	50	64	64	74	81	90	101	10
Year-to-Year Increase (%)	-20	7	28	1	15	10	11	12	
Software Revenue	30	33	48	53	57	61	66	71	8
Year-to-Year Increase (%)	-21	13	45	9	8	8	7	8	
Software Service	15	20	35	35	36	37	38	38	2
Hardware Service	12	12	16	15	17	18	19	20	5
Service Revenue	27	33	51	50	53	55	57	59	3
Year-to-Year Increase (%)	1	20	56	-3	7	4	4	4	
Total Factory Revenue	103	116	164	167	184	197	213	231	7
Year-to-Year Increase (%)	-16	12	41	2	10	7	8	9	

NA = Not applicable
Source: Dataquest (April 1996)

Table B-28
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Japan, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	2,094	2,234	2,500	3,000	3,700	5,100	7,200	8,600	28
Seats	2,079	2,185	2,469	3,000	3,700	5,100	7,200	8,600	28
Year-to-Year Increase (%)	-2	5	13	22	23	39	39	20	
Installed Base									
CPUs	11,443	12,263	13,487	15,100	17,600	21,600	26,500	31,500	19
Seats	11,534	12,264	13,432	15,000	17,500	21,500	26,400	31,500	19
Year-to-Year Increase (%)	8	6	10	12	16	23	23	19	
REVENUE DATA ($M)									
CPU Revenue	83	94	104	127	162	235	340	423	32
Terminal Revenue	1	-	-	-	-	-	-	-	NA
Peripheral Revenue	2	2	1	1	1	2	3	3	24
Hardware Revenue	86	95	105	129	164	237	343	426	32
Year-to-Year Increase (%)	-18	11	11	22	27	45	45	24	
Software Revenue	50	61	72	84	100	142	198	237	27
Year-to-Year Increase (%)	-19	20	18	18	18	42	39	20	
Software Service	30	40	51	57	66	89	118	133	21
Hardware Service	22	23	26	30	36	51	71	85	27
Service Revenue	52	63	76	87	102	140	190	218	23
Year-to-Year Increase (%)	16	21	21	14	18	37	35	15	
Total Factory Revenue	188	219	254	300	366	519	730	881	28
Year-to-Year Increase (%)	-11	16	16	18	22	42	41	21	

NA = Not applicable
Source: Dataquest (April 1996)

Table B-29
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Asia/Pacific, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	678	896	1,094	1,500	2,000	2,800	3,700	4,500	33
Seats	660	873	1,078	1,500	2,000	2,800	3,700	4,500	33
Year-to-Year Increase (%)	3	32	24	35	38	38	36	20	
Installed Base									
CPUs	1,988	2,767	3,674	4,900	6,600	9,000	11,900	14,700	32
Seats	1,974	2,727	3,616	4,800	6,600	9,000	11,900	14,700	32
Year-to-Year Increase (%)	43	38	33	33	36	37	33	24	
REVENUE DATA ($M)									
CPU Revenue	21	27	32	43	62	88	123	152	36
Terminal Revenue	0	0	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	16
Hardware Revenue	21	27	32	43	62	88	123	152	36
Year-to-Year Increase (%)	2	25	22	34	43	42	40	23	
Software Revenue	14	18	23	30	40	57	76	91	31
Year-to-Year Increase (%)	-5	32	30	30	33	40	35	19	
Software Service	7	10	14	18	23	31	39	44	25
Hardware Service	6	7	8	10	14	19	26	31	31
Service Revenue	13	17	22	28	37	50	65	75	27
Year-to-Year Increase (%)	27	31	32	26	32	34	31	15	
Total Factory Revenue	48	62	78	102	140	194	265	317	32
Year-to-Year Increase (%)	6	29	27	30	37	39	36	20	

NA = Not applicable

Source: Dataquest (April 1996)

Table B-30
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Rest of World, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	31	34	44	100	100	100	100	100	26
Seats	30	33	43	100	100	100	100	100	27
Year-to-Year Increase (%)	-34	11	29	47	39	17	19	18	
Installed Base									
CPUs	300	291	295	300	400	400	500	600	16
Seats	306	293	293	300	400	400	500	600	16
Year-to-Year Increase (%)	1	-4	0	7	15	23	20	14	
REVENUE DATA ($M)									
CPU Revenue	1	1	1	2	3	3	4	5	28
Terminal Revenue	0	0	-	-	-	-	-	-	NA
Peripheral Revenue	-	-	-	-	-	-	-	-	NA
Hardware Revenue	1	1	1	2	3	3	4	5	28
Year-to-Year Increase (%)	-30	3	23	37	43	20	22	22	
Software Revenue	1	1	1	1	2	2	2	3	25
Year-to-Year Increase (%)	-38	15	44	42	33	19	18	17	
Software Service	0	0	1	1	1	1	2	2	20
Hardware Service	0	0	0	0	1	1	1	1	23
Service Revenue	1	1	1	1	2	2	2	3	21
Year-to-Year Increase (%)	-3	18	44	34	32	14	14	13	
Total Factory Revenue	2	2	3	5	6	7	9	10	25
Year-to-Year Increase (%)	-26	10	35	37	36	18	19	18	

NA = Not applicable

Source: Dataquest (April 1996)

Table A-4
CAD/CAM/CAE/GIS Software History and Forecast
Top-Level PCB/MCM/Hybrid Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue ($M)									
Worldwide, All Operating Systems	245	256	267	289	313	342	374	409	8.9
Worldwide									
UNIX	202	208	214	220	224	226	215	202	-1.2
Windows NT	-	2	6	25	45	72	114	162	90.8
Personal Computer	42	45	45	43	43	44	45	45	0.2
Host/Proprietary	1	1	1	1	1	0	0	0	-36.3
All Operating Systems									
North America	65	67	70	84	97	113	132	151	16.6
Europe	43	41	43	45	47	49	51	53	4.4
Japan	125	134	138	142	147	154	161	169	4.1
Asia/Pacific	10	13	15	17	20	23	27	31	16.2
Rest of World	1	1	1	1	2	3	4	5	39.6
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		4.4	4.3	8.2	8.5	9.2	9.5	9.4	
Worldwide									
UNIX		3.3	3.0	2.7	1.9	0.5	-4.8	-6.2	
Windows NT		NA	292.8	287.1	80.6	59.7	59.4	41.9	
Personal Computer		6.6	-0.1	-4.8	1.3	1.9	1.4	1.3	
Host/Proprietary		-30.3	2.8	-19.9	-29.1	-37.5	-44.3	-46.8	
All Operating Systems									
North America		2.0	5.1	19.1	15.8	16.8	16.5	14.8	
Europe		-5.1	4.4	4.6	5.5	4.1	3.4	4.2	
Japan		7.1	2.8	3.0	3.8	4.4	4.6	4.8	
Asia/Pacific		26.1	15.1	14.7	16.6	16.6	16.8	16.3	
Rest of World		12.1	14.4	31.6	45.8	42.5	39.7	38.8	

NA = Not applicable

Source: Dataquest (April 1996)

Table B-31
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	26,410	27,411	28,258	31,700	36,300	41,000	46,700	52,900	13
Seats	26,778	27,729	28,611	32,000	36,500	41,200	46,900	53,000	13
Year-to-Year Increase (%)	0	4	3	12	14	13	14	13	
Installed Base									
CPUs	146,978	148,996	153,574	162,300	176,500	191,500	203,600	212,000	7
Seats	152,844	153,489	156,879	164,700	178,400	193,200	205,300	213,600	6
Year-to-Year Increase (%)	2	0	2	5	8	8	6	4	
REVENUE DATA ($M)									
CPU Revenue	304	298	298	328	366	389	409	430	8
Terminal Revenue	10	9	7	6	5	4	4	3	-14
Peripheral Revenue	17	21	17	20	23	24	26	27	9
Hardware Revenue	331	327	322	354	394	417	439	461	7
Year-to-Year Increase (%)	-9	-1	-1	10	11	6	5	5	
Software Revenue	245	256	267	289	313	342	374	409	9
Year-to-Year Increase (%)	2	4	4	8	8	9	9	9	
Software Service	106	117	141	138	138	137	134	132	-1
Hardware Service	73	67	66	71	78	81	84	87	5
Service Revenue	179	184	208	209	216	218	218	219	1
Year-to-Year Increase (%)	20	3	13	1	3	1	0	0	
Total Factory Revenue	756	767	797	851	923	977	1,031	1,089	6
Year-to-Year Increase (%)	0	2	4	7	8	6	6	6	

Source: Dataquest (April 1996)

Table B-32
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Worldwide, UNIX

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	11,823	12,157	11,785	12,400	13,200	13,000	12,500	11,800	0
Seats	11,823	12,157	11,785	12,400	13,200	13,000	12,500	11,800	0
Year-to-Year Increase (%)	9	3	-3	5	6	-1	-4	-6	
Installed Base									
CPUs	61,352	67,103	73,062	79,200	86,900	94,100	95,100	91,100	5
Seats	61,352	67,103	73,062	79,200	86,900	94,100	95,100	91,100	5
Year-to-Year Increase (%)	12	9	9	8	10	8	1	-4	
REVENUE DATA ($M)									
CPU Revenue	245	244	246	269	294	301	297	289	3
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	15	19	16	16	17	16	15	14	-2
Hardware Revenue	260	264	261	285	311	317	312	303	3
Year-to-Year Increase (%)	-2	1	-1	9	9	2	-2	-3	
Software Revenue	202	208	214	220	224	226	215	202	-1
Year-to-Year Increase (%)	1	3	3	3	2	1	-5	-6	
Software Service	100	109	127	122	119	113	102	90	-7
Hardware Service	66	60	60	63	67	66	62	58	-1
Service Revenue	166	169	187	185	186	178	164	148	-5
Year-to-Year Increase (%)	23	2	11	-1	0	-4	-8	-10	
Total Factory Revenue	628	641	663	690	722	721	692	653	0
Year-to-Year Increase (%)	5	2	3	4	5	0	-4	-6	

NA = Not applicable

Source: Dataquest (April 1996)

Table B-33
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Worldwide, NT/Hybrid

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	-	120	412	1,700	3,200	5,200	8,200	11,500	94
Seats	-	120	412	1,700	3,200	5,200	8,200	11,500	94
Year-to-Year Increase (%)	NA	NA	244	315	87	61	59	40	
Installed Base									
CPUs	-	119	529	2,200	5,400	9,700	15,000	22,600	112
Seats	-	119	529	2,200	5,400	9,700	15,000	22,600	112
Year-to-Year Increase (%)	NA	NA	343	324	143	77	56	50	
REVENUE DATA ($M)									
CPU Revenue	-	1	3	10	18	29	45	66	88
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	1	3	5	7	9	12	71
Hardware Revenue	-	2	4	13	23	35	55	78	84
Year-to-Year Increase (%)	NA	NA	121	253	78	54	55	42	
Software Revenue	-	2	6	25	45	72	114	162	91
Year-to-Year Increase (%)	NA	NA	293	287	81	60	59	42	
Software Service	-	1	1	4	7	12	21	31	99
Hardware Service	-	1	1	5	8	12	18	24	75
Service Revenue	-	2	2	8	15	24	38	55	86
Year-to-Year Increase (%)	NA	NA	51	241	81	59	59	44	
Total Factory Revenue	-	5	13	46	83	131	208	295	88
Year-to-Year Increase (%)	NA	NA	155	268	80	58	58	42	

NA = Not applicable

Source: Dataquest (April 1996)

Table B-34
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Worldwide, Personal Computer

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	14,323	14,983	15,951	17,500	19,900	22,800	26,000	29,600	13
Seats	14,323	14,983	15,969	17,500	19,900	22,800	26,000	29,600	13
Year-to-Year Increase (%)	-4	5	7	9	14	15	14	14	
Installed Base									
CPUs	83,100	79,765	78,491	79,800	83,300	87,200	92,900	97,800	4
Seats	83,100	79,765	78,491	79,800	83,300	87,200	92,900	97,800	4
Year-to-Year Increase (%)	-3	-4	-2	2	4	5	7	5	
REVENUE DATA ($M)									
CPU Revenue	39	40	41	44	50	57	65	74	12
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	2	2	1	1	1	1	1	1	-3
Hardware Revenue	41	42	42	45	51	58	66	74	12
Year-to-Year Increase (%)	-17	2	1	7	13	14	13	13	
Software Revenue	42	45	45	43	43	44	45	45	0
Year-to-Year Increase (%)	12	7	0	-5	1	2	1	1	
Software Service	5	7	13	11	11	11	11	11	-3
Hardware Service	2	3	2	2	3	3	4	4	12
Service Revenue	7	9	15	14	14	14	15	15	0
Year-to-Year Increase (%)	13	34	60	-7	1	2	2	2	
Total Factory Revenue	90	96	102	101	108	116	125	135	6
Year-to-Year Increase (%)	-3	7	6	0	6	8	8	8	

NA = Not applicable

Source: Dataquest (April 1996)

Table B-35
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Worldwide, Host/Proprietary

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	264	152	110	100	100	100	0	0	-20
Seats	632	469	444	400	300	200	200	200	-17
Year-to-Year Increase (%)	-36	-26	-5	-17	-20	-20	-17	-13	
Installed Base									
CPUs	2,526	2,009	1,492	1,100	800	600	600	500	-19
Seats	8,392	6,502	4,797	3,500	2,600	2,300	2,200	2,100	-15
Year-to-Year Increase (%)	-16	-23	-26	-28	-23	-14	-3	-4	
REVENUE DATA ($M)									
CPU Revenue	20	12	8	5	3	3	2	2	-27
Terminal Revenue	10	9	7	6	5	4	4	3	-14
Peripheral Revenue	0	0	0	0	0	0	0	0	38
Hardware Revenue	30	20	16	11	8	7	6	5	-20
Year-to-Year Increase (%)	-41	-33	-23	-30	-24	-18	-15	-9	
Software Revenue	1	1	1	1	1	0	0	0	-36
Year-to-Year Increase (%)	-47	-30	3	-20	-29	-38	-44	-47	
Software Service	1	1	1	1	0	0	0	0	-35
Hardware Service	5	3	2	1	1	1	0	0	-31
Service Revenue	6	4	3	2	1	1	1	0	-31
Year-to-Year Increase (%)	-21	-32	-24	-41	-28	-30	-31	-26	
Total Factory Revenue	38	25	20	13	10	8	7	6	-22
Year-to-Year Increase (%)	-39	-33	-22	-31	-25	-21	-18	-12	

Source: Dataquest (April 1996)

Table B-36
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, North America, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	9,761	10,653	11,884	14,000	16,500	19,500	23,000	26,800	18
Seats	9,787	10,694	11,921	14,100	16,500	19,500	23,000	26,800	18
Year-to-Year Increase (%)	4	9	11	18	18	18	18	16	
Installed Base									
CPUs	57,286	56,614	58,493	63,500	71,300	79,600	86,500	93,700	10
Seats	59,670	58,298	59,530	64,000	71,600	79,700	86,700	93,800	10
Year-to-Year Increase (%)	-2	-2	2	8	12	11	9	8	
REVENUE DATA ($M)									
CPU Revenue	78	74	73	81	90	98	108	118	10
Terminal Revenue	2	2	1	1	1	0	0	0	-52
Peripheral Revenue	1	1	1	3	4	6	7	9	59
Hardware Revenue	81	77	75	85	95	104	115	127	11
Year-to-Year Increase (%)	-6	-5	-3	12	12	10	10	11	
Software Revenue	65	67	70	84	97	113	132	151	17
Year-to-Year Increase (%)	-2	2	5	19	16	17	16	15	
Software Service	39	40	50	48	48	48	47	48	-1
Hardware Service	18	16	15	17	19	21	23	25	11
Service Revenue	57	55	65	65	67	68	70	73	2
Year-to-Year Increase (%)	17	-4	18	0	3	2	3	4	
Total Factory Revenue	204	199	210	233	259	286	317	351	11
Year-to-Year Increase (%)	1	-2	6	11	11	10	11	11	

Source: Dataquest (April 1996)

Table B-37
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	7,636	7,050	6,971	7,400	8,500	9,400	10,500	11,600	11
Seats	7,769	7,184	7,132	7,600	8,600	9,600	10,600	11,800	11
Year-to-Year Increase (%)	-10	-8	-1	7	13	11	11	11	
Installed Base									
CPUs	49,053	47,082	45,658	45,100	45,900	47,200	48,700	48,700	1
Seats	50,985	48,663	46,946	46,200	46,900	48,200	49,700	49,700	1
Year-to-Year Increase (%)	-2	-5	-4	-2	1	3	3	0	
REVENUE DATA ($M)									
CPU Revenue	55	48	47	49	54	57	61	65	7
Terminal Revenue	4	4	4	4	3	3	3	3	-4
Peripheral Revenue	0	1	1	1	1	1	1	1	17
Hardware Revenue	60	54	52	53	58	61	65	70	6
Year-to-Year Increase (%)	-24	-10	-3	2	10	6	6	7	
Software Revenue	43	41	43	45	47	49	51	53	4
Year-to-Year Increase (%)	-19	-5	4	5	6	4	3	4	
Software Service	21	20	30	28	27	26	25	24	-4
Hardware Service	11	9	9	9	9	9	10	10	2
Service Revenue	32	29	39	36	37	36	35	34	-2
Year-to-Year Increase (%)	-14	-8	32	-6	1	-2	-3	-3	
Total Factory Revenue	134	124	134	134	142	146	151	157	3
Year-to-Year Increase (%)	-20	-8	8	0	6	3	3	4	

Source: Dataquest (April 1996)

Table B-38
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Japan, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	7,537	7,571	7,069	7,500	8,100	8,300	8,800	9,300	6
Seats	7,731	7,714	7,233	7,600	8,200	8,400	8,800	9,300	5
Year-to-Year Increase (%)	-1	0	-6	5	7	3	5	5	
Installed Base									
CPUs	35,771	38,881	41,263	43,600	46,900	50,300	52,100	51,600	5
Seats	36,849	39,784	42,065	44,300	47,500	50,900	52,700	52,200	4
Year-to-Year Increase (%)	13	8	6	5	7	7	4	-1	
REVENUE DATA ($M)									
CPU Revenue	156	159	160	178	196	203	207	209	5
Terminal Revenue	3	2	2	1	1	0	0	0	-44
Peripheral Revenue	16	19	16	16	17	17	16	16	0
Hardware Revenue	174	179	177	195	214	221	223	224	5
Year-to-Year Increase (%)	-7	3	-1	10	10	3	1	1	
Software Revenue	125	134	138	142	147	154	161	169	4
Year-to-Year Increase (%)	13	7	3	3	4	4	5	5	
Software Service	40	50	54	54	54	53	50	49	-2
Hardware Service	41	39	39	42	45	45	45	45	3
Service Revenue	81	90	94	96	99	98	95	93	0
Year-to-Year Increase (%)	40	10	4	2	3	-1	-2	-2	
Total Factory Revenue	381	403	409	433	460	472	479	486	4
Year-to-Year Increase (%)	7	6	1	6	6	3	2	1	

Source: Dataquest (April 1996)

Table B-39
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Asia/Pacific, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	1,356	2,070	2,278	2,600	3,100	3,600	4,100	4,700	16
Seats	1,358	2,056	2,269	2,600	3,100	3,600	4,100	4,700	16
Year-to-Year Increase (%)	58	51	10	16	18	15	16	15	
Installed Base									
CPUs	3,964	5,644	7,495	9,400	11,700	13,700	15,300	16,700	17
Seats	4,207	5,794	7,563	9,500	11,700	13,700	15,300	16,700	17
Year-to-Year Increase (%)	32	38	31	25	24	17	12	9	
REVENUE DATA ($M)									
CPU Revenue	14	15	17	20	25	29	33	36	16
Terminal Revenue	1	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	1	1	1	1	32
Hardware Revenue	15	16	17	21	26	30	34	37	16
Year-to-Year Increase (%)	32	5	11	19	24	17	13	10	
Software Revenue	10	13	15	17	20	23	27	31	16
Year-to-Year Increase (%)	31	26	15	15	17	17	17	16	
Software Service	5	7	7	7	8	9	10	10	9
Hardware Service	3	3	3	4	5	6	6	7	13
Service Revenue	9	10	10	11	13	15	16	17	11
Year-to-Year Increase (%)	68	11	3	13	16	12	8	5	
Total Factory Revenue	34	38	42	49	59	68	77	85	15
Year-to-Year Increase (%)	40	13	10	16	20	16	13	11	

NA = Not applicable
Source: Dataquest (April 1996)

Table B-40
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Rest of World, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	121	68	57	100	100	200	300	500	51
Seats	134	81	56	100	100	200	300	500	52
Year-to-Year Increase (%)	47	-39	-31	44	64	57	51	45	
Installed Base									
CPUs	905	774	665	600	600	700	1,000	1,200	13
Seats	1,133	950	776	700	700	800	1,000	1,200	10
Year-to-Year Increase (%)	-10	-16	-18	-13	-3	17	26	29	
REVENUE DATA ($M)									
CPU Revenue	1	1	0	0	1	1	2	2	46
Terminal Revenue	0	0	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	93
Hardware Revenue	1	1	0	0	1	1	2	3	49
Year-to-Year Increase (%)	-3	-5	-61	11	69	63	57	53	
Software Revenue	1	1	1	1	2	3	4	5	40
Year-to-Year Increase (%)	-8	12	14	32	46	42	40	39	
Software Service	0	0	0	0	1	1	1	1	30
Hardware Service	0	0	0	0	0	0	0	1	48
Service Revenue	0	0	0	0	1	1	1	2	35
Year-to-Year Increase (%)	1	-3	26	17	40	39	39	40	
Total Factory Revenue	2	2	2	2	3	5	7	10	41
Year-to-Year Increase (%)	-4	1	-18	24	49	46	44	43	

NA = Not applicable
Source: Dataquest (April 1996)

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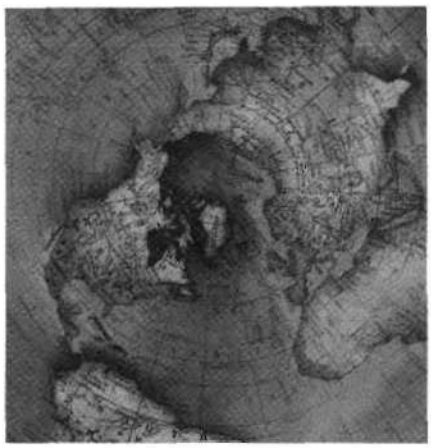

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Electronic Design Automation Forecast Update

Market Statistics

Program: Electronic Design Automation Worldwide
Product Code: CEDA-WW-MS-9604
Publication Date: September 23, 1996
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Introduction

Dataquest's CAD/CAM/CAE and GIS forecast is based on market share software revenue gathered primarily during the first quarter of 1996. Dataquest's software forecast for all CAD/CAM/CAE and GIS applications includes:

- Three-year historical software and hardware revenue by region and operating system
- Five-year forecast of software, hardware, and service revenue by region and operating system
- Three-year history and five-year forecast of hardware shipments and installed base data

Although Dataquest does not forecast currency exchange rates, we do forecast with the best information available. The exchange rate is calculated as the simple arithmetic mean of the 12 average monthly rates for each country. For the purpose of this forecast, Dataquest assumes the July exchange rate will remain stable in the future (see Tables 1 and 2).

Additional market statistics publications for Dataquest's CAD/CAM/CAE and GIS services for 1996 are as follows:

- Dataquest's 1995 Market Share document (published as CAEC-WW-MS-9601, CEDA-WW-MS-9601, and CMEC-WW-MS-9601) was sent to our clients in March.
- Dataquest's 1995 forecast documents were released in May (published as CAEC-WW-MS-9602, CEDA-WW-MS-9602, and CMEC-WW-MS-9602).
- Dataquest's 1995 market share data was verified, updated, and sent to our clients in August as a Market Share Update report (published as CAEC-WW-MS-9603, CEDA-WW-MS-9603, and CMEC-WW-MS-9603). Country-level data was made available at this time.

This document is an updated forecast that has been expanded to include country-level information and in-depth analysis.

Worldwide Forecast Assumptions

The following section describes the main forces driving the CAD/CAM/CAE and GIS worldwide software forecast. See Table 3 for worldwide forecast data.

Table 1
CAD/CAM/CAE and GIS Revenue Growth Comparison
(U.S. Dollars versus Local Currency for Both Europe and Japan)

	1994	1995	Forecast 2000	Growth (%) 1994-1995	CAGR (%) 1995-2000
Europe (U.S.$ Million)					
Software Revenue	1,722.19	2,098.63	3,162.67	21.9	8.5
Hardware Revenue	2,564.26	2,875.36	5,198.78	12.1	12.6
Service Revenue	1,105.03	1,322.33	1,732.88	19.7	5.6
Total Factory Revenue	5,391.48	6,296.32	10,094.33	16.8	9.9
ECU/U.S$ Exchange Rate*	0.84	0.77	0.80	-8.7	0.7
Europe (ECU Million)					
Software Revenue	1,452.84	1,615.95	2,522.47	11.2	9.3
Hardware Revenue	2,163.21	2,214.03	4,146.42	2.3	13.4
Service Revenue	932.20	1,018.20	1,382.10	9.2	6.3
Total Factory Revenue	4,548.25	4,848.17	8,050.99	6.6	10.7
Japan (U.S.$ Million)					
Software Revenue	1,390.78	1,619.06	2,734.07	16.4	11.0
Hardware Revenue	2,473.61	2,708.99	5,059.97	9.5	13.3
Service Revenue	1,015.66	1,205.87	1,862.75	18.7	9.1
Total Factory Revenue	4,880.05	5,533.92	9,656.80	13.4	11.8
Japan/U.S.$ Exchange Rate*	101.56	93.90	107.93	-7.5	2.8
Japan (Yen Million)					
Software Revenue	141,247.93	152,029.54	295,088.20	7.6	14.2
Hardware Revenue	251,219.54	254,374.60	546,123.10	1.3	16.5
Service Revenue	103,150.46	113,230.97	201,046.82	9.8	12.2
Total Factory Revenue	495,617.94	519,635.11	1,042,258.12	4.8	14.9

(Continued)

Table 1 (Continued)
CAD/CAM/CAE and GIS Revenue Growth Comparison
(U.S. Dollars versus Local Currency for Both Europe and Japan)

	1994	1995	Forecast 2000	Growth (%) 1994-1995	CAGR (%) 1995-2000
North America (U.S.$ Million)					
Software Revenue	1,874.61	2,153.26	4,163.06	14.9	14.1
Hardware Revenue	2,533.51	2,750.34	6,025.62	8.6	17.0
Service Revenue	1,184.42	1,430.03	2,458.27	20.7	11.4
Total Factory Revenue	5,592.53	6,333.63	12,646.95	13.3	14.8
Worldwide (U.S.$ Million)					
Software Revenue	5,340.51	6,342.95	11,434.70	18.8	12.5
Hardware Revenue	8,099.47	8,986.02	18,392.56	10.9	15.4
Service Revenue	3,528.29	4,254.57	6,826.12	20.6	9.9
Total Factory Revenue	16,968.27	19,583.55	36,653.38	15.4	13.4

*Assuming a stable currency, the 2000 exchange rate is July 1996 monthly rate.
Source: Dataquest (August 1996)

Table 2
Foreign Currency/U.S. Dollar

		Actual					Current		Year-to-Year Change (%)					
Country	Currency	1991	1992	1993	1994	1995	1996	1997	1991-1992	1992-1993	1993-1994	1994-1995	1995-1996	1996-1997
Austria	Schilling	11.67	10.95	11.65	11.40	10.06	10.55	10.58	-6.17	6.4	-2.1	-11.8	4.9	0.3
Belgium	Franc	34.13	32.02	34.67	33.66	29.42	30.84	30.95	-6.18	8.3	-2.9	-12.6	4.8	0.4
Denmark	Krone	6.39	6.02	6.49	6.35	5.59	5.80	5.80	-5.79	7.8	-2.2	-12.0	3.8	0
Finland	Markka	4.04	4.45	5.73	5.21	4.37	4.60	4.58	10.15	28.8	-9.1	-16.1	5.3	-0.4
France	Franc	5.64	5.27	5.67	5.54	4.97	5.09	5.09	-6.56	7.6	-2.3	-10.3	2.4	0
Germany	D-Mark	1.66	1.56	1.66	1.62	1.43	1.50	1.50	-6.02	6.4	-2.4	-11.7	4.9	0
Italy	Lira	1,238.93	1,227.75	1,577.85	1,609.34	1,628.21	1,545.31	1,526.82	-0.90	28.5	2.0	1.2	-5.1	-1.2
Netherlands	Guilder	1.87	1.75	1.86	1.82	1.60	1.68	1.69	-6.42	6.3	-2.2	-12.1	5.0	0.6
Norway	Krone	6.49	6.18	7.11	7.04	6.33	6.46	6.45	-4.78	15.0	-1.0	-10.1	2.1	-0.2
Spain	Peseta	103.81	101.90	127.87	133.48	124.40	126.29	126.96	-1.84	25.5	4.4	-6.8	1.5	0.5
Sweden	Krona	6.04	5.81	7.82	7.70	7.14	6.70	6.64	-3.81	34.6	-1.5	-7.3	-6.2	-0.9
Switzerland	Franc	1.43	1.40	1.48	1.37	1.18	1.22	1.23	-2.10	5.7	-7.4	-13.9	3.4	0.8
United Kingdom	Pound	0.57	0.57	0.67	0.65	0.63	0.65	0.64	0	17.5	-3.0	-3.1	3.9	-2.3
Europe Average	ECU	0.81	0.77	0.86	0.84	0.77	0.80	0.80	-4.86	11.4	-1.5	-8.7	3.6	0
China	Renminbi	5.33	5.51	5.76	8.54	8.35	8.34	8.34	3.38	4.5	48.3	-2.2	-0.1	0
Hong Kong	Dollar	7.77	7.74	7.74	7.73	7.74	7.74	7.74	-0.39	0	-0.1	0.1	0	0
Japan	Yen	134.59	126.34	110.85	101.56	93.90	107.93	109.19	-6.13	-12.3	-8.4	-7.5	14.9	1.2
Korea	Won	730.67	782.41	799.42	805.80	770.57	798.87	813.03	7.08	2.2	0.8	-4.4	3.7	1.8
Singapore	Dollar	1.73	1.63	1.62	1.53	1.43	1.41	1.42	-5.78	-0.9	-5.3	-6.5	-1.4	0.7
Taiwan	Dollar	26.49	24.93	26.15	26.45	26.48	27.50	27.57	-5.89	4.9	1.1	0.1	3.9	0.3

Source: Dataquest (August 1996)

Table 3
CAD/CAM/CAE/GIS Software History and Forecast
Top Level Worldwide Forecast, All Applications, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	1995-2000 CAGR (%)
Software Revenue (M$)									
Worldwide, All Operating Systems	4,814	5,341	6,343	7,221	8,148	9,193	10,142	11,435	12.5
Worldwide									
UNIX	3,311	3,749	+4,298	4,807	5,244	5,619	5,944	6,377	8.2
Windows NT	5	119	359	654	1,031	1,560	2,033	2,746	50.2
Personal Computer	1,174	1,277	1,502	1,637	1,793	1,964	2,131	2,289	8.8
Host/Proprietary	323	194	184	122	80	51	33	23	-34.1
All Operating Systems									
North America	1,720	1,875	2,153	2,499	2,878	3,295	3,672	4,163	14.1
Europe	1,569	1,722	2,099	2,261	2,438	2,644	2,883	3,163	8.5
Japan	1,235	1,391	1,619	1,860	2,056	2,298	2,469	2,734	11.0
Asia/Pacific	200	264	358	463	606	740	859	1,013	23.2
Rest of World	91	89	114	137	170	215	259	362	25.9
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		10.9	18.8	13.8	12.8	12.8	10.3	12.8	
Worldwide									
UNIX		13.2	14.6	11.8	9.1	7.2	5.8	7.3	
Windows NT		2221.0	200.3	82.3	57.7	51.3	30.4	35.0	
Personal Computer		8.8	17.6	9.0	9.5	9.5	8.5	7.4	
Host/Proprietary		-39.9	-5.4	-33.4	-34.8	-36.7	-34.3	-31.1	
All Operating Systems									
North America		9.0	14.9	16.1	15.1	14.5	11.4	13.4	
Europe		9.8	21.9	7.8	7.8	8.4	9.0	9.7	
Japan		12.6	16.4	14.9	10.5	11.8	7.4	10.7	
Asia/Pacific		32.0	35.5	29.6	30.8	22.1	16.0	18.0	
Rest of World		-1.8	28.4	19.6	24.0	27.0	20.4	39.4	

Source: Dataquest (April 1996)

All Applications

As CAD/CAM/CAE/GIS becomes more of a replacement market, market leaders would appear to have the upper hand; the cost of switching is high. However, software that lets users get a better product to market faster, software that helps eliminate business risks will always be in demand—regardless of market share. Thus, there is always an opportunity for new vendors in technical markets.

The primary trend in design software function is toward operating at a higher level of abstraction. In all applications, we have seen an evolution of focus from "electronic paper" to component modeling, and now to system modeling. The eventual goal is the ability to fully simulate, evaluate, redesign, and test the design inside the computer prior to manufacture. At the same time, increased computing power is allowing the nature of design to evolve to include constituencies in manufacturing, product support, and from users themselves. Thus the engineering process is being expanded to include input from a broader base.

At the same time, the nature of design data itself is expanding from a focus on geometry to include multiple data types—making the challenge of system modeling even more complex. Also, the World Wide Web holds the potential to expand the nature of collaborative design, by harnessing the joint power of anticipated increases in both computing power and communications bandwidth. Thus there is little limit to the problems that design or GIS software can tackle. The primary challenge will continue to be developing robust, leading-edge software ahead of competitors. During the forecast period we anticipate significant, but not revolutionary, advances in the ability of the existing programmer pool to produce new software.

Mechanical Forecast Assumptions

New Interest in Mechanical CAD Technology

In 1995, we saw a mix of replacement business and new purchases for mechanical CAD technology, particularly in Europe and North America. Growth is picking up in nontraditional industries (those industries outside of aerospace, automotive, and industrial machinery). We expect this trend to continue, as mechanical modeling, analysis, design, and simulation software become more user-friendly. Closely linked to the use of mechanical CAD in new arenas is the availability of software on lower-cost platforms and the potential use of object technology to create customized industry- or application-specific solutions.

The product data management market has clearly found a worldwide interest. Within the past year, we have seen pilot programs move to full-scale production, support for new client platforms (Windows NT, Windows), integration with manufacturing resource planning (MRP) systems, and an emergence of parts/component management software. Product data management will be one of the significant drivers of the mechanical CAD market through 2000.

Growth in Asia/Pacific

The Asia/Pacific region is being fueled by CAD investments from local governments, multinational companies, and local initiatives (such as Indonesia's IPTN). Most of the sales to date are UNIX-based, but some of the future growth is expected to shift to NT.

Ground Shifts in Japan

Mechanical CAD/CAM/CAE growth in Japan is expected to undergo a significant shift in platform usage over our forecast period. The UNIX platform dominates the mechanical sector in Japan, despite the fact that the Japanese mechanical market still places a heavy emphasis on 2-D drafting instead of 3-D/solid modeling. We expect this drafting orientation to persist, and over next five years we anticipate a significant shift to more Windows NT-based systems at the expense of UNIX. This shift will not begin in earnest until 1997, when more NT-based applications are more widely available in Japan.

Windows NT

As of today, not all of the major mechanical CAD vendors have ported their products to the Windows NT platform. The lack of availability of Windows NT versions of some of the market-share-leading mechanical CAD packages, coupled with the fact that Europe has just completed its five-year investment cycle in mechanical CAD software, will mean that Windows NT will not begin to impact UNIX-based sales for at least a few more years.

AEC Forecast Assumptions

The Impact of Windows NT

Intergraph's shift to Windows NT has initiated the collapse of UNIX sales in North America, a trend expected to increase broadly in this cost-conscious application. At the same time, we expect growth in Windows NT from DOS-based users who find Windows 95 and successors less than reliable. The primary factor holding up growth in the large installed base of DOS users is their reluctance to buy the new hardware required for either Windows 95 or Windows NT.

The factors that should contribute to the long-term expansion of the AEC CAD industry are noted in the following sections.

CAD Is Becoming a Business Requirement

Large design firms are growing at the expense of smaller firms. These large end users increasingly require their employees and suppliers to adopt automation tools in the design and construction process. Smaller design firms must increasingly buy CAD systems or risk being dropped from consideration as a partner.

CAD purchases are increasingly justified as a competitive advantage in both sales and design reviews. Electronic design data is also required downstream by the designer's client—from the federal government down to the small commercial developer. Also, a significant pool of

untapped users still exists. The relatively low market penetration of AEC CAD systems should allow steady worldwide growth during the next five years despite constant volatility in demand for the buildings and infrastructure to be designed.

New Features in AEC CAD Products Are Achievable

Better, lower-cost visualization tools will be in increasing demand as sales and communication tools. Data and database functions (versus graphics functions) are increasing in importance in AEC design systems, creating opportunities to sell users significant new functionality. Some vendors will create products that foster communications in the entire design, construction, and maintenance process—products that will increase the payoff in CAD investments.

The three trends that will inhibit growth in the AEC CAD industry are noted in the following sections.

Design Is Only Part of the Problem

AEC's one-design-one-build structure means CAD provides fewer economic benefits to these users than does the one-design-build-many structure of manufacturing. Construction, which is essentially a prototype build, is fraught with uncertainties and delays that are not well-addressed by AEC systems as they exist today. Design tools can only thrive in the AEC structure when they support more of the entire business problem. Based on Autodesk's increased commitment to progress in this arena, we have increased our forecast modestly; commitment to and cooperation on the problem from multiple vendors will allow us to increase the forecast growth rate further.

Poor Cooperation among Users

Users are poorly organized to take advantage of improved products, partly because of competition between engineering constructors and partly because designs are often split among several different companies representing different and competing aspects of the design process. New approaches to the design and construction process are appearing, allowing users to take full advantage of CAD tools. Still, many users in AEC will need to be shown leadership in working together, both from the very large, most competitive users, and from CAD vendors themselves.

Downturn in Germany

The German construction industry, which has been the driving force behind the high growth of the recent years, has come to an abrupt halt. Although other regions such as Italy are investing, Germany plays such a dominant role that it will drag down the overall European growth for AEC. The applications that are still growing even in Germany are facilities design/management as these are not dependent on the construction industry.

GIS/Mapping Forecast Assumptions

The Impact of Windows NT

Intergraph's move to Windows NT at the expense of UNIX will quickly make PC-based operating systems the dominant revenue stream in North America. In the long term, the GIS UNIX market is highly subject to erosion by Windows NT because of the appeal of better integration of GIS and Windows-based productivity tools, an appealing prospect to many GIS users. The factors that should contribute to the long-term expansion of the GIS market are noted in the following sections.

"Open GIS"

The thrust of the Open GIS Foundation has been to allow some fresh air into a market that was getting a bit inbred. The nature of GIS data is under greater scrutiny, and several vendors are embarking on different, creative directions. Ultimately, much of "spatial analysis" will be embedded into other applications, rather than known as a GIS. Nonetheless, a fresh approach to spatial analysis is creating new opportunities for more useful solutions in traditional GIS environments.

Abundant Supply of Prospective Buyers

Penetration is still moderately low among core users. Bread-and-butter prospects in government and utilities are charged with maintaining information on land and assets in perpetuity. Many of these prospective buyers are still using paper maps, which will degrade over time, or have only entry-level systems in terms of value delivered. This creates a certain inevitability to moving from paper maps computer-based models.

New Technologies Will Drive Growth

Faster, cheaper computers will be continually leveraged to support new software products. Widespread computer industry developments in open, distributed systems supporting high-speed networking will make it possible for GIS technology to broadly expand the user base. Lower cost, higher resolution satellite imagery holds the potential to drive another explosion in GIS market growth among users who cannot afford aerial photography. Advances in aerial photography, global positioning systems (GPSs), and laser range finders are making it possible to create GISs that are significantly cheaper, more accurate, and more complete than existing paper maps, giving experienced users some compelling reasons to reinvest. Portable and pen-based computers are bringing GIS to new users in field operations. Finally, database companies themselves are gaining a better understanding of spatial analysis, a key factor in spreading use of GIS systems more broadly.

Data Will Drive Growth

The GIS business market is driving high growth on PCs. However, we see a wide band of uncertainty surrounding the clearly growing revenue opportunity from new applications. Several new applications in GIS are destined to become a relatively low revenue-producing feature in another software program (and market), rather than a standalone product in the GIS market. At the same time, data is increasing in value relative to software in this low-end market.

GIS has attained a certain indispensability, particularly among federal users and in utilities. As a result, users are beginning to expect to share the data that lies in their various GIS systems. Within three years, we expect data to be readily exchangeable across different systems. At that point, shareable data will help drive market growth.

Several factors seriously constraining the long-term expansion of the GIS market are noted in the following sections.

High Cost of Entry Remains a Barrier

There will remain an uncertain, but certainly high, cost of creating a working GIS system in traditional environments. No magic will emerge to create a low-cost, meaningful data set for mainstream customers in government and utilities. Data conversion will remain costly because the significant cost of correcting prior errors and omissions on paper maps is inevitably bundled into the cost of "conversion."

Price Pressures Inhibit Growth

Price pressure will hold down total revenue. Innovation is the only way to maintain prices in any software industry, and GIS vendors will struggle in their attempt to create compelling new applications and improved investment payoff for customers.

Electronic Design Automation Forecast Assumptions

The EDA software market grew 17.5 percent in 1995. Over the next five years, growth will continue to be fueled by continuing increasing design complexity and ever-higher speeds. The semiconductor downturn is a fact of life. Although many people expect a similar downturn in EDA sales, this is not the case. Semiconductor downturns, an indication of an electronic hardware downturn, actually increase EDA sales as companies design their way out of the recession. The EDA market typically sees its downturn three years later. Dataquest therefore predicts growth to drop off—to about 10 percent in 1999.

Electronic CAE

Design complexity is forcing a large-scale swap: Gate-level users are swapping up to register-transfer level (RTL) while RTL users are swapping up to electronic-system level (ESL) tools. RTL tools are beginning to appear on Windows NT, competing with UNIX-based tools, while the ESL tools will remain UNIX-based. The second wave, those FPGA/CPLD designers moving up to the RTL, are starting to make an impact on the numbers.

IC Layout

Final results show the IC layout market growing at 29.6 percent—a little lower than the preliminary data, but strong nonetheless. Design complexity and high speed are forcing replacement of obsolete tools, driving this high growth. This is primarily a replacement market of very high-cost tools and very few players. The ensuing frenzy for market share is the result. The few PC-based tools in this market are being replaced by

UNIX-class tools in North America, and Windows NT will not be a factor in this market. In fact, this is the market that is demanding a "standard" 64-bit operating system. If UNIX repeats its 32-bit performance, these guys could wait for a 64-bit Windows NT.

PCB/MCM/Hybrid

The printed circuit board (PCB) market grew 4.7 percent in 1995. The swap out of old tools continues for the second year. The most significant shift has been the acceptance of Windows NT as the operating system of choice in the PCB design world. It will not happen overnight, as swap out in this segment is slower than in CAE and IC layout, but it will happen.

Forecast Methodology

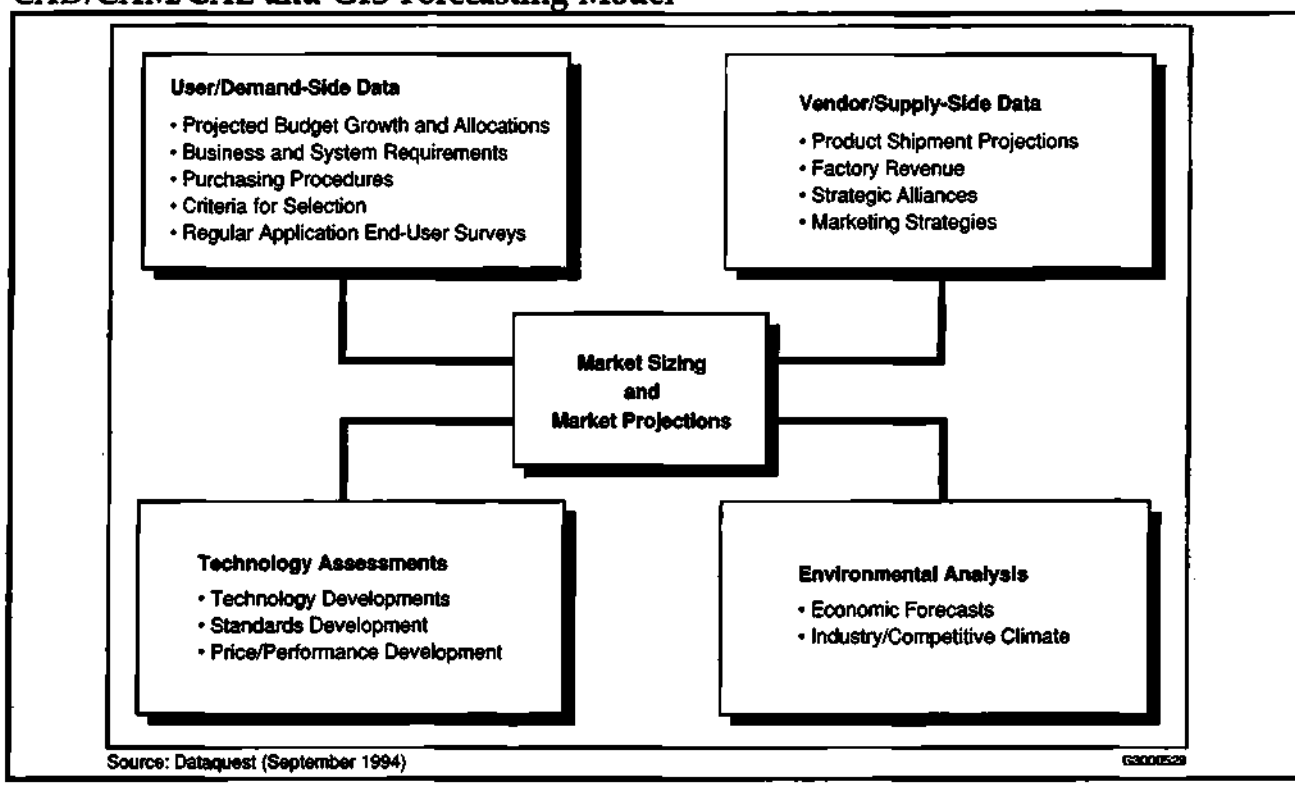
Fundamental to the way Dataquest conducts its research is the underlying philosophy that the best data and analysis come from a well-balanced program. This program includes the following: balance between primary and secondary collection techniques; balance between supply-side and demand-side analysis; balance between focused, industry-specific research and coordinated, "big picture" analysis aided by integration of data from the more than 25 separate high-technology industries Dataquest covers; and balance between the perspectives of experienced industry professionals and rigorous, disciplined techniques of seasoned market researchers.

Dataquest also analyzes trends in the macro environment, which can have major influences on both supply-side and demand-side forecasting. In addition to demographics, analysts look at gross national product (GNP) growth, interest rate fluctuation, business expectations, and capital spending plans. In the geopolitical arena, the group looks at trade issues, political stability or lack thereof, tariffs, nontariff barriers, and such factors as the effect on Europe of the events of 1995.

Figure 1 shows the CAD/CAM/CAE and GIS forecasting model. The overall forecasting process uses a combination of techniques such as time series and technological modeling. Market estimates and forecasts are derived using the following research techniques:

- Segment forecasting—Individual forecasts are derived for each application segment tracked by the CAD/CAM/CAE and GIS group. Specifically, each application, segmented by region and platform, is forecast and rolled up. In this way, each application segment incorporates its own set of unique assumptions.
- Demand-based analysis—Market growth is tracked and forecast in terms of the present and anticipated demand of current and future users. This requires the development of a total available market model and a satisfied available market figure to assess the levels of penetration accurately. Dataquest analysts also factor in the acceptance or ability for users to consume new technology.

Figure 1
CAD/CAM/CAE and GIS Forecasting Model



Source: Dataquest (September 1996)

- Capacity-based analysis—This method involves identifying future shipment volume constraints. These constraints, or "ceilings," can be the result of component availability, manufacturing capacity, or distribution capacity. In any case, capacity limitations are capable of keeping shipnents below the demand level.

Segmentation Definitions

- UNIX—Includes all UNIX variants and older workstation operating systems
- Host—Host includes minicomputer and mainframe operating systems in which external workstations' functions are dependent on a host computer.
- Windows NT—Windows NT is the Microsoft operating system.
- PC—PC includes DOS, WIndows, Windows 95, OS/2, and Apple Operating Systems.

Line Items

Line item definitions are as follows:

- Average selling price (ASP) is defined as the average price of a product, inclusive of any discounts.

- CPU revenue is the portion of revenue derived from a system sale that is related to the value of the CPU.
- CPU shipment is defined as the number of CPUs delivered.
- CPU installed base is defined as the total number of CPUs in active, day-to-day use.
- Unit shipment is defined as the number of products delivered (that is, seats).
- Seats are defined as the number of possible simultaneous users.
- Installed seats are defined as the total number of seats in active, day-to-day use.
- Hardware revenue is defined as the sum of the revenue from the hardware system components: CPU revenue, terminal revenue, and peripherals revenue.
- Peripherals revenue is defined as the value of all the peripherals from turnkey sale. (Peripherals in this category typically are input and output devices.)
- Terminal revenue is defined as revenue derived from the sale of terminals used to graphically create, analyze, or manipulate designs. The term is applicable only to the host systems.
- Software revenue is revenue derived from the sale of application software.
- Service revenue is defined as revenue derived from the service and support of CAD/CAM/CAE or GIS systems. Serevice is followed as software service and hardware service.
- Total factory revenue is defined as the amount of money received for goods measured in U.S. dollars and is the sum of hardware, software, and service revenue.

Table A-1
CAD/CAM/CAE/GIS Software History and Forecast
Top Level EDA Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue (U.S.$ Million)									
Worldwide, All Operating Systems	1,187	1,318	1,549	1,850	2,205	2,641	2,933	3,519	17.8
Worldwide									
UNIX	1,016	1,131	1,325	1,541	1,755	1,960	2,104	2,350	12.1
Windows NT	-	13	34	103	221	432	562	878	91.8
Personal Computer	168	171	188	205	228	249	267	291	9.2
Host/Proprietary	3	3	3	1	1	-	-	-	-40.1
All Operating Systems									
North America	553	606	723	881	1,047	1,232	1,371	1,601	17.2
Europe	236	250	277	304	335	366	391	428	9.1
Japan	331	392	447	514	594	735	809	984	17.1
Asia/Pacific	62	65	96	141	207	261	293	363	30.5
Rest of World	5	5	6	9	23	48	69	143	90.5
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		11.0	17.5	19.4	19.2	19.8	11.0	20.0	
Worldwide									
UNIX		11.4	17.2	16.3	13.9	11.7	7.3	11.7	
Windows NT		4,1919.7	163.9	204.6	115.0	95.0	30.0	56.3	
Personal Computer		1.8	9.7	9.2	11.3	9.0	7.3	9.1	
Host/Proprietary		-10.5	-14.3	-62.6	-28.3	-33.0	-36.4	-32.4	
All Operating Systems									
North America		9.6	19.3	21.9	18.8	17.6	11.3	16.8	
Europe		6.2	10.6	9.9	10.2	9.3	6.8	9.5	
Japan		18.3	14.2	14.9	15.5	23.7	10.1	21.7	
Asia/Pacific		5.6	47.1	46.8	46.7	26.3	12.3	23.8	
Rest of World		-12.9	23.8	58.1	153.4	110.0	43.4	108.0	

Source: Dataquest (September 1996)

Table B-1
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	130,228	133,760	147,188	180,600	223,300	266,100	306,800	371,400	20
Seats	130,175	133,966	147,363	180,900	223,400	266,300	306,900	371,500	20
Year-to-Year Increase (%)	6	3	10	23	24	19	15	21	
Installed Base									
CPUs	604,942	645,653	700,176	781,000	908,000	1,057,600	1,196,400	1,327,300	14
Seats	612,410	650,752	703,282	782,800	909,200	1,058,600	1,197,500	1,328,500	14
Year-to-Year Increase (%)	10	6	8	11	16	16	13	11	
Revenue Data (U.S.$ Million)									
CPU Revenue	1,637	1,771	2,016	2,484	3,085	3,612	4,084	4,880	19
Terminal Revenue	22	16	12	7	6	5	4	4	-20
Peripheral Revenue	40	49	42	49	58	68	72	88	16
Hardware Revenue	1,700	1,836	2,070	2,540	3,149	3,685	4,160	4,972	19
Year-to-Year Increase (%)	-5	8	13	23	24	17	13	20	
Software Revenue	1,187	1,318	1,549	1,850	2,205	2,641	2,933	3,519	18
Year-to-Year Increase (%)	0	11	18	19	19	20	11	20	
Software Service	527	651	838	959	1,113	1,290	1,390	1,636	14
Hardware Service	397	375	460	549	671	778	850	998	17
Service Revenue	924	1,026	1,298	1,508	1,785	2,068	2,241	2,634	15
Year-to-Year Increase (%)	21	11	27	16	18	16	8	18	
Total Factory Revenue	3,811	4,180	4,917	5,898	7,139	8,394	9,334	11,125	18
Year-to-Year Increase (%)	2	10	18	20	21	18	11	19	

Source: Dataquest (September 1996)

Table B-2
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Worldwide, UNIX

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	63,336	69,706	76,861	92,600	109,600	119,400	128,200	142,200	13
Seats	63,336	69,706	76,861	92,600	109,600	119,400	128,200	142,200	13
Year-to-Year Increase (%)	11	10	10	20	18	9	7	11	
Installed Base									
CPUs	276,783	320,456	371,927	435,300	517,800	606,000	668,100	703,100	14
Seats	276,783	320,456	371,927	435,300	517,800	606,000	668,100	703,100	14
Year-to-Year Increase (%)	19	16	16	17	19	17	10	5	
Revenue Data (U.S.$ Million)									
CPU Revenue	1,376	1,548	1,763	2,197	2,690	3,061	3,414	3,972	18
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	37	45	37	41	44	44	44	44	3
Hardware Revenue	1,413	1,593	1,800	2,238	2,734	3,105	3,457	4,016	17
Year-to-Year Increase (%)	-3	13	13	24	22	14	11	16	
Software Revenue	1,016	1,131	1,325	1,541	1,755	1,960	2,104	2,350	12
Year-to-Year Increase (%)	0	11	17	16	14	12	7	12	
Software Service	507	616	769	861	955	1,023	1,050	1,116	8
Hardware Service	366	353	435	516	611	670	720	805	13
Service Revenue	873	969	1,204	1,377	1,566	1,693	1,770	1,921	10
Year-to-Year Increase (%)	22	11	24	14	14	8	5	9	
Total Factory Revenue	3,301	3,693	4,329	5,155	6,055	6,758	7,331	8,286	14
Year-to-Year Increase (%)	4	12	17	19	17	12	8	13	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-3
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Worldwide, NT/Hybrid

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1	717	1,846	5,800	12,700	25,100	33,500	53,300	96
Seats	1	717	1,846	5,800	12,700	25,100	33,500	53,300	96
Year-to-Year Increase (%)	NA	55,895	157	214	120	97	34	59	
Installed Base									
CPUs	1	718	2,564	8,400	21,100	42,800	65,300	100,800	108
Seats	1	718	2,564	8,400	21,100	42,800	65,300	100,800	108
Year-to-Year Increase (%)	NA	55,995	257	226	153	103	53	54	
Revenue Data (U.S.$ Million)									
CPU Revenue	0	8	18	52	111	212	268	422	88
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	1	1	4	10	18	22	36	89
Hardware Revenue	0	9	20	56	121	231	290	458	88
Year-to-Year Increase (%)	NA	60,096	123	187	116	91	26	58	
Software Revenue	0	13	34	103	221	432	562	878	92
Year-to-Year Increase (%)	NA	41,920	164	205	115	95	30	56	
Software Service	0	4	12	39	94	200	271	447	105
Hardware Service	-	2	8	21	48	93	113	172	85
Service Revenue	0	6	20	60	142	293	383	618	98
Year-to-Year Increase (%)	NA	379,651	255	199	135	106	31	61	
Total Factory Revenue	0	27	74	220	485	956	1,235	1,954	93
Year-to-Year Increase (%)	NA	58,485	170	198	121	97	29	58	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-4
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Worldwide, Personal Computer

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	65,763	62,749	67,974	82,100	100,800	121,600	144,900	175,800	21
Seats	65,763	62,750	68,015	82,100	100,800	121,600	144,900	175,800	21
Year-to-Year Increase (%)	3	-5	8	21	23	21	19	21	
Installed Base									
CPUs	320,872	318,447	320,903	333,900	366,700	406,900	461,400	521,800	10
Seats	320,872	318,447	320,903	333,900	366,700	406,900	461,400	521,800	10
Year-to-Year Increase (%)	5	-1	1	4	10	11	13	13	
Revenue Data (U.S.$ Million)									
CPU Revenue	169	167	185	224	276	333	398	482	21
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	3	4	3	3	4	5	6	7	19
Hardware Revenue	173	170	188	227	280	338	403	489	21
Year-to-Year Increase (%)	-10	-1	11	21	23	21	19	21	
Software Revenue	168	171	188	205	228	249	267	291	9
Year-to-Year Increase (%)	5	2	10	9	11	9	7	9	
Software Service	20	31	55	59	63	67	69	73	6
Hardware Service	5	6	7	9	11	14	17	21	24
Service Revenue	24	36	63	68	75	81	86	94	8
Year-to-Year Increase (%)	18	49	73	8	10	8	7	9	
Total Factory Revenue	365	378	439	500	583	668	757	875	15
Year-to-Year Increase (%)	-2	3	16	14	17	15	13	16	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-5
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Worldwide, Host/Proprietary

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1,128	588	508	200	100	100	100	100	-31
Seats	1,074	792	642	400	300	300	200	200	-21
Year-to-Year Increase (%)	-51	-26	-19	-38	-20	-17	-14	-11	
Installed Base									
CPUs	7,286	6,032	4,781	3,400	2,400	1,900	1,700	1,600	-20
Seats	14,754	11,131	7,887	5,300	3,700	2,900	2,700	2,700	-19
Year-to-Year Increase (%)	-20	-25	-29	-33	-31	-20	-6	0	
Revenue Data (U.S.$ Million)									
CPU Revenue	92	48	50	12	8	6	4	4	-40
Terminal Revenue	22	16	12	7	6	5	4	4	-20
Peripheral Revenue	0	0	0	0	0	0	1	1	74
Hardware Revenue	114	64	62	19	14	11	9	9	-32
Year-to-Year Increase (%)	-26	-44	-3	-69	-28	-20	-15	-3	
Software Revenue	3	3	3	1	1	0	0	0	-40
Year-to-Year Increase (%)	-71	-10	-14	-63	-28	-33	-36	-32	
Software Service	1	1	1	1	1	0	0	0	-30
Hardware Service	26	14	10	2	1	1	1	1	-42
Service Revenue	27	15	11	3	2	2	1	1	-40
Year-to-Year Increase (%)	-9	-45	-24	-73	-30	-27	-28	-21	
Total Factory Revenue	145	82	76	23	16	13	11	10	-33
Year-to-Year Increase (%)	-26	-44	-7	-69	-29	-21	-17	-6	

Source: Dataquest (September 1996)

Table B-6
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, North America, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	71,744	73,127	78,868	96,400	116,800	136,900	156,600	184,000	18
Seats	71,592	73,130	78,828	96,400	116,800	136,900	156,600	184,000	18
Year-to-Year Increase (%)	8	2	8	22	21	17	14	18	
Installed Base									
CPUs	330,669	351,723	378,393	419,000	482,400	554,600	621,000	676,600	12
Seats	333,992	353,855	379,500	419,400	482,500	554,600	621,000	676,600	12
Year-to-Year Increase (%)	10	6	7	11	15	15	12	9	
Revenue Data (U.S.$ Million)									
CPU Revenue	730	785	906	1,143	1,419	1,634	1,852	2,166	19
Terminal Revenue	6	4	2	1	1	0	0	0	-38
Peripheral Revenue	3	2	1	3	5	7	9	12	52
Hardware Revenue	739	791	910	1,148	1,425	1,642	1,861	2,178	19
Year-to-Year Increase (%)	-1	7	15	26	24	15	13	17	
Software Revenue	553	606	723	881	1,047	1,232	1,371	1,601	17
Year-to-Year Increase (%)	1	10	19	22	19	18	11	17	
Software Service	261	310	395	459	528	585	624	693	12
Hardware Service	174	163	207	252	305	342	374	425	16
Service Revenue	435	473	602	711	832	927	998	1,118	13
Year-to-Year Increase (%)	24	9	27	18	17	11	8	12	
Total Factory Revenue	1,727	1,870	2,235	2,740	3,304	3,800	4,230	4,896	17
Year-to-Year Increase (%)	5	8	19	23	21	15	11	16	

Source: Dataquest (September 1996)

Table B-7
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	29,346	29,997	32,900	39,000	46,900	55,200	63,800	75,600	18
Seats	29,381	30,156	33,036	39,100	47,000	55,300	63,900	75,700	18
Year-to-Year Increase (%)	-2	3	10	18	20	18	16	19	
Installed Base									
CPUs	150,819	155,836	164,791	178,600	201,100	226,700	250,600	273,900	11
Seats	153,032	157,487	165,959	179,400	201,900	227,400	251,500	274,900	11
Year-to-Year Increase (%)	6	3	5	8	13	13	11	9	
Revenue Data (U.S.$ Million)									
CPU Revenue	334	336	359	402	465	515	571	642	12
Terminal Revenue	9	8	6	4	3	3	3	3	-12
Peripheral Revenue	1	2	1	1	2	2	2	3	26
Hardware Revenue	344	346	366	406	470	520	576	648	12
Year-to-Year Increase (%)	-14	1	6	11	16	11	11	13	
Software Revenue	236	250	277	304	335	366	391	428	9
Year-to-Year Increase (%)	-9	6	11	10	10	9	7	9	
Software Service	101	123	162	170	179	184	187	193	4
Hardware Service	77	67	75	80	89	94	99	106	7
Service Revenue	178	190	237	250	268	278	286	299	5
Year-to-Year Increase (%)	1	7	25	5	7	4	3	5	
Total Factory Revenue	757	786	880	961	1,074	1,165	1,254	1,376	9
Year-to-Year Increase (%)	-10	4	12	9	12	9	8	10	

Source: Dataquest (September 1996)

Table B-8
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Japan, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	20,703	22,022	24,192	28,600	33,800	39,700	44,100	52,000	17
Seats	20,798	22,093	24,310	28,700	33,800	39,700	44,100	52,000	16
Year-to-Year Increase (%)	0	6	10	18	18	17	11	18	
Installed Base									
CPUs	96,896	106,211	117,516	132,100	152,500	177,200	196,800	212,300	13
Seats	98,222	107,160	118,216	132,600	152,900	177,600	197,100	212,600	12
Year-to-Year Increase (%)	12	9	10	12	15	16	11	8	
Revenue Data (U.S.$ Million)									
CPU Revenue	473	550	610	725	859	1,023	1,143	1,385	18
Terminal Revenue	6	4	3	2	1	1	1	0	-33
Peripheral Revenue	37	44	39	43	48	52	54	58	8
Hardware Revenue	515	598	652	771	909	1,076	1,197	1,444	17
Year-to-Year Increase (%)	-7	16	9	18	18	18	11	21	
Software Revenue	331	392	447	514	594	735	809	984	17
Year-to-Year Increase (%)	5	18	14	15	15	24	10	22	
Software Service	134	182	227	255	294	373	410	511	18
Hardware Service	121	124	147	170	203	247	268	324	17
Service Revenue	256	306	374	425	497	620	679	834	17
Year-to-Year Increase (%)	31	19	22	14	17	25	9	23	
Total Factory Revenue	1,102	1,295	1,473	1,710	2,000	2,430	2,685	3,262	17
Year-to-Year Increase (%)	3	17	14	16	17	22	10	22	

Source: Dataquest (September 1996)

Table B-9
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Asia/Pacific, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	7,000	7,453	9,725	14,600	22,100	28,200	33,800	44,200	35
Seats	6,954	7,407	9,681	14,600	22,100	28,200	33,800	44,200	36
Year-to-Year Increase (%)	54	7	31	51	51	28	20	31	
Installed Base									
CPUs	19,449	24,840	32,259	43,500	61,900	84,400	107,700	133,200	33
Seats	19,727	24,960	32,236	43,400	61,800	84,300	107,600	133,100	33
Year-to-Year Increase (%)	39	27	29	35	42	36	28	24	
Revenue Data (U.S.$ Million)									
CPU Revenue	93	94	134	205	321	405	469	592	35
Terminal Revenue	1	0	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	1	1	1	1	1	28
Hardware Revenue	94	94	134	205	322	406	470	593	35
Year-to-Year Increase (%)	14	1	42	53	57	26	16	26	
Software Revenue	62	65	96	141	207	261	293	363	30
Year-to-Year Increase (%)	17	6	47	47	47	26	12	24	
Software Service	30	34	51	71	102	121	130	152	24
Hardware Service	23	20	31	45	69	83	92	111	29
Service Revenue	53	54	82	117	170	204	222	262	26
Year-to-Year Increase (%)	36	3	50	43	46	20	9	18	
Total Factory Revenue	208	214	312	463	699	871	986	1,219	31
Year-to-Year Increase (%)	20	3	46	48	51	25	13	24	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-10
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Rest of World, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1,434	1,162	1,504	2,100	3,600	6,200	8,600	15,500	60
Seats	1,450	1,181	1,508	2,100	3,600	6,200	8,600	15,500	59
Year-to-Year Increase (%)	11	-19	28	37	76	72	37	81	
Installed Base									
CPUs	7,110	7,043	7,216	7,800	10,100	14,700	20,400	31,300	34
Seats	7,437	7,289	7,371	7,900	10,200	14,700	20,400	31,300	34
Year-to-Year Increase (%)	8	-2	1	7	28	45	38	53	
Revenue Data (U.S.$ Million)									
CPU Revenue	8	6	7	10	20	36	49	94	67
Terminal Revenue	0	1	0	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	2	5	7	14	164
Hardware Revenue	8	7	7	10	22	41	56	109	71
Year-to-Year Increase (%)	-17	-14	9	39	114	86	36	94	
Software Revenue	5	5	6	9	23	48	69	143	91
Year-to-Year Increase (%)	-13	-13	24	58	153	110	43	108	
Software Service	1	2	2	4	12	26	39	87	106
Hardware Service	1	1	1	2	6	12	16	34	94
Service Revenue	3	3	4	6	17	38	56	121	102
Year-to-Year Increase (%)	-3	-11	42	66	191	121	46	116	
Total Factory Revenue	16	14	17	25	62	127	181	372	86
Year-to-Year Increase (%)	-14	-13	20	51	146	104	42	106	

NA = Not applicable
Source: Dataquest (September 1996)

Table A-2
CAD/CAM/CAE/GIS Software History and Forecast
Top Level ECAE Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue (U.S.$ Million)									
Worldwide, All Operating Systems	767	861	1,020	1,217	1,455	1,750	1,936	2,319	17.9
Worldwide									
UNIX	642	724	853	986	1,108	1,203	1,271	1,368	9.9
Windows NT	-	5	18	65	158	338	438	701	107.9
Personal Computer	123	131	148	166	189	209	226	250	11.1
Host/Proprietary	2	2	2	-	-	-	-	-	-42.8
All Operating Systems									
North America	406	445	530	623	716	838	922	1,065	15.0
Europe	164	180	197	219	244	270	290	321	10.2
Japan	156	195	228	272	325	412	454	544	19.0
Asia/Pacific	38	38	60	96	149	186	207	253	33.2
Rest of World	4	3	4	7	20	44	64	136	101.5
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		12.2	18.5	19.3	19.6	20.2	10.7	19.8	
Worldwide									
UNIX		12.8	17.8	15.6	12.4	8.5	5.7	7.6	
Windows NT		15329.6	283.6	258.0	144.3	114.2	29.6	59.9	
Personal Computer		5.8	13.0	12.7	13.5	10.4	8.5	10.5	
Host/Proprietary		-0.8	-22.6	-86.9	-25.7	-18.1	-16.3	-8.2	
All Operating Systems									
North America		9.6	19.1	17.7	14.9	17.0	9.9	15.6	
Europe		9.6	9.9	10.7	11.8	10.4	7.5	10.5	
Japan		25.3	17.0	19.3	19.5	26.5	10.3	19.8	
Asia/Pacific		1.3	57.0	59.0	55.6	24.4	11.2	22.4	
Rest of World		-21.6	28.3	63.3	192.4	123.5	45.5	114.0	

Source: Dataquest (September 1996)

Table B-11
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	94,199	97,898	108,533	134,500	167,600	201,400	233,800	285,600	21
Seats	94,014	98,089	108,665	134,500	167,600	201,400	233,800	285,600	21
Year-to-Year Increase (%)	10	4	11	24	25	20	16	22	
Installed Base									
CPUs	409,648	445,809	490,338	553,600	652,100	767,200	876,300	981,700	15
Seats	411,509	447,101	491,166	554,100	652,500	767,500	876,700	982,000	15
Year-to-Year Increase (%)	13	9	10	13	18	18	14	12	
Revenue Data (U.S.$ Million)									
CPU Revenue	1,063	1,153	1,319	1,639	2,026	2,338	2,620	3,069	18
Terminal Revenue	9	7	5	1	1	1	1	1	-34
Peripheral Revenue	22	26	23	28	36	45	50	66	24
Hardware Revenue	1,094	1,185	1,347	1,668	2,062	2,384	2,671	3,136	18
Year-to-Year Increase (%)	2	8	14	24	24	16	12	17	
Software Revenue	767	861	1,020	1,217	1,455	1,750	1,936	2,319	18
Year-to-Year Increase (%)	4	12	18	19	20	20	11	20	
Software Service	315	389	507	579	674	788	850	1,011	15
Hardware Service	253	238	297	357	438	507	549	639	17
Service Revenue	568	627	804	936	1,112	1,294	1,399	1,650	15
Year-to-Year Increase (%)	24	10	28	16	19	16	8	18	
Total Factory Revenue	2,430	2,674	3,170	3,821	4,629	5,428	6,006	7,104	18
Year-to-Year Increase (%)	7	10	19	21	21	17	11	18	

Source: Dataquest (September 1996)

Table B-12
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Worldwide, UNIX

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	43,391	48,407	54,052	65,100	76,600	82,100	87,500	95,000	12
Seats	43,391	48,407	54,052	65,100	76,600	82,100	87,500	95,000	12
Year-to-Year Increase (%)	15	12	12	20	18	7	7	9	
Installed Base									
CPUs	173,964	206,758	245,024	291,500	350,400	411,300	453,300	473,300	14
Seats	173,964	206,758	245,024	291,500	350,400	411,300	453,300	473,300	14
Year-to-Year Increase (%)	23	19	19	19	20	17	10	4	
Revenue Data (U.S.$ Million)									
CPU Revenue	884	1,005	1,148	1,421	1,717	1,891	2,073	2,315	15
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	20	23	20	22	24	25	25	26	6
Hardware Revenue	904	1,029	1,168	1,443	1,741	1,916	2,098	2,340	15
Year-to-Year Increase (%)	4	14	14	24	21	10	10	12	
Software Revenue	642	724	853	986	1,108	1,203	1,271	1,368	10
Year-to-Year Increase (%)	6	13	18	16	12	9	6	8	
Software Service	302	363	454	503	549	566	568	574	5
Hardware Service	235	229	283	334	390	414	437	469	11
Service Revenue	537	593	737	837	938	980	1,005	1,043	7
Year-to-Year Increase (%)	25	10	24	14	12	4	3	4	
Total Factory Revenue	2,082	2,345	2,758	3,266	3,787	4,098	4,374	4,751	11
Year-to-Year Increase (%)	10	13	18	18	16	8	7	9	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-13
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Worldwide, NT/Hybrid

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1	298	1,014	3,700	9,100	19,500	26,100	43,000	112
Seats	1	298	1,014	3,700	9,100	19,500	26,100	43,000	112
Year-to-Year Increase (%)	NA	23,151	241	261	147	115	34	65	
Installed Base									
CPUs	1	299	1,313	5,000	14,000	31,400	50,000	79,800	127
Seats	1	299	1,313	5,000	14,000	31,400	50,000	79,800	127
Year-to-Year Increase (%)	NA	23,251	339	279	182	124	59	60	
Revenue Data (U.S.$ Million)									
CPU Revenue	0	4	10	33	81	168	213	345	103
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	1	3	8	16	20	33	103
Hardware Revenue	0	4	11	36	89	185	233	377	103
Year-to-Year Increase (%)	NA	27,495	170	235	144	108	26	62	
Software Revenue	0	5	18	65	158	338	438	701	108
Year-to-Year Increase (%)	NA	15,330	284	258	144	114	30	60	
Software Service	0	1	7	26	71	164	221	372	123
Hardware Service	-	1	5	16	40	82	99	153	97
Service Revenue	0	3	12	42	111	246	320	525	114
Year-to-Year Increase (%)	NA	180,094	338	252	165	123	30	64	
Total Factory Revenue	0	11	41	143	357	769	991	1,603	108
Year-to-Year Increase (%)	NA	24,444	256	250	150	115	29	62	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-14
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Worldwide, Personal Computer

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	50,167	49,005	53,308	65,700	81,800	99,800	120,100	147,600	23
Seats	50,167	49,006	53,329	65,700	81,800	99,800	120,100	147,600	23
Year-to-Year Increase (%)	6	-2	9	23	25	22	20	23	
Installed Base									
CPUs	232,268	235,960	241,834	255,600	286,700	323,700	372,500	428,000	12
Seats	232,268	235,960	241,834	255,600	286,700	323,700	372,500	428,000	12
Year-to-Year Increase (%)	8	2	2	6	12	13	15	15	
Revenue Data (U.S.$ Million)									
CPU Revenue	126	128	145	180	226	276	332	409	23
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	2	2	2	3	3	4	5	6	26
Hardware Revenue	128	130	147	182	229	280	337	415	23
Year-to-Year Increase (%)	-6	1	13	24	25	22	20	23	
Software Revenue	123	131	148	166	189	209	226	250	11
Year-to-Year Increase (%)	3	6	13	13	14	10	8	11	
Software Service	13	24	46	50	54	58	61	65	7
Hardware Service	3	3	5	6	8	10	13	16	28
Service Revenue	16	27	51	56	62	68	73	81	10
Year-to-Year Increase (%)	14	70	87	11	12	9	8	10	
Total Factory Revenue	268	287	345	405	480	557	637	746	17
Year-to-Year Increase (%)	-1	7	20	17	19	16	14	17	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-15
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Worldwide, Host/Proprietary

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	640	188	159	100	0	0	0	0	-26
Seats	455	378	270	100	100	0	0	0	-34
Year-to-Year Increase (%)	-46	-17	-29	-68	-30	-19	-18	-12	
Installed Base									
CPUs	3,414	2,792	2,168	1,500	1,000	700	600	500	-24
Seats	5,275	4,084	2,995	2,000	1,400	1,000	900	900	-22
Year-to-Year Increase (%)	-20	-23	-27	-33	-32	-24	-12	-6	
Revenue Data (U.S.$ Million)									
CPU Revenue	53	16	16	5	3	2	2	2	-38
Terminal Revenue	9	7	5	1	1	1	1	1	-34
Peripheral Revenue	0	0	0	0	0	0	0	1	89
Hardware Revenue	62	23	21	6	4	3	3	3	-31
Year-to-Year Increase (%)	-17	-63	-9	-71	-35	-19	-12	12	
Software Revenue	2	2	2	0	0	0	0	0	-43
Year-to-Year Increase (%)	-77	-1	-23	-87	-26	-18	-16	-8	
Software Service	0	0	0	0	0	0	0	0	-24
Hardware Service	15	4	3	1	1	0	0	0	-40
Service Revenue	15	5	4	1	1	1	0	0	-37
Year-to-Year Increase (%)	-9	-69	-17	-72	-34	-22	-20	-11	
Total Factory Revenue	80	30	26	7	5	4	3	4	-33
Year-to-Year Increase (%)	-21	-63	-11	-72	-34	-19	-13	8	

Source: Dataquest (September 1996)

Table B-16
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, North America, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	56,879	58,303	62,278	75,200	89,900	105,100	119,800	140,300	18
Seats	56,737	58,333	62,283	75,200	89,900	105,100	119,800	140,200	18
Year-to-Year Increase (%)	11	3	7	21	20	17	14	17	
Installed Base									
CPUs	249,130	268,963	291,490	322,800	370,600	424,300	473,700	513,500	12
Seats	250,045	269,507	291,742	322,900	370,600	424,300	473,700	513,500	12
Year-to-Year Increase (%)	13	8	8	11	15	14	12	8	
Revenue Data (U.S.$ Million)									
CPU Revenue	538	577	666	817	978	1,110	1,239	1,418	16
Terminal Revenue	3	1	1	0	0	0	0	0	-27
Peripheral Revenue	2	1	1	2	3	6	7	9	63
Hardware Revenue	542	580	668	819	982	1,116	1,246	1,428	16
Year-to-Year Increase (%)	5	7	15	23	20	14	12	15	
Software Revenue	406	445	530	623	716	838	922	1,065	15
Year-to-Year Increase (%)	5	10	19	18	15	17	10	16	
Software Service	169	202	262	292	322	355	374	412	9
Hardware Service	126	118	151	178	209	232	250	278	13
Service Revenue	295	319	412	470	531	586	623	690	11
Year-to-Year Increase (%)	29	8	29	14	13	10	6	11	
Total Factory Revenue	1,243	1,344	1,609	1,913	2,229	2,541	2,790	3,183	15
Year-to-Year Increase (%)	10	8	20	19	17	14	10	14	

Source: Dataquest (September 1996)

Table B-17
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	20,561	22,082	24,458	29,500	36,200	43,400	50,800	61,200	20
Seats	20,524	22,194	24,516	29,500	36,200	43,400	50,800	61,200	20
Year-to-Year Increase (%)	2	8	10	20	23	20	17	21	
Installed Base									
CPUs	95,015	102,555	111,888	124,700	144,600	166,900	188,100	209,800	13
Seats	95,531	102,975	112,204	124,900	144,800	167,000	188,200	210,000	13
Year-to-Year Increase (%)	11	8	9	11	16	15	13	12	
Revenue Data (U.S.$ Million)									
CPU Revenue	233	239	253	292	341	381	425	482	14
Terminal Revenue	4	3	2	-	-	-	-	-	NA
Peripheral Revenue	1	1	0	1	1	1	2	2	40
Hardware Revenue	237	243	256	292	342	383	427	484	14
Year-to-Year Increase (%)	-8	3	5	14	17	12	12	14	
Software Revenue	164	180	197	219	244	270	290	321	10
Year-to-Year Increase (%)	-3	10	10	11	12	10	7	10	
Software Service	65	80	102	108	115	121	124	130	5
Hardware Service	53	47	52	57	65	68	72	78	8
Service Revenue	118	127	154	166	180	189	196	207	6
Year-to-Year Increase (%)	6	7	22	7	9	5	4	6	
Total Factory Revenue	519	550	608	676	767	842	913	1,012	11
Year-to-Year Increase (%)	-4	6	11	11	13	10	8	11	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-18
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Japan, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	10,704	11,785	13,908	17,300	21,200	25,500	28,900	34,200	20
Seats	10,725	11,835	13,979	17,400	21,200	25,500	28,900	34,200	20
Year-to-Year Increase (%)	2	10	18	24	22	20	14	18	
Installed Base									
CPUs	47,946	53,118	60,269	70,300	84,300	101,200	115,200	127,100	16
Seats	48,236	53,367	60,506	70,500	84,500	101,400	115,400	127,200	16
Year-to-Year Increase (%)	13	11	13	16	20	20	14	10	
Revenue Data (U.S.$ Million)									
CPU Revenue	230	277	311	381	454	526	580	668	17
Terminal Revenue	2	2	2	1	1	0	0	0	-25
Peripheral Revenue	19	23	21	25	29	33	35	39	13
Hardware Revenue	252	302	334	407	484	559	615	708	16
Year-to-Year Increase (%)	3	20	10	22	19	15	10	15	
Software Revenue	156	195	228	272	325	412	454	544	19
Year-to-Year Increase (%)	8	25	17	19	20	27	10	20	
Software Service	63	87	111	129	155	205	228	286	21
Hardware Service	59	62	74	89	109	136	147	174	19
Service Revenue	122	149	185	218	265	341	375	460	20
Year-to-Year Increase (%)	31	22	24	18	22	29	10	22	
Total Factory Revenue	529	646	747	897	1,074	1,312	1,444	1,711	18
Year-to-Year Increase (%)	10	22	16	20	20	22	10	18	

Source: Dataquest (September 1996)

Table B-19
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Asia/Pacific, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	4,858	4,880	6,782	11,000	17,400	22,400	27,100	36,100	40
Seats	4,828	4,871	6,772	11,000	17,400	22,400	27,100	36,100	40
Year-to-Year Increase (%)	68	1	39	62	59	28	21	33	
Installed Base									
CPUs	12,368	15,998	21,355	30,100	45,100	63,600	83,300	105,200	38
Seats	12,416	16,008	21,330	30,000	45,000	63,600	83,200	105,200	38
Year-to-Year Increase (%)	48	29	33	41	50	41	31	26	
Revenue Data (U.S.$ Million)									
CPU Revenue	57	55	84	142	236	290	334	414	37
Terminal Revenue	0	0	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	1	87
Hardware Revenue	57	55	84	142	236	291	334	415	38
Year-to-Year Increase (%)	18	-3	53	68	66	23	15	24	
Software Revenue	38	38	60	96	149	186	207	253	33
Year-to-Year Increase (%)	24	1	57	59	56	24	11	22	
Software Service	17	20	31	47	71	83	87	100	27
Hardware Service	14	11	19	31	50	59	65	76	32
Service Revenue	31	31	50	78	121	142	152	176	29
Year-to-Year Increase (%)	32	1	61	56	55	17	7	16	
Total Factory Revenue	126	125	195	316	507	618	693	844	34
Year-to-Year Increase (%)	23	-1	56	62	60	22	12	22	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-20
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Rest of World, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1,197	848	1,107	1,500	2,800	5,100	7,100	13,800	66
Seats	1,201	855	1,115	1,500	2,800	5,100	7,100	13,800	65
Year-to-Year Increase (%)	16	-29	30	33	88	83	40	93	
Installed Base									
CPUs	5,189	5,175	5,336	5,700	7,400	11,300	16,100	26,100	37
Seats	5,281	5,243	5,384	5,700	7,500	11,300	16,100	26,100	37
Year-to-Year Increase (%)	13	-1	3	7	30	51	43	62	
Revenue Data (U.S.$ Million)									
CPU Revenue	6	4	5	7	16	31	43	86	76
Terminal Revenue	0	0	0	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	2	5	7	14	169
Hardware Revenue	6	4	5	8	18	36	50	101	80
Year-to-Year Increase (%)	-14	-24	22	43	138	98	38	102	
Software Revenue	4	3	4	7	20	44	64	136	102
Year-to-Year Increase (%)	-9	-22	28	63	192	124	45	114	
Software Service	1	1	2	3	10	24	37	84	123
Hardware Service	1	1	1	2	5	11	16	33	105
Service Revenue	2	2	2	4	15	36	53	117	117
Year-to-Year Increase (%)	-4	-19	60	82	246	135	48	121	
Total Factory Revenue	12	9	12	19	53	116	166	354	97
Year-to-Year Increase (%)	-11	-22	30	58	183	118	44	113	

NA = Not applicable
Source: Dataquest (September 1996)

Table A-3
CAD/CAM/CAE/GIS Software History and Forecast
Top Level IC Layout Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue (U.S.$ Million)									
Worldwide, All Operating Systems	175	203	263	340	428	537	624	786	24.4
Worldwide									
UNIX	172	200	258	335	423	532	618	780	24.7
Windows NT	-	-	1	1	1	1	1	1	0.0
Personal Computer	3	3	4	4	4	4	4	4	4.7
Host/Proprietary	-	-	-	-	-	-	-	-	NA
All Operating Systems									
North America	82	95	126	179	237	282	324	387	25.2
Europe	29	30	37	40	43	47	50	54	8.0
Japan	50	62	80	94	111	158	190	265	27.1
Asia/Pacific	14	15	20	26	35	49	58	79	31.1
Rest of World	1	1	1	1	1	1	1	2	25.4
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		15.9	29.7	29.2	25.8	25.6	16.0	26.1	
Worldwide									
UNIX		16.4	29.2	29.6	26.1	25.8	16.2	26.3	
Windows NT		NA	NA	0.0	0.0	0.0	0.0	0.0	
Personal Computer		-9.8	17.0	7.2	6.5	5.3	2.1	2.8	
Host/Proprietary		NA	NA	NA	NA	NA	NA	NA	
All Operating Systems									
North America		16.1	32.4	42.3	32.6	18.8	14.9	19.3	
Europe		3.2	22.5	8.9	7.6	7.9	7.4	8.1	
Japan		24.3	28.1	17.7	18.5	42.3	19.8	39.6	
Asia/Pacific		11.4	34.5	29.9	32.9	39.9	19.0	34.9	
Rest of World		-2.5	5.4	42.0	33.0	18.5	17.4	18.0	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-21
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	9,201	10,088	12,215	16,100	21,200	25,900	30,200	37,700	25
Seats	9,070	9,860	12,001	16,100	21,200	25,900	30,200	37,700	26
Year-to-Year Increase (%)	-10	9	22	35	31	22	16	25	
Installed Base									
CPUs	46,770	51,269	58,480	69,100	85,000	105,300	124,900	144,100	20
Seats	46,782	50,957	57,940	68,600	84,500	104,800	124,400	143,600	20
Year-to-Year Increase (%)	10	9	14	18	23	24	19	15	
Revenue Data (U.S.$ Million)									
CPU Revenue	265	306	379	492	664	852	1,029	1,355	29
Terminal Revenue	2	0	-	-	-	-	-	-	NA
Peripheral Revenue	3	2	1	1	2	2	3	4	24
Hardware Revenue	270	308	381	494	665	855	1,031	1,358	29
Year-to-Year Increase (%)	-19	14	23	30	35	28	21	32	
Software Revenue	175	203	263	340	428	537	624	786	24
Year-to-Year Increase (%)	-17	16	30	29	26	26	16	26	
Software Service	106	144	194	240	292	348	384	455	19
Hardware Service	70	70	92	115	150	186	216	274	24
Service Revenue	176	214	286	355	442	534	600	729	21
Year-to-Year Increase (%)	13	22	34	24	24	21	12	21	
Total Factory Revenue	621	725	930	1,189	1,535	1,926	2,255	2,873	25
Year-to-Year Increase (%)	-11	17	28	28	29	25	17	27	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-22
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Worldwide, UNIX

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	7,608	8,781	10,715	14,600	19,300	23,800	27,800	35,000	27
Seats	7,608	8,781	10,715	14,600	19,300	23,800	27,800	35,000	27
Year-to-Year Increase (%)	-9	15	22	36	32	23	17	26	
Installed Base									
CPUs	39,156	44,272	51,292	61,800	77,300	97,100	116,100	134,700	21
Seats	39,156	44,272	51,292	61,800	77,300	97,100	116,100	134,700	21
Year-to-Year Increase (%)	14	13	16	20	25	26	20	16	
Revenue Data (U.S.$ Million)									
CPU Revenue	241	283	354	488	658	846	1,022	1,347	31
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	3	2	1	1	2	2	3	4	25
Hardware Revenue	243	284	355	489	660	848	1,024	1,350	31
Year-to-Year Increase (%)	-19	17	25	38	35	29	21	32	
Software Revenue	172	200	258	335	423	532	618	780	25
Year-to-Year Increase (%)	-17	16	29	30	26	26	16	26	
Software Service	105	143	192	238	290	346	382	453	19
Hardware Service	64	65	87	115	149	185	215	273	26
Service Revenue	169	207	280	353	439	532	597	726	21
Year-to-Year Increase (%)	13	23	35	26	25	21	12	22	
Total Factory Revenue	584	692	893	1,177	1,522	1,912	2,240	2,857	26
Year-to-Year Increase (%)	-11	18	29	32	29	26	17	28	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-23
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Worldwide, NT/Hybrid

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	-	-	43	0	0	0	0	0	2
Seats	-	-	43	0	0	0	0	0	2
Year-to-Year Increase (%)	NA	NA	NA	4	4	2	2	0	
Installed Base									
CPUs	-	-	43	100	100	200	100	100	26
Seats	-	-	43	100	100	200	100	100	26
Year-to-Year Increase (%)	NA	NA	NA	104	53	14	-7	-6	
Revenue Data (U.S.$ Million)									
CPU Revenue	-	-	0	0	0	0	0	0	-3
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	-	0	0	0	0	0	0	-9
Hardware Revenue	-	-	1	1	1	1	0	0	-4
Year-to-Year Increase (%)	NA	NA	NA	-7	-2	-4	-4	-1	
Software Revenue	-	-	1	1	1	1	1	1	0
Year-to-Year Increase (%)	NA	NA	NA	0	0	0	0	0	
Software Service	-	-	1	1	1	1	1	1	3
Hardware Service	-	-	1	0	0	0	0	0	-8
Service Revenue	-	-	1	1	1	1	1	1	-1
Year-to-Year Increase (%)	NA	NA	NA	-8	1	0	0	1	
Total Factory Revenue	-	-	3	3	3	3	3	3	-1
Year-to-Year Increase (%)	NA	NA	NA	-4	0	-1	-1	0	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-24
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Worldwide, Personal Computer

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1,358	1,059	1,243	1,500	1,800	2,100	2,300	2,700	17
Seats	1,358	1,059	1,243	1,500	1,800	2,100	2,300	2,700	17
Year-to-Year Increase (%)	1	-22	17	20	19	17	13	14	
Installed Base									
CPUs	6,250	5,725	5,988	6,400	6,900	7,500	8,200	8,800	8
Seats	6,250	5,725	5,988	6,400	6,900	7,500	8,200	8,800	8
Year-to-Year Increase (%)	-4	-8	5	6	8	9	9	7	
Revenue Data (U.S.$ Million)									
CPU Revenue	4	3	3	4	5	6	7	7	16
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	-	0	0	0	0	0	0	15
Hardware Revenue	4	3	4	4	5	6	7	8	16
Year-to-Year Increase (%)	-1	-35	24	19	18	17	13	14	
Software Revenue	3	3	4	4	4	4	4	4	5
Year-to-Year Increase (%)	16	-10	17	7	7	5	2	3	
Software Service	1	1	1	1	1	1	1	1	1
Hardware Service	0	0	0	0	0	0	0	0	20
Service Revenue	1	1	1	1	1	2	2	2	5
Year-to-Year Increase (%)	156	-27	34	5	6	5	4	4	
Total Factory Revenue	9	7	8	9	10	12	12	14	10
Year-to-Year Increase (%)	15	-25	23	12	12	11	8	9	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-25
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Worldwide, Host/Proprietary

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	235	248	214	-	-	-	-	-	NA
Seats	103	20	-	-	-	-	-	-	NA
Year-to-Year Increase (%)	-70	-81	NA		NA	NA	NA	NA	NA
Installed Base									
CPUs	1,364	1,272	1,156	900	700	500	500	400	-18
Seats	1,376	961	616	400	200	100	0	0	-51
Year-to-Year Increase (%)	-29	-30	-36	-41	-50	-56	-63	-42	
Revenue Data (U.S.$ Million)									
CPU Revenue	20	21	22	-	-	-	-	-	NA
Terminal Revenue	2	0	-	-	-	-	-	-	NA
Peripheral Revenue	-	-	-	-	-	-	-	-	NA
Hardware Revenue	22	21	22	-	-	-	-	-	NA
Year-to-Year Increase (%)	-22	-5	3	NA	NA	NA	NA	NA	
Software Revenue	-	-	-	-	-	-	-	-	NA
Year-to-Year Increase (%)	NA		NA	NA	NA	NA	NA	NA	NA
Software Service	-	-	0	-	-	-	-	-	NA
Hardware Service	6	6	4	-	-	-	-	-	NA
Service Revenue	6	6	4	-	-	-	-	-	NA
Year-to-Year Increase (%)	7	5	-32	NA		NA	NA	NA	NA
Total Factory Revenue	28	27	25	-	-	-	-	-	NA
Year-to-Year Increase (%)	-19	-3	-5	NA		NA	NA	NA	NA

NA = Not applicable
Source: Dataquest (September 1996)

Table B-26
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, North America, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	5,029	5,592	6,808	9,700	13,200	15,500	17,900	21,400	26
Seats	4,994	5,523	6,734	9,700	13,200	15,500	17,900	21,400	26
Year-to-Year Increase (%)	-11	11	22	44	36	17	15	20	
Installed Base									
CPUs	24,895	27,564	31,736	38,500	48,700	60,900	72,800	83,100	21
Seats	24,919	27,468	31,563	38,300	48,600	60,800	72,600	83,000	21
Year-to-Year Increase (%)	10	10	15	21	27	25	20	14	
Revenue Data (U.S.$ Million)									
CPU Revenue	113	131	166	244	348	420	500	619	30
Terminal Revenue	1	0	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	2
Hardware Revenue	114	131	166	244	348	420	500	620	30
Year-to-Year Increase (%)	-16	16	27	47	42	21	19	24	
Software Revenue	82	95	126	179	237	282	324	387	25
Year-to-Year Increase (%)	-16	16	32	42	33	19	15	19	
Software Service	52	68	88	121	156	177	193	217	20
Hardware Service	30	30	40	57	78	91	105	125	25
Service Revenue	82	98	129	178	235	268	298	342	22
Year-to-Year Increase (%)	14	19	32	38	32	14	11	15	
Total Factory Revenue	277	324	421	601	820	970	1,122	1,348	26
Year-to-Year Increase (%)	-9	17	30	43	36	18	16	20	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-27
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1,294	1,332	1,561	1,700	1,900	2,000	2,200	2,400	9
Seats	1,232	1,245	1,485	1,700	1,900	2,000	2,200	2,400	10
Year-to-Year Increase (%)	-20	1	19	13	12	7	8	9	
Installed Base									
CPUs	7,670	7,968	8,709	9,600	10,700	12,000	12,800	13,200	9
Seats	7,573	7,790	8,473	9,400	10,500	11,800	12,700	13,100	9
Year-to-Year Increase (%)	3	3	9	11	12	12	7	3	
Revenue Data (U.S.$ Million)									
CPU Revenue	46	48	56	56	64	70	79	88	10
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	0	0	0	0	0	-1
Hardware Revenue	47	48	56	56	64	70	79	88	10
Year-to-Year Increase (%)	-25	3	16	0	15	10	11	12	
Software Revenue	29	30	37	40	43	47	50	54	8
Year-to-Year Increase (%)	-21	3	22	9	8	8	7	8	
Software Service	15	23	31	33	34	35	36	36	3
Hardware Service	12	11	13	13	15	15	17	18	6
Service Revenue	28	34	44	46	49	50	52	54	4
Year-to-Year Increase (%)	2	23	31	3	7	4	4	4	
Total Factory Revenue	103	112	137	142	156	168	181	197	7
Year-to-Year Increase (%)	-18	8	22	3	10	7	8	9	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-28
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Japan, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	2,150	2,363	2,841	3,400	4,200	5,900	7,100	9,900	28
Seats	2,135	2,315	2,799	3,400	4,200	5,900	7,100	9,900	29
Year-to-Year Increase (%)	-3	8	21	22	23	39	20	40	
Installed Base									
CPUs	11,837	12,734	14,264	16,300	19,200	23,900	28,600	34,500	19
Seats	11,927	12,736	14,200	16,200	19,100	23,800	28,500	34,400	19
Year-to-Year Increase (%)	8	7	11	14	18	24	20	21	
Revenue Data (U.S.$ Million)									
CPU Revenue	84	102	125	151	193	279	347	504	32
Terminal Revenue	1	-	-	-	-	-	-	-	NA
Peripheral Revenue	2	2	1	1	2	2	3	3	25
Hardware Revenue	87	104	127	153	194	281	350	507	32
Year-to-Year Increase (%)	-22	20	22	21	27	45	24	45	
Software Revenue	50	62	80	94	111	158	190	265	27
Year-to-Year Increase (%)	-19	24	28	18	19	42	20	40	
Software Service	31	44	61	69	79	107	122	160	21
Hardware Service	22	23	31	36	44	61	73	102	27
Service Revenue	52	68	91	104	123	168	195	262	23
Year-to-Year Increase (%)	16	29	35	14	18	37	16	34	
Total Factory Revenue	189	234	298	351	428	608	734	1,034	28
Year-to-Year Increase (%)	-13	23	28	18	22	42	21	41	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-29
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Asia/Pacific, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	696	772	976	1,300	1,800	2,400	2,900	4,000	32
Seats	678	748	955	1,300	1,800	2,400	2,900	4,000	33
Year-to-Year Increase (%)	2	10	28	35	38	38	20	36	
Installed Base									
CPUs	2,054	2,705	3,488	4,500	6,000	8,100	10,300	12,800	30
Seats	2,041	2,665	3,425	4,500	6,000	8,100	10,200	12,800	30
Year-to-Year Increase (%)	43	31	29	30	34	35	27	25	
Revenue Data (U.S.$ Million)									
CPU Revenue	21	24	31	40	57	81	100	140	36
Terminal Revenue	0	0	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	22
Hardware Revenue	21	24	31	40	57	81	100	140	36
Year-to-Year Increase (%)	-3	11	28	31	43	42	23	40	
Software Revenue	14	15	20	26	35	49	58	79	31
Year-to-Year Increase (%)	-5	11	35	30	33	40	19	35	
Software Service	7	9	13	17	21	28	32	41	25
Hardware Service	6	6	7	9	13	18	21	28	31
Service Revenue	13	14	21	26	34	46	53	69	27
Year-to-Year Increase (%)	29	8	46	25	32	34	15	30	
Total Factory Revenue	48	53	72	93	127	177	212	288	32
Year-to-Year Increase (%)	3	11	35	29	37	39	20	36	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-30
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Rest of World, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	31	30	29	0	100	100	100	100	25
Seats	30	29	27	0	100	100	100	100	27
Year-to-Year Increase (%)	-34	-6	-7	47	39	17	18	19	
Installed Base									
CPUs	315	297	282	300	300	300	400	400	9
Seats	321	299	280	300	300	300	400	400	9
Year-to-Year Increase (%)	0	-7	-6	-1	5	16	14	11	
Revenue Data (U.S.$ Million)									
CPU Revenue	1	1	1	1	2	2	2	3	25
Terminal Revenue	0	0	-	-	-	-	-	-	NA
Peripheral Revenue	-	-	-	-	-	-	-	-	NA
Hardware Revenue	1	1	1	1	2	2	2	3	25
Year-to-Year Increase (%)	-33	-6	1	19	43	20	22	22	
Software Revenue	1	1	1	1	1	1	1	2	25
Year-to-Year Increase (%)	-38	-3	5	42	33	19	17	18	
Software Service	0	0	1	1	1	1	1	1	20
Hardware Service	0	0	0	0	0	0	1	1	22
Service Revenue	1	1	1	1	1	1	2	2	20
Year-to-Year Increase (%)	-1	5	11	31	32	14	13	13	
Total Factory Revenue	2	2	2	3	4	5	6	7	24
Year-to-Year Increase (%)	-28	-2	5	28	36	18	18	18	

NA = Not applicable

Source: Dataquest (September 1996)

Table A-4
CAD/CAM/CAE/GIS Software History and Forecast
Top Level PCB/MCM/Hybrid Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue (U.S.$ Million)									
Worldwide, All Operating Systems	244	254	266	293	322	355	374	414	9.3
Worldwide									
UNIX	202	207	214	220	224	226	215	202	-1.2
Windows NT	-	8	14	37	62	92	122	176	65.0
Personal Computer	41	37	37	35	35	36	36	37	0.2
Host/Proprietary	1	1	1	1	1	-	-	-	-36.2
All Operating Systems									
North America	66	67	68	79	93	111	126	149	17.1
Europe	42	40	42	45	48	50	51	53	4.7
Japan	125	134	139	148	157	165	165	176	4.8
Asia/Pacific	10	12	15	19	22	26	28	31	15.4
Rest of World	1	1	1	2	2	3	3	5	35.1
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		3.9	4.7	10.1	10.2	10.0	5.4	10.9	
Worldwide									
UNIX		2.8	3.1	2.8	2.0	0.6	-4.8	-6.2	
Windows NT		NA	77.3	157.3	68.0	48.6	32.0	44.2	
Personal Computer		-9.3	-2.4	-4.7	1.4	1.9	1.3	1.1	
Host/Proprietary		-27.3	5.5	-19.9	-29.1	-37.5	-44.3	-46.6	
All Operating Systems									
North America		1.5	1.9	16.7	17.8	19.1	13.1	18.6	
Europe		-4.9	4.9	7.2	4.7	4.5	2.4	5.0	
Japan		7.2	3.7	6.3	6.2	4.8	0.4	6.4	
Asia/Pacific		13.7	30.8	21.0	20.4	17.4	7.7	11.1	
Rest of World		32.9	18.5	46.1	42.4	30.5	22.7	35.0	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-31
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	26,828	25,774	26,441	30,000	34,500	38,800	42,800	48,000	13
Seats	27,091	26,017	26,697	30,200	34,700	39,000	43,000	48,100	13
Year-to-Year Increase (%)	0	-4	3	13	15	12	10	12	
Installed Base									
CPUs	148,524	148,576	151,358	158,200	170,900	185,100	195,200	201,600	6
Seats	154,119	152,694	154,176	160,100	172,300	186,200	196,400	202,900	6
Year-to-Year Increase (%)	2	-1	1	4	8	8	5	3	
Revenue Data (U.S.$ Million)									
CPU Revenue	309	312	318	353	396	421	435	456	7
Terminal Revenue	10	9	7	6	5	4	4	3	-14
Peripheral Revenue	16	21	18	19	20	20	19	19	1
Hardware Revenue	336	342	343	378	421	446	458	478	7
Year-to-Year Increase (%)	-13	2	0	10	11	6	3	4	
Software Revenue	244	254	266	293	322	355	374	414	9
Year-to-Year Increase (%)	3	4	5	10	10	10	5	11	
Software Service	107	118	137	140	148	154	157	170	4
Hardware Service	74	66	72	76	83	85	85	86	4
Service Revenue	180	185	208	217	231	239	241	255	4
Year-to-Year Increase (%)	21	2	13	4	6	4	1	6	
Total Factory Revenue	760	781	817	888	974	1,040	1,073	1,148	7
Year-to-Year Increase (%)	-1	3	5	9	10	7	3	7	

Source: Dataquest (September 1996)

Table B-32
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Worldwide, UNIX

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	12,338	12,519	12,094	12,900	13,600	13,500	13,000	12,200	0
Seats	12,338	12,519	12,094	12,900	13,600	13,500	13,000	12,200	0
Year-to-Year Increase (%)	10	1	-3	6	6	-1	-4	-6	
Installed Base									
CPUs	63,662	69,427	75,611	82,100	90,100	97,600	98,700	95,100	5
Seats	63,662	69,427	75,611	82,100	90,100	97,600	98,700	95,100	5
Year-to-Year Increase (%)	12	9	9	9	10	8	1	-4	
Revenue Data (U.S.$ Million)									
CPU Revenue	251	260	261	288	316	323	319	310	4
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	15	19	16	17	18	17	16	15	-2
Hardware Revenue	265	280	278	305	334	340	335	325	3
Year-to-Year Increase (%)	-6	5	-1	10	9	2	-1	-3	
Software Revenue	202	207	214	220	224	226	215	202	-1
Year-to-Year Increase (%)	1	3	3	3	2	1	-5	-6	
Software Service	100	110	122	119	117	111	100	89	-6
Hardware Service	67	59	65	68	72	71	67	63	0
Service Revenue	167	169	187	187	188	181	167	151	-4
Year-to-Year Increase (%)	23	1	10	0	1	-4	-8	-10	
Total Factory Revenue	634	656	678	712	746	747	718	678	0
Year-to-Year Increase (%)	3	3	3	5	5	0	-4	-5	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-33
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Worldwide, NT/Hybrid

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	-	419	788	2,100	3,600	5,500	7,400	10,200	67
Seats	-	419	788	2,100	3,600	5,500	7,400	10,200	67
Year-to-Year Increase (%)	NA	NA	88	165	75	52	33	38	
Installed Base									
CPUs	-	419	1,208	3,300	6,900	11,200	15,200	20,900	77
Seats	-	419	1,208	3,300	6,900	11,200	15,200	20,900	77
Year-to-Year Increase (%)	NA	NA	188	173	111	61	35	38	
Revenue Data (U.S.$ Million)									
CPU Revenue	-	5	8	18	30	43	55	77	59
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	1	2	2	2	3	50
Hardware Revenue	-	5	8	19	32	45	57	80	58
Year-to-Year Increase (%)	NA	NA	71	137	65	43	26	40	
Software Revenue	-	8	14	37	62	92	122	176	65
Year-to-Year Increase (%)	NA	NA	77	157	68	49	32	44	
Software Service	-	2	5	13	23	35	49	73	71
Hardware Service	-	1	2	5	8	11	13	18	52
Service Revenue	-	3	7	18	30	46	62	92	66
Year-to-Year Increase (%)	NA	NA	142	145	72	51	35	49	
Total Factory Revenue	-	16	30	74	124	184	241	348	64
Year-to-Year Increase (%)	NA	NA	87	149	68	48	31	44	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-34
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Worldwide, Personal Computer

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	14,237	12,685	13,423	15,000	17,200	19,700	22,500	25,600	14
Seats	14,237	12,685	13,443	15,000	17,200	19,700	22,500	25,600	14
Year-to-Year Increase (%)	-5	-11	6	11	15	15	14	14	
Installed Base									
CPUs	82,354	76,762	73,082	71,800	73,100	75,600	80,700	85,000	3
Seats	82,354	76,762	73,082	71,800	73,100	75,600	80,700	85,000	3
Year-to-Year Increase (%)	-3	-7	-5	-2	2	3	7	5	
Revenue Data (U.S.$ Million)									
CPU Revenue	39	36	37	40	45	52	58	66	12
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	1	2	1	1	1	1	1	1	-3
Hardware Revenue	40	37	38	41	46	52	59	67	12
Year-to-Year Increase (%)	-21	-7	0	8	13	14	13	13	
Software Revenue	41	37	37	35	35	36	36	37	0
Year-to-Year Increase (%)	13	-9	-2	-5	1	2	1	1	
Software Service	6	6	9	8	8	8	8	7	-3
Hardware Service	2	3	2	3	3	3	4	4	13
Service Revenue	7	8	11	10	11	11	11	12	2
Year-to-Year Increase (%)	14	18	30	-4	2	3	3	4	
Total Factory Revenue	89	83	85	86	92	99	107	116	6
Year-to-Year Increase (%)	-5	-6	2	1	7	8	8	8	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-35
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Worldwide, Host/Proprietary

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	253	151	135	100	100	100	100	0	-20
Seats	516	394	371	300	300	200	200	200	-15
Year-to-Year Increase (%)	-48	-24	-6	-16	-17	-16	-14	-10	
Installed Base									
CPUs	2,508	1,968	1,457	1,000	700	600	600	600	-16
Seats	8,103	6,086	4,276	2,900	2,100	1,800	1,800	1,800	-15
Year-to-Year Increase (%)	-18	-25	-30	-32	-27	-15	0	4	
Revenue Data (U.S.$ Million)									
CPU Revenue	20	12	12	7	5	3	3	2	-29
Terminal Revenue	10	9	7	6	5	4	4	3	-14
Peripheral Revenue	0	0	0	0	0	0	0	0	39
Hardware Revenue	30	20	19	13	10	8	6	6	-21
Year-to-Year Increase (%)	-41	-33	-4	-33	-25	-20	-17	-10	
Software Revenue	1	1	1	1	1	0	0	0	-36
Year-to-Year Increase (%)	-28	-27	5	-20	-29	-37	-44	-47	
Software Service	1	1	1	1	1	0	0	0	-35
Hardware Service	5	3	2	1	1	1	0	0	-31
Service Revenue	6	4	3	2	1	1	1	0	-32
Year-to-Year Increase (%)	-19	-32	-21	-40	-28	-30	-32	-28	
Total Factory Revenue	37	25	24	16	12	9	7	6	-23
Year-to-Year Increase (%)	-38	-33	-6	-34	-26	-22	-19	-12	

Source: Dataquest (September 1996)

Table B-36
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, North America, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	9,836	9,232	9,783	11,500	13,700	16,200	18,900	22,300	18
Seats	9,861	9,273	9,810	11,500	13,700	16,200	18,900	22,300	18
Year-to-Year Increase (%)	4	-6	6	17	19	19	16	18	
Installed Base									
CPUs	56,644	55,196	55,167	57,700	63,000	69,400	74,600	80,000	8
Seats	59,028	56,880	56,195	58,200	63,300	69,500	74,700	80,100	7
Year-to-Year Increase (%)	-1	-4	-1	4	9	10	7	7	
Revenue Data (U.S.$ Million)									
CPU Revenue	80	77	74	82	94	104	113	128	12
Terminal Revenue	2	2	1	1	1	0	0	0	-52
Peripheral Revenue	1	1	1	1	1	2	2	2	33
Hardware Revenue	83	79	76	84	95	106	115	130	11
Year-to-Year Increase (%)	-9	-4	-4	11	13	11	8	13	
Software Revenue	66	67	68	79	93	111	126	149	17
Year-to-Year Increase (%)	-2	1	2	17	18	19	13	19	
Software Service	40	41	45	46	49	53	57	65	7
Hardware Service	18	16	16	16	18	19	20	21	7
Service Revenue	58	56	61	62	67	72	77	86	7
Year-to-Year Increase (%)	19	-3	7	3	7	8	6	12	
Total Factory Revenue	206	202	205	226	256	290	317	365	12
Year-to-Year Increase (%)	0	-2	1	10	13	13	10	15	

Source: Dataquest (September 1996)

Table B-37
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	7,491	6,583	6,881	7,800	8,800	9,800	10,800	12,000	12
Seats	7,624	6,717	7,034	7,900	9,000	9,900	11,000	12,100	12
Year-to-Year Increase (%)	-10	-12	5	13	13	11	10	11	
Installed Base									
CPUs	48,134	45,313	44,194	44,300	45,800	47,800	49,700	50,900	3
Seats	49,928	46,723	45,282	45,100	46,500	48,600	50,600	51,900	3
Year-to-Year Increase (%)	-3	-6	-3	0	3	4	4	3	
Revenue Data (U.S.$ Million)									
CPU Revenue	55	49	50	54	60	63	67	72	7
Terminal Revenue	4	4	4	4	3	3	3	3	-4
Peripheral Revenue	0	1	0	0	1	1	1	1	7
Hardware Revenue	60	54	55	58	64	67	71	76	7
Year-to-Year Increase (%)	-27	-9	1	7	9	6	5	7	
Software Revenue	42	40	42	45	48	50	51	53	5
Year-to-Year Increase (%)	-19	-5	5	7	5	5	2	5	
Software Service	21	21	29	29	29	29	28	27	-1
Hardware Service	11	9	9	10	10	10	10	11	3
Service Revenue	32	30	38	39	39	39	38	38	0
Year-to-Year Increase (%)	-14	-7	29	1	2	-1	-2	-1	
Total Factory Revenue	134	125	135	142	150	156	160	167	4
Year-to-Year Increase (%)	-21	-7	9	5	6	4	3	5	

Source: Dataquest (September 1996)

Table B-38
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Japan, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	7,849	7,874	7,443	7,800	8,400	8,400	8,100	7,900	1
Seats	7,939	7,943	7,531	7,900	8,400	8,400	8,100	7,900	1
Year-to-Year Increase (%)	-2	0	-5	5	7	0	-3	-3	
Installed Base									
CPUs	37,113	40,359	42,983	45,500	48,900	52,100	53,000	50,800	3
Seats	38,058	41,057	43,511	45,900	49,300	52,400	53,200	51,000	3
Year-to-Year Increase (%)	12	8	6	6	7	6	2	-4	
Revenue Data (U.S.$ Million)									
CPU Revenue	159	170	173	193	212	218	216	213	4
Terminal Revenue	3	2	2	1	1	0	0	0	-44
Peripheral Revenue	15	19	16	17	18	17	16	15	-1
Hardware Revenue	177	192	192	211	231	236	232	229	4
Year-to-Year Increase (%)	-11	8	0	10	10	2	-1	-1	
Software Revenue	125	134	139	148	157	165	165	176	5
Year-to-Year Increase (%)	14	7	4	6	6	5	0	6	
Software Service	40	50	55	57	60	61	60	65	3
Hardware Service	41	39	43	46	49	50	48	48	2
Service Revenue	81	89	98	103	109	110	108	113	3
Year-to-Year Increase (%)	40	10	10	5	6	1	-2	4	
Total Factory Revenue	384	415	429	462	497	511	506	518	4
Year-to-Year Increase (%)	5	8	3	8	8	3	-1	2	

Source: Dataquest (September 1996)

Table B-39
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Asia/Pacific, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1,446	1,801	1,966	2,400	2,900	3,300	3,700	4,200	16
Seats	1,448	1,787	1,954	2,400	2,900	3,300	3,700	4,200	16
Year-to-Year Increase (%)	50	23	9	21	21	16	11	13	
Installed Base									
CPUs	5,026	6,137	7,416	8,900	10,800	12,700	14,100	15,200	15
Seats	5,270	6,287	7,481	8,900	10,800	12,600	14,100	15,200	15
Year-to-Year Increase (%)	21	19	19	19	21	17	12	8	
Revenue Data (U.S.$ Million)									
CPU Revenue	15	15	19	23	28	33	36	38	15
Terminal Revenue	1	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	1	1	1	9
Hardware Revenue	15	15	19	23	29	34	36	38	15
Year-to-Year Increase (%)	27	-1	27	20	26	17	7	5	
Software Revenue	10	12	15	19	22	26	28	31	15
Year-to-Year Increase (%)	32	14	31	21	20	17	8	11	
Software Service	5	6	7	8	9	10	11	11	10
Hardware Service	3	3	4	5	5	6	6	6	8
Service Revenue	9	9	11	12	15	16	17	17	10
Year-to-Year Increase (%)	69	2	19	15	18	12	2	1	
Total Factory Revenue	34	36	45	54	66	76	81	87	14
Year-to-Year Increase (%)	37	4	26	19	22	16	6	7	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-40
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Rest of World, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	205	284	368	600	800	1,100	1,400	1,600	35
Seats	218	297	366	600	800	1,100	1,400	1,600	35
Year-to-Year Increase (%)	-4	36	23	51	47	34	24	21	
Installed Base									
CPUs	1,606	1,571	1,598	1,800	2,400	3,100	3,900	4,700	24
Seats	1,835	1,747	1,708	1,900	2,400	3,100	3,900	4,700	23
Year-to-Year Increase (%)	-4	-5	-2	11	27	29	25	22	
Revenue Data (U.S.$ Million)									
CPU Revenue	1	1	1	2	2	3	4	5	34
Terminal Revenue	0	0	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	46
Hardware Revenue	1	1	1	2	2	3	4	5	34
Year-to-Year Increase (%)	-12	23	-22	38	48	34	25	29	
Software Revenue	1	1	1	2	2	3	3	5	35
Year-to-Year Increase (%)	-9	33	19	46	42	30	23	35	
Software Service	0	0	0	0	1	1	1	2	35
Hardware Service	0	0	0	0	0	0	0	0	26
Service Revenue	0	0	0	1	1	1	1	2	33
Year-to-Year Increase (%)	2	3	21	32	40	30	24	40	
Total Factory Revenue	2	3	3	4	5	7	9	11	34
Year-to-Year Increase (%)	-9	23	-3	40	44	32	24	33	

NA = Not applicable
Source: Dataquest (September 1996)

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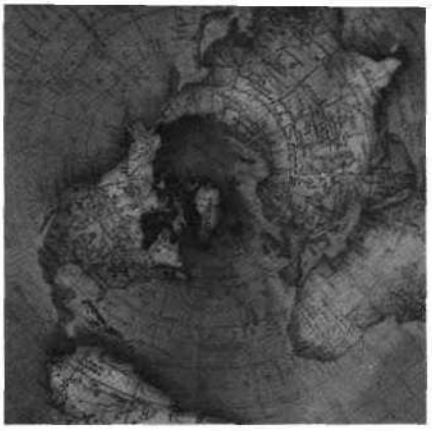

Dataquest

CAD/CAM/CAE/GIS EDA Market Share Update

Market Statistics

Program: Electronic Design Automation Worldwide
Product Code: CEDA-WW-MS-9603
Publication Date: August 12, 1996
Filing: Market Statistics

CAD/CAM/CAE/GIS EDA Market Share Update

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Note: All tables show estimated data.

Chapter 1
CAD/CAM/CAE/GIS EDA Market Share Update

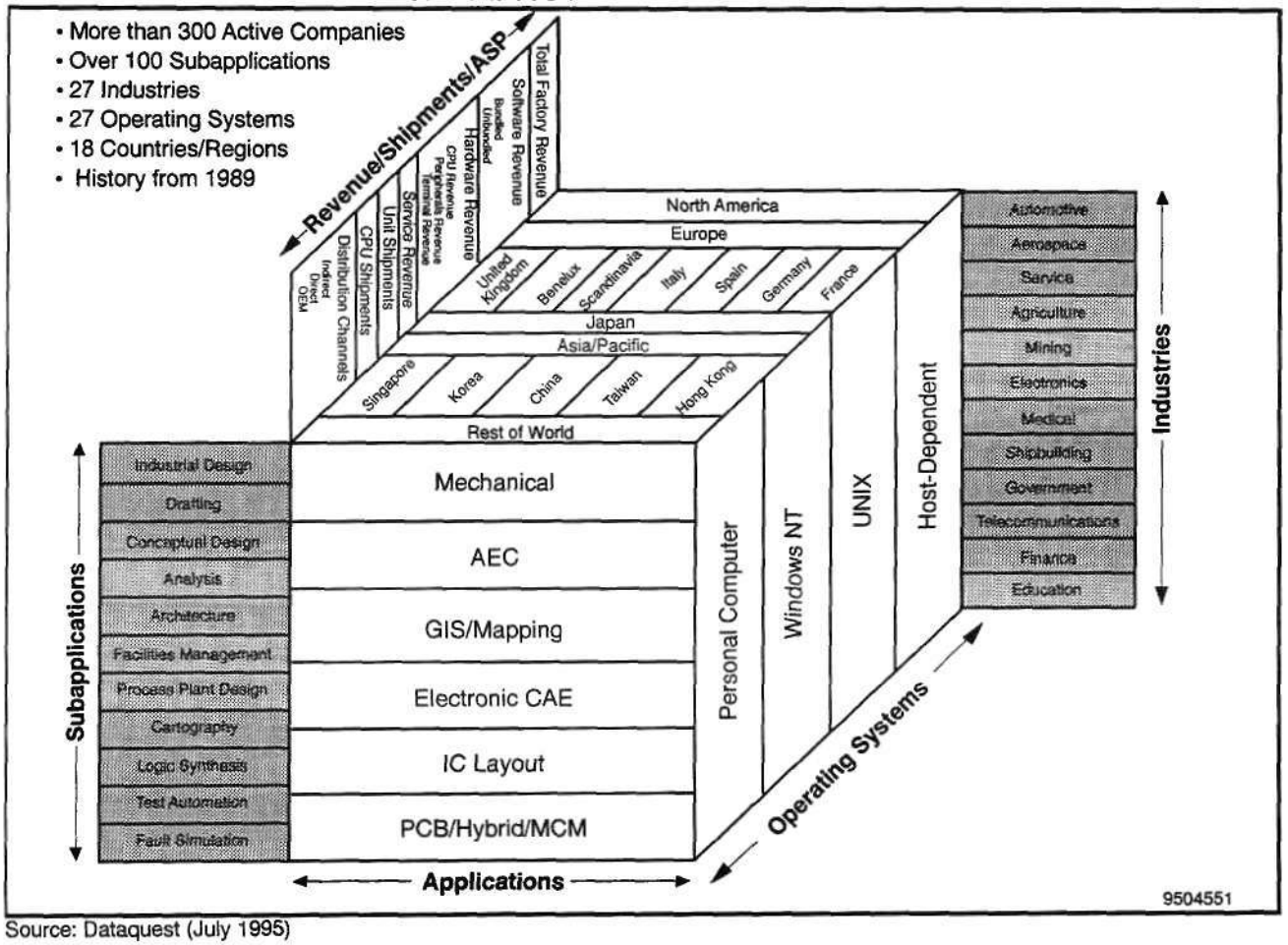
Introduction

CAD/CAM/CAE/GIS systems have dramatically changed the methods by which designers and production managers originate and implement products. CAD and CAE systems allow designers to create, draft, analyze, test, and manipulate products on a screen in two and three dimensions. As CAD/CAM/CAE/GIS systems continue to decrease in cost, they become more available and cost-justifiable to new users.

In order to provide a comprehensive view of the CAD/CAM/CAE/GIS industry, Dataquest's CAD/CAM/CAE/GIS group maintains a large database of industry information. The type of information contained in the database is depicted in Figure 1.

Table 1 summarizes the performance in various segments of the CAD/CAM/CAE/GIS markets in 1995 versus 1994.

Figure 1
CAD/CAM/CAE/GIS Market Database



Source: Dataquest (July 1995)

Table 1
CAD/CAM/CAE/GIS Market Summary, 1994 to 1995

	Software Revenue		Growth (%)	Total Factory Revenue		Growth (%)	Seat Shipments		Growth (%)
	1994	1995	1994-1995	1994	1995	1994-1995	1994	1995	1994-1995
Applications									
Mechanical	2,491.15	3,011.91	20.90	8,339.60	9,571.96	14.78	306,513.18	353,406.86	15.30
AEC	840.13	958.22	14.06	2,444.13	2,768.62	13.28	208,900.88	247,104.23	18.29
GIS/Mapping	692.92	826.29	19.25	2,230.49	2,613.11	17.15	106,411.06	131,365.76	23.45
Electronic CAE	861.06	1,020.03	18.46	2,460.41	2,938.66	19.44	96,349.49	101,773.77	5.63
IC Layout	203.35	263.50	29.58	712.51	885.53	24.28	12,340.43	14,251.15	15.48
PCB/MCM/Hybrid	253.90	265.84	4.70	799.12	827.01	3.49	27,012.53	27,546.43	1.98
Electronic Design Automation	1,318.31	1,549.36	17.53	3,972.03	4,651.20	17.10	135,702.45	143,571.36	5.80
All Applications	5,342.51	6,345.79	18.78	16,986.24	19,604.89	15.42	757,527.57	875,448.20	15.57
Regions									
North America	1,874.61	2,153.26	14.86	5,942.32	6,599.13	11.05	335,044.51	354,952.40	5.94
Europe	1,722.46	2,098.63	21.84	5,472.44	6,489.91	18.59	246,367.12	299,541.87	21.58
Japan	1,390.78	1,619.06	16.41	4,610.52	5,276.78	14.45	114,609.09	143,641.20	25.33
Asia-Pacific	265.60	360.50	35.73	720.99	916.86	27.17	43,760.89	56,326.06	28.71
Rest of World	89.06	114.34	28.38	239.98	322.22	34.27	17,745.96	20,986.67	18.26
Worldwide	5,342.51	6,345.79	18.78	16,986.24	19,604.89	15.42	757,527.57	875,448.20	15.57
Operating Systems									
UNIX	3,749.35	4,298.63	14.65	12,206.29	13,880.11	13.71	232,067.13	249,634.54	7.57
Host/Proprietary	194.47	183.91	-5.43	1,309.64	1,130.22	-13.70	17,325.44	13,673.37	-21.08
NT/Hybrid	119.41	358.64	200.33	311.72	929.48	198.17	7,942.47	26,088.00	228.46
Personal Computer	1,279.28	1,504.60	17.61	3,158.59	3,665.09	16.04	500,192.53	586,052.30	17.17
All Operating Systems	5,342.51	6,345.79	18.78	16,986.24	19,604.89	15.42	757,527.57	875,448.20	15.57

Source: Dataquest (July 1996)

About This Document

This document contains Dataquest's detailed market share information on the CAD/CAM/CAE/GIS industry. The following list contains descriptions of the companies included in the Market Share books. See Tables 2, 3, 4, and 5 for changes in the companies tracked from our 1994 report.

- Mechanical applications—All companies in database with mechanical revenue
- GIS and AEC applications—All companies in database with GIS revenue and all companies in database with AEC revenue. We also have added GIS data companies.
- Electronic design automation applications—All companies in database with EDA (electronic CAE, IC layout, PCB/hybrid/MCM) revenue
- Europe—All companies with European revenue
- Asia—All companies with Asian revenue

We no longer publish top-level market statistics for the entire CAD/CAM/CAE/GIS industry. This data is available by calling Suzanne Snygg at (408) 468-8124. More detailed data on these markets may be requested through our client inquiry service.

This document represents our final market share of 1995 shipments and revenue.

Table 2
Companies Renamed Since 1994

Original Company Name	New Company Name
American Small Business Company	Viagrafix
SHL Systemhouse	SHL VISION Solutions
IEZ	IEZ-Speedikon

Source: Dataquest (July 1996)

Table 3
Companies (or CAD Portions of Companies) Sold/Merged in 1994

Original Company Name	Acquired by/Merged with
3Soft	Mentor Graphics
Exemplar Logic	Mentor Graphics
Facilities Mapping Systems	Eagle Point
Geographix	Landmark Graphics
Integrated Silicon Systems & Arcsys	Avant!
Integrity Engineering	Mentor Graphics
Marcus Computer Systems	ISD Software
Neocad	Xilinx
Rasna	Parametric Technology

Source: Dataquest (February 1996)

Table 4
Companies Deleted from Database Since 1994

Company
Aucotec
INS Engineering
Micrografx

Source: Dataquest (July 1996)

Table 5
Companies Added to Database Since 1994

Company
Altair Computing Inc.
Ansoft
Bentley Systems
Bionic Knight
CAE Plus Inc.
Eagle Design Automation
Escalade
Frontline Design Automation
Just in Time Systems
Logic Vision
Macon
MicroCADAM Inc.
Number One Systems
Protel Technologies
Speedsim

Source: Dataquest (July 1996)

Dataquest's policy is to continually update its market information, for current and past years, with any new data received in order to arrive at the most accurate market representation possible.

Segmentation Definitions

This section lists the definitions specific to this document. The following paragraphs define the segments.

Applications

Mechanical

The mechanical segment refers to computer-aided tools used by engineers, designers, analysts, technicians, and draftspeople working predominantly in the discrete manufacturing industries, but includes government and education. Users of mechanical CAD/CAM/CAE tools work in all departments across the typical organization, with a majority found in product design, advanced engineering, and manufacturing engineering. Common design applications include conceptual design, industrial design, structural or thermal analysis, detail design, and electromechanical design (the mechanical part of design with electrical or

electronic components and mechanisms). Common manufacturing applications include tool and fixture design, numerical control part programming, offline robotics programming, and interface to quality control systems. Management tools for database control and distribution are included in this segment, as well as user-defined application programming.

Architecture, Engineering, and Construction (AEC)

The AEC segment covers the use of computer-aided tools by architects, contractors, plant engineers, civil engineers, and other people associated with these disciplines to aid in designing and managing buildings, industrial plants, ships, and other types of nondiscrete entities.

Geographic Information Systems (GIS)/Mapping

GIS is computer-based technology, and the segment comprises hardware, software, and data used to capture, edit, display, and analyze spatial (tagged by location) information.

Electronic Design Automation (EDA)

The EDA segment covers computer-based tools used to automate the design of an electronic product, including printed circuit boards, ICs, and systems. EDA includes ECAE, IC layout, and PCB/hybrid/MCM, as follows:

- Electronic computer-aided engineering (ECAE)—These are computer-aided tools used in the engineering or design phase of electronic products (as opposed to the physical layout phase of the product). Examples of electronic CAE applications are schematic capture and simulation.
- IC layout—This is a software application tool used to create and validate the physical implementation of an IC. The IC layout category comprises polygon editors, symbolic editors, placement and routing (gate array, cell, and block), and design verification tools (DRC/ERC/logic-to-layout).
- PCB/hybrid/MCM—This segment covers products used to create the placement and routing of the traces and components laid out on a printed circuit board. Also included in this category are thermal analysis tools.

Regions

The following paragraphs define the regions.

North America

Includes Canada, Mexico, Puerto Rico, and the United States

Europe

Western Europe. Includes Austria, Benelux (Belgium, the Netherlands, Luxembourg), France, Germany (including former East Germany), Italy, Scandinavia (Denmark, Finland, Norway, Sweden), Switzerland, the United Kingdom, and the Rest of Western Europe (Andorra, Cyprus, Gibraltar, Iceland, Liechtenstein, Malta, Monaco, San Marino, Spain, Sweden, Turkey, Vatican City, and others)

Eastern Europe. Includes all countries currently categorized as Central Europe in addition to Albania, Bulgaria, the Czech Republic and Slovakia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and the republics of the former Yugoslavia. Also included in this group is Russia and the other republics of the former Soviet Union (Belarus, Ukraine, Georgia, Moldova, Armenia, Azerbaijan, Kazakhstan, Uzbekistan, Tajikistan, Kyrgyzstan, and Turkmenistan)

Japan

Asia/Pacific
Includes Hong Kong, Korea, Singapore, Taiwan, and Rest of Asia (Australia, Brunei, Cambodia, China, India, Indonesia, Laos, Malaysia, Maldives, Myanmar, Nepal, New Zealand, Pakistan, the Philippines, Sri Lanka, Thailand, and Vietnam)

Rest of World
Includes Africa, Central America, the Caribbean, the Middle East, Oceania, and South America

Operating Systems

Dataquest defines the operating systems as follows:

- UNIX: UNIX includes all UNIX variants and older workstation operating systems.
- Host: Host includes minicomputer and mainframe operating systems in which the functions of external workstations are dependent on a host computer.
- Windows NT: Windows NT is the Microsoft operating system. We understand that code for Windows NT and Windows will be merged within the next three years. The probability is high that Microsoft will develop a client environment and a server environment. In our forecast, the future client environment is included in PC operating systems, and the future server environment is referenced as NT. Also included in NT is potential for an additional, new, high-end operating environment that could be developed by any vendor.
- PC: PC includes DOS, Windows, Windows 95, and Apple operating systems.

Metrics

The following paragraphs define measurements:

- Total factory revenue is defined as the amount of money received by a manufacturer for its goods and services measured in U.S. dollars. Total factory revenue does not include revenue that a company may receive from products that are sold to another company for resale (OEM revenue). Total factory revenue is the sum of software revenue, hardware revenue, and service revenue.
- Unit shipment is defined as the number of seats delivered (number of possible simultaneous users of product delivered) excluding OEM shipments.

- Hardware revenue is revenue derived from sales of CPUs (including operating systems), terminals (for host-dependent systems), and peripherals.
- Software revenue is revenue derived from the sale of application software that exists on a company's standard price list.
- End-user revenue
- Service revenue is defined as all revenue derived from the service and support of CAD/CAM/CAE/GIS systems. Service revenue can be calculated in the tables by subtracting hardware and software revenue from total revenue. A split by hardware service and software service is available through inquiry.
  - Maintenance fees for hardware and software
  - Management and operations services—Help desk, education and training, disaster recovery, vaulting, and configuration management
  - Service bureau—Project work, including construction of database, data conversion, product design, analysis, or manufacturing
  - Application development—Design and development of customized software applications or the modification, enhancement of customization of existing software applications, adding new functionality
  - Consulting revenue—Assessment of CAD/CAM/CAE/GIS business and information technology needs and the formulation of a plan based on needs identification
  - Implementation and integration services—Planning, implementation, migration, and integration of software products (software network support and integration, account integration management, data center design, and construction)

Market Share Methodology

Dataquest uses both primary and secondary sources to produce our market share data. In the fourth quarter of each year and second quarter of the subsequent year, we survey all participants in each industry. Each vendor is offered the opportunity to self-report the information required. Although there is a primary contact for each company, large companies are surveyed across product lines and across geographic regions. Thus there is a corresponding increase in the number of contacts at large companies. (Dataquest maintains a large contact database on all sources of information.) Examples of the job titles of people contacted for information are the following:

- President and CEO
- Vice president and general manager
- Vice president of marketing
- Vice president, strategic product planning

- Director of strategic planning
- Director of marketing
- Director of market development
- Manager, CAD/CAM/CAE/GIS marketing programs
- Market research analyst

The Audit Process

Data supplied by vendors is evaluated against information drawn from many sources, including the following:

- Revenue published by major industry participants
- Estimates made by knowledgeable and reliable industry spokespersons
- Government data or trade association data
- Published product literature and price lists
- Interviews with knowledgeable manufacturers, distributors, and users
- Relevant economic data
- Information and data from online data banks
- Articles in both the general and trade press
- Annual reports, SEC documents, credit reports
- Company publications and press releases
- Reports from financial analysts
- User studies
- Reseller and supplier reports and reports from a vendor's competitors

Dataquest also sums vendor revenue across other industries covered by Dataquest to make sure that revenue is not credited twice, and checks with multiple sources at one company to cross-check data on that company.

Dataquest analysts have many years of experience in how to apply the tools described to get the most accurate information possible on a particular company (such as what to use when and what industry averages are). We believe that the estimates presented here are the most accurate and meaningful generally available today. It is the CAD/CAM/CAE/GIS group's policy to continually update our market information for any year, based on any new data received, in order to arrive at the most accurate market representation possible.

Dataquest's CAD/CAM/CAE/GIS market numbers are often higher than those reported by other sources. We survey worldwide, which involves more vendors, higher total market revenue, lower market share per vendor, and a more accurate market picture—which is particularly useful when comparing regions or applications.

Reporting Changes

Beginning with our March 4 publication, we published market share data that reports OEM revenue for all regions. Also, for the first time in the United States our market share tables included companies that resell products from other vendors as well as their own products (these are primarily Japanese companies), and companies that sell products primarily to other vendors (such as Dassault). In the past, this reporting was standard only in our products for Japan, Europe, and Asia/Pacific. We believe that this reporting accurately reflects the activity of all the vendors in the CAD/CAM/CAE and GIS market. To prevent double counting of the market, we will continue to count the total market size by excluding OEM and reseller revenue. As a result, the sum of the individual software vendors will be greater than the total market size in all market share tables. On an inquiry basis, we can produce market share tables that exclude OEM revenue, or report only OEM revenue.

We have also altered IBM's revenue to exclude revenue derived from MicroCADAM sales. We have restated history so that MicroCADAM now appears as its own company for 1994 and 1995, in much the same way that we now separately report Bentley and Intergraph. We believe this will correctly reflect both the change in IBM's ownership of MicroCADAM and a reduction of IBM's role as a reseller of this product. Also, after close examination of Fujitsu, we have restated this company's revenue split to more accurately reflect its OEM sales.

These reporting changes primarily reflect our efforts to both accurately depict markets while accounting for revenue by distribution channel. Dataquest's CAD/CAM/CAE/GIS database was first developed in the turnkey era of CAD/CAM, when channel reporting was relatively unimportant. Today, of course, worldwide distribution and PC-based products require us to better report revenue by channel. While our existing database does account for much of this information, we believe improvements are necessary.

Changes in Software Distribution Channel Accounting

The CAD/CAM/CAE/GIS software industries make extensive use of complex distribution channels throughout the world, which has resulted in considerable confusion. At last, we believe we have developed a data architecture that accurately reflects the revenue flow. This Market Statistics is our first effort to present this new reporting.

For many years, our market database could report the following categories for distribution channels: direct, indirect, OEM, and "*" companies. The "*" *generally* was used to indicate data *included* (but not limited to) revenue received by a vendor acting as a reseller, typically a Japanese vendor reselling U.S. originated products. This "*" revenue was typically reported in tables delivered to clients in Europe and Asia, where very large resellers exist, and not reported in tables delivered to clients in North America.

From now on, we are tracking this reseller revenue as a separate channel, in addition to new tracking of software based on user spending. Definitions and examples of this new reporting follow.

Channel Definitions

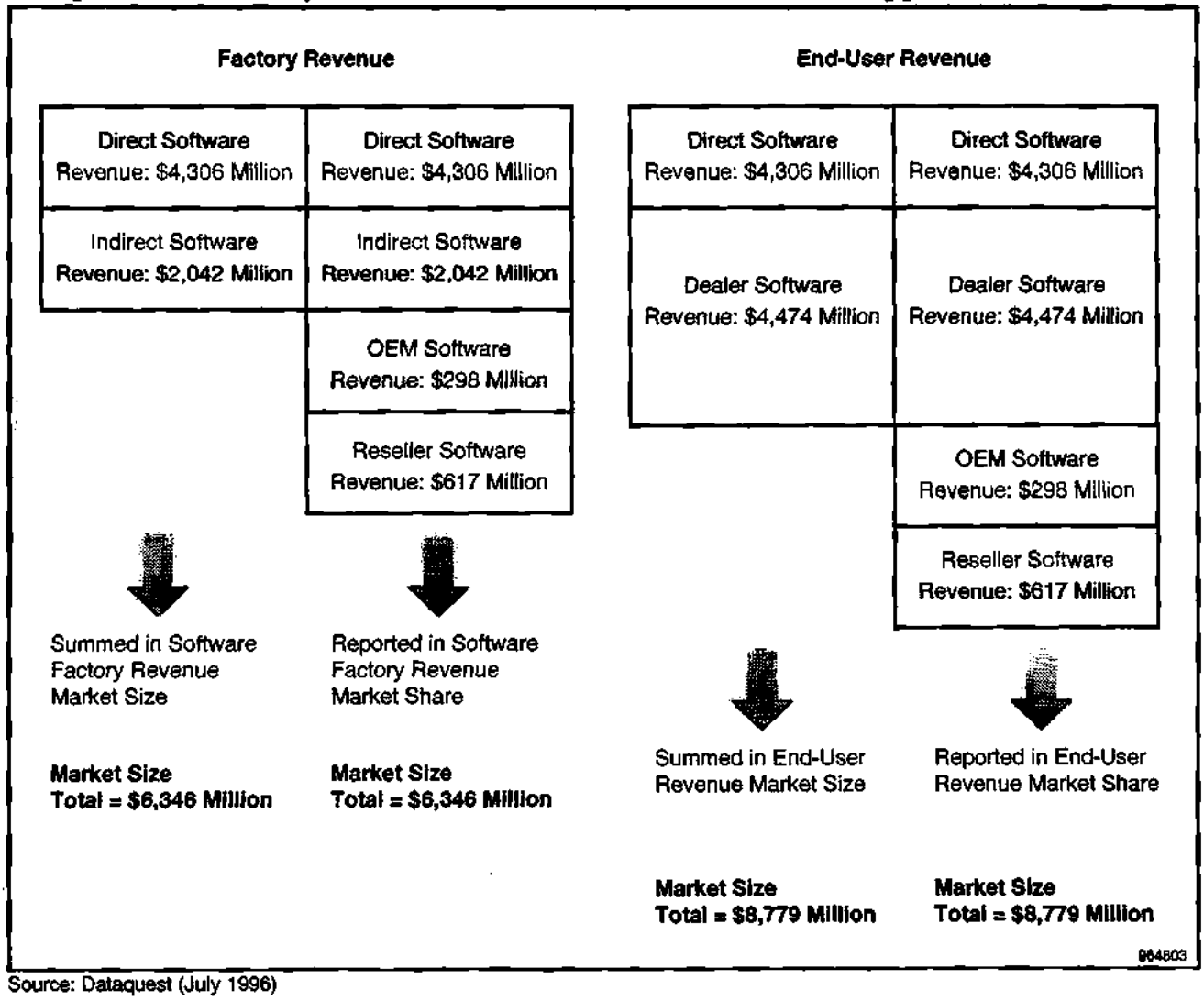
- Direct—Direct to end user
- Indirect—Sales to resellers, from which dealer revenue is calculated
- Dealer Revenue—The calculation of total end-user revenue earned by resellers. Dealer revenue is based on a multiplier of indirect revenue. Thus, dealer revenue always exists for every vendor with indirect sales and it is always at least equal to indirect revenue. Calculation of these multipliers will vary by vendor, by region, and by platform.
- OEM—A channel through which vendors sell their finished product to other companies for resale through an agreement. This revenue is included in reporting by vendor in typical market share tables, but is not added to our market totals, to avoid double counting. Once sold, the product is usually modified slightly, relabeled and rebranded by the new original equipment manufacturer, and then resold directly to the end user or through an indirect channel. Revenue as sold by that final vendor (who, from the perspective of the original component supplier, is also popularly known as the OEM) is then credited as factory revenue to the final supplier, and as revenue contributing to the market.
- Reseller—The revenue a named company in the CAD/CAM/CAE/GIS database receives for selling another company's product, such as Intergraph's revenue from Bentley Microstation products, IBM's revenue for reselling MicroCADAM, or Fujitsu's revenue for reselling software from several U.S. vendors. Essentially, this is "dealers" revenue for the cases where we actively track individual dealers, or resellers.
- Software product—Direct and indirect software revenue combined, excluding OEM and reseller sales. Here the individual vendor's revenue will exactly equal the total market. These tables will be published occasionally and are always available on request. Although we can produce tables from a wide variety of conceptually consistent perspectives, the following are typical tables that we will publish:
  - Company software tables that include OEM and reseller revenue at the vendor level but do not add revenue from these two channels to the total market
  - End-user revenue tables (new)

Standard components (direct and indirect revenue) are used to calculate company software revenue and two additional components (reseller revenue and OEM revenue) are reported on the table—and market shares are calculated on the total number listed on the table. This means that the sum of market shares will be somewhat more than 100 percent.

The same plan is used to calculate end-user revenue—the additional component included is dealer revenue. This reporting is outlined in the summary in Figure 2.

To understand this concept for the vendors with complex business models, imagine separating the part of a company that writes a software product from the company that owns the copyright (that is, HP's mechanical software or IBM's architectural design software) from the part of the company that packages software into complete offerings. So Fujitsu, the packaging company, sells its own sofware and software from outside vendors. In a special case, IBM receives direct revenue credit for selling Dassault's Catia (rather than reseller revenue) because, as the sole reseller, IBM essentially obscures the Dassault identity and effectively puts its own label on the product as the original equipment manufacturer (if Dassault ever sold CAD software through multiple resellers, we would alter our reporting appropriately). Dassault's revenue will be

Figure 2
Comparison of Factory and End-User Market, Worldwide, All Applications



Source: Dataquest (July 1996)

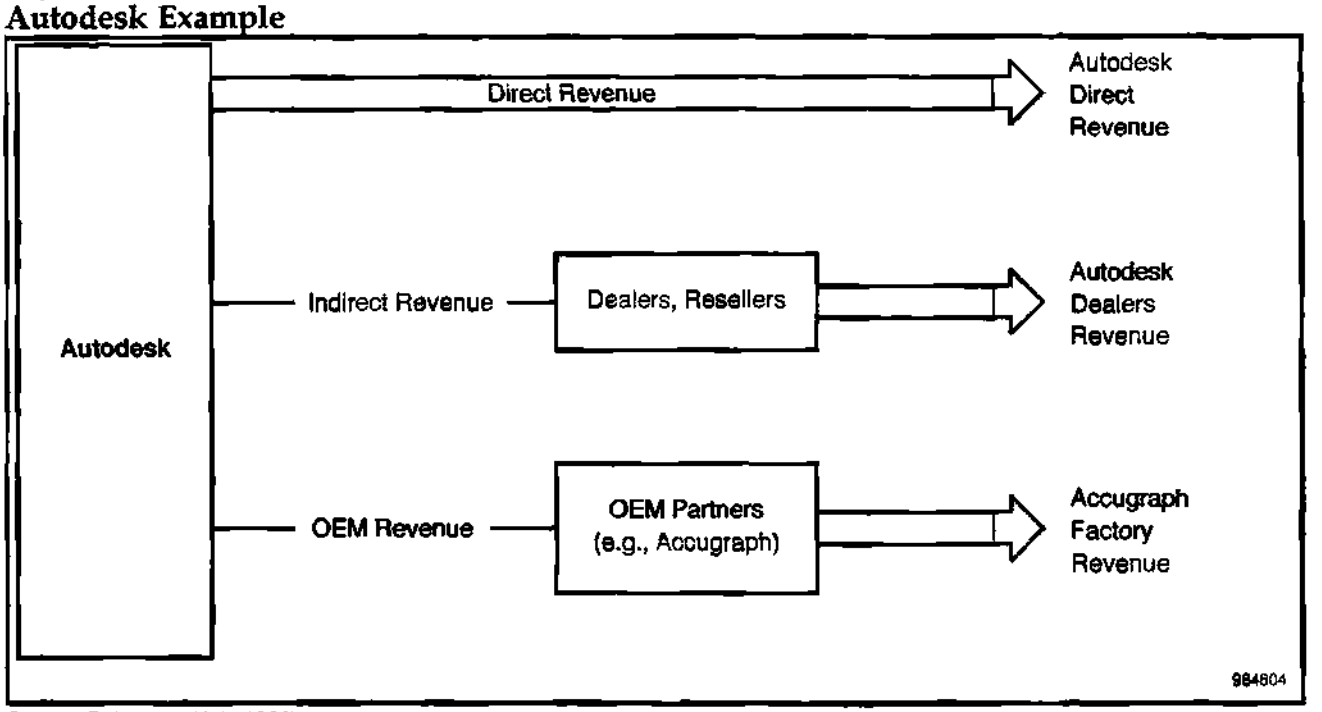
reported on market share tables, but OEM revenue will not be added to the market total (avoiding double counting). Also, in the case where IBM itself sells MicroCADAM software (a company 50 percent owned by IBM), it will receive reseller revenue—but IBM gets no revenue credit for the Microcadam revenue sold by others. At the same time, MicroCADAM Inc.'s revenue is calculated both for its indirect and dealers revenue, in the same way that Bentley Systems (also owned 50 percent by Intergraph) receives its own revenue credit, regardless of who sells its products.

The best way to think about this is to picture the revenue counted for key companies. A few examples follow; see Figures 3, 4, and 5. The labels refer to the specific vendor and type of revenue as it would be reported.

This reporting scheme means that the sum of vendor revenue (and market shares) will total to more than the sum of the market. We have used similar reporting for European and Asian clients for years, in response to the realities of market requirements. We believe the best way to accurately report market opportunities and positioning worldwide is through this method. Advantages to this approach include:

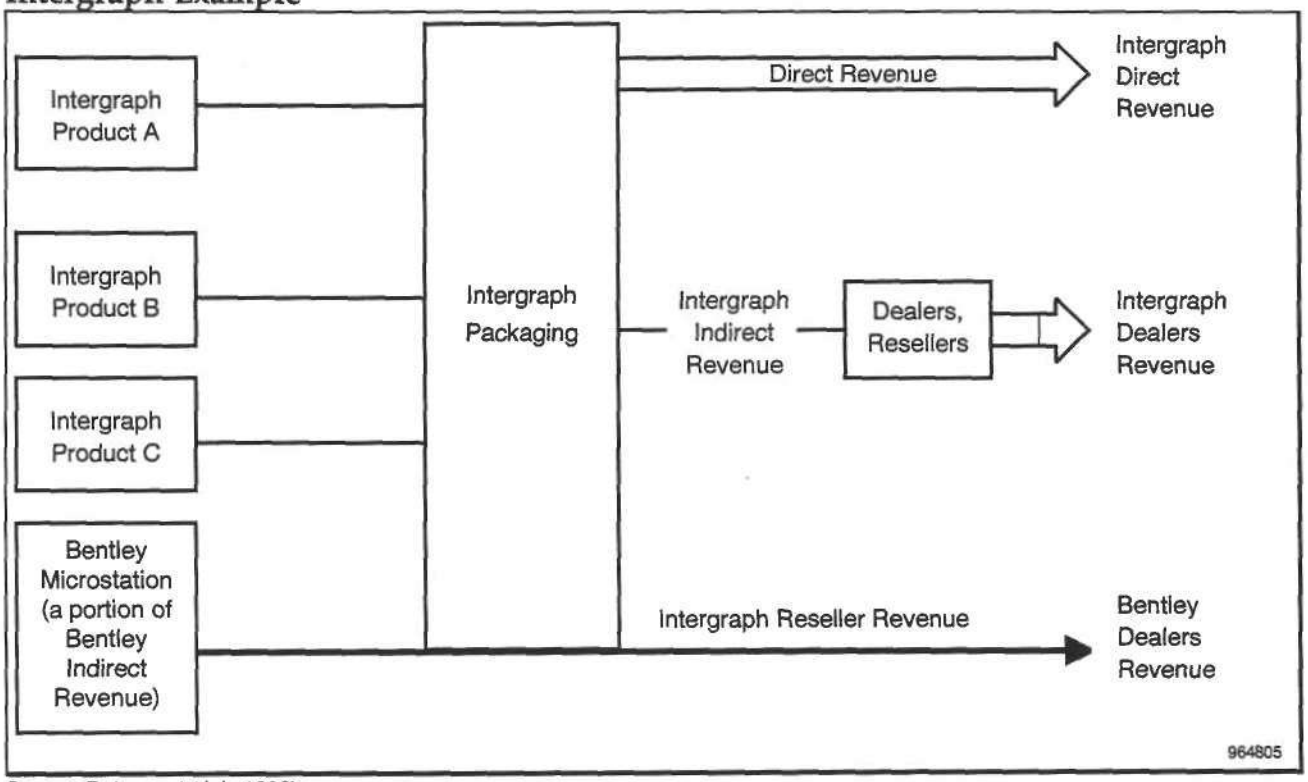
- We do not double count any total market opportunity, and we will continue to avoid overstating the actual revenue available, which will help our clients make the most reasonable investments.

Figure 3
Autodesk Example



Source: Dataquest (July 1996)

Figure 4
Intergraph Example

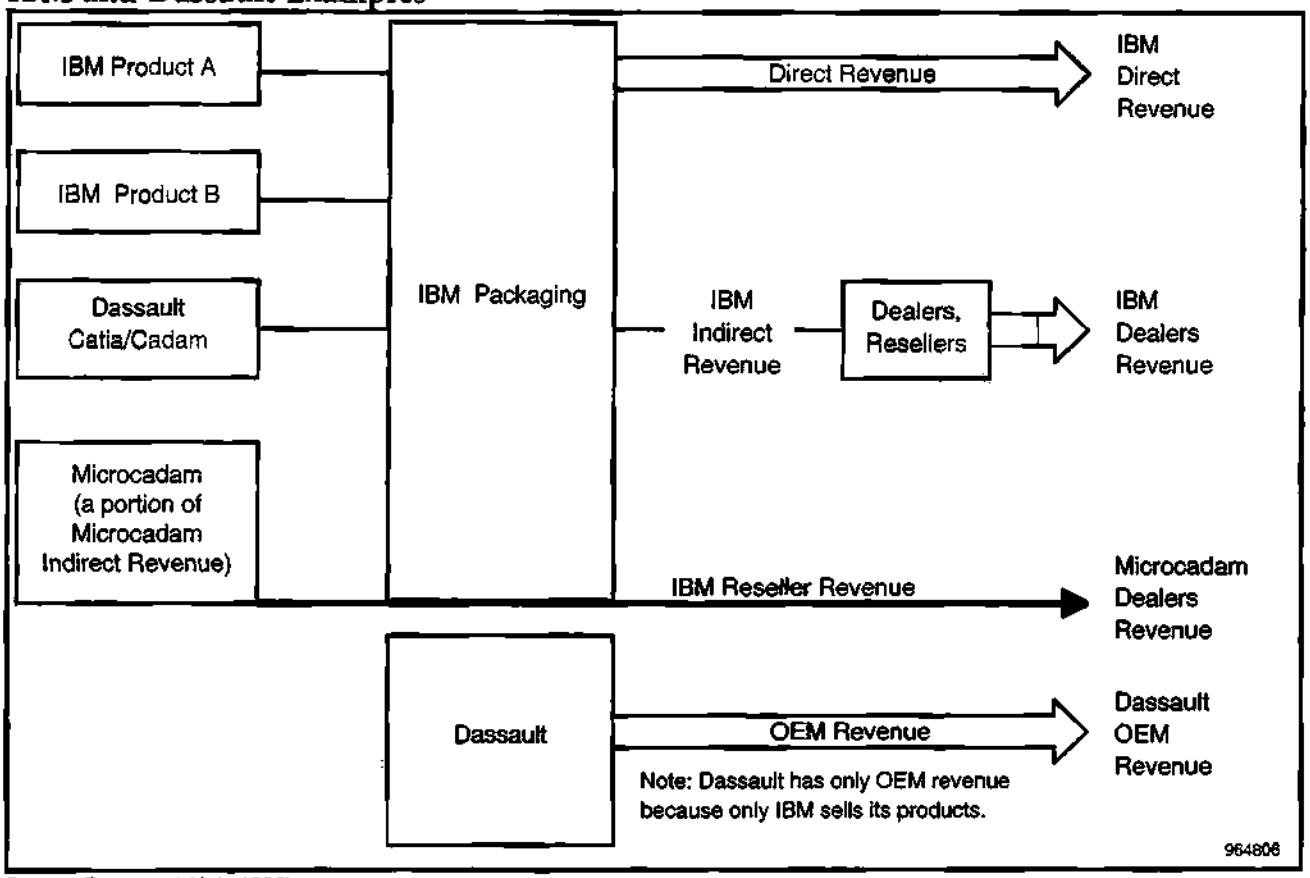


Source: Dataquest (July 1996)

- The high level of activity of vendors who are active in multiple channels will show up in market share tables, again without double counting revenue. For example, it will be possible to understand the status of Bentley Systems vis-a-vis Intergraph. We can report Bentley's factory software revenue, Bentley's total end-user revenue (some of which will be sold by Intergraph), Intergraph's sales from Intergraph products, Intergraph resesser sales from Bentley products, and sales made by Intergraph's own dealers. In general, this model will allow us to better detail market contributions by companies with complex business models, such as Fujitsu, IBM, and NEC.
- In our ongoing tests of alternate reporting schemes, tables that report only vendor revenue (that is, tables where individual vendor revenue always sums to the total market) produce significantly misleading results in a number of important cases. On the other hand, tables that add all revenue reported into the market total produce results that mislead vendors about the actual revenue opportunity. We have found that tables that include all vendor activity while not double counting the market actually produce the closest to what we believe is a true depiction of the market.

Tables 6, 7, and 8, which follow, provide three successive views of the market, beginning with product software revenue in Table 6, in which Autodesk has a slim lead. In Table 7, which shows company software revenue (or revenue in the bank for any CAD software sales), IBM takes

Figure 5
IBM and Dassault Examples



Source: Dataquest (July 1996)

the lead, because of the company's significant resales of MicroCADAM. Finally, in Table 8, we see the calculation of end-user revenue (or revenue from the user's wallet), where Autodesk's dominant market position, only suggested by Table 6, becomes clear. Calculated on the basis of what Autodesk's extensive dealer network receives from users, Autodesk is almost twice the size of its nearest competitor. For those receiving GIS tables, we highlight the significant differences between factory revenue, where Intergraph, through its direct sales, puts more money in the bank than ESRI, which relies on an extensive international network of dealers (that, it is important to note, are often partially owned by CEO, Jack Dangermond, independent of ESRI Inc.). ESRI's market dominance is only clear in Table 8, where the software revenue from these resellers is calculated in the equation.

A Final Note

The tables we choose to publish in statistics books are those we believe useful for the greatest number of clients. However, given the rich dynamics in distribution channels, it is not possible to understand the full opportunity from a single viewpoint. On request, we are happy to deliver alternative views of the market, as detailed tables—we do prefer to deliver these as Excel workbooks via e-mail. For example, we will continue to be able to produce tables that show only product software revenue, direct revenue, indirect revenue, or OEM revenue. Our ongoing committment is to maintain an accurate and complete model of the entire CAD/CAM/CAE/GIS market, worldwide, and we welcome your input.

Publishing Schedule

We publish market share and forecasting twice each year for each, allowing for both timely distribution of data and thorough analysis and forecasting. Our annual delivery schedule is as follows:

- Market share was published and distributed to clients by March 4.
- A five-year forecast for CAD/CAM/CAE/GIS was shipped to clients on May 13.
- Final updated market share tables, based on additional data collection and analysis, are presented in this report. At this point, the market share database is frozen and will not be changed until the end of the year. For the next six months, supplementary market data will be based on this final market data. Other cuts of data not presented in these books (such as subapplication information) are available through our Client Inquiry service.

  We provide complete final forecast tables by September 2. These tables take into consideration changes in the market share during the previous six months. Books will be shipped by September 31.

Table 6
Top 30 Product Software Revenue, Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Autodesk	398.6	438.6	511.3	16.6	8.1
2	IBM	426.6	358.4	467.6	30.5	7.4
3	Parametric Technology	163.7	206.5	321.2	55.5	5.1
4	Intergraph	322.2	318.4	295.6	-7.2	4.7
5	Cadence	179.5	197.8	253.6	28.2	4.0
6	Synopsys	112.9	142.7	193.5	35.6	3.0
7	EDS Unigraphics	148.9	169.8	192.5	13.4	3.0
8	Mentor Graphics	167.3	175.6	182.2	3.8	2.9
9	Computervision	172.6	163.1	163.7	0.3	2.6
10	Fujitsu	125.2	135.1	151.4	12.1	2.4
11	MicroCADAM	-	91.7	129.2	40.9	2.0
12	Hewlett-Packard	104.0	108.9	117.8	8.2	1.9
13	SDRC	85.6	103.3	117.6	13.8	1.9
14	MacNeal-Schwendler	77.4	93.6	117.6	25.5	1.9
15	NEC	96.4	103.4	109.9	6.3	1.7
16	ESRI	76.1	95.0	109.2	15.0	1.7
17	Hitachi	85.1	88.9	94.5	6.4	1.5
18	Siemens Nixdorf Info systeme	86.8	91.4	93.2	2.0	1.5
19	Landmark Graphics	64.1	72.5	89.9	24.0	1.4
20	Bentley Systems	-	4.2	89.9	2032.9	1.4
21	Matra Datavision	64.1	75.6	87.4	15.6	1.4
22	Toshiba*	64.8	78.1	86.0	10.1	1.4
23	Nihon Unisys	62.9	69.9	77.1	10.3	1.2
24	Zuken-Redac	71.5	67.7	72.4	7.0	1.1
25	Quickturn Design Systems	49.5	59.0	70.7	19.9	1.1
26	Nemetschek	44.7	58.1	65.8	13.1	1.0
27	Viewlogic Systems	63.4	70.0	65.5	-6.5	1.0
28	GDS	38.4	45.2	52.2	15.6	0.8
29	Compass Design Automation	43.0	43.1	50.4	16.8	0.8
30	IEZ-Speedikon	29.6	40.3	46.9	16.6	0.7
	All N.A. Companies	3,444.1	3,865.0	4,691.3	21.4	73.9
	All European Companies	632.4	698.7	796.1	13.9	12.5
	All Asian Companies	739.6	778.8	858.4	10.2	13.5
	All Companies	4,816.1	5,342.5	6,345.8	18.8	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table 7
Top 30 Company Software Revenue, Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	IBM	426.6	411.5	527.6	28.2	8.3
2	Autodesk	398.6	438.9	516.4	17.6	8.1
3	Intergraph	322.2	318.3	345.8	8.6	5.4
4	Parametric Technology	165.7	209.8	321.2	53.1	5.1
5	Cadence	189.5	200.8	257.7	28.3	4.1
6	Fujitsu	161.6	182.1	210.8	15.8	3.3
7	EDS Unigraphics	152.8	172.9	195.8	13.3	3.1
8	Dassault	136.0	157.1	194.5	23.8	3.1
9	Synopsys	113.7	142.7	193.5	35.6	3.0
10	Mentor Graphics	167.3	175.6	184.0	4.7	2.9
11	Computervision	173.3	163.1	163.7	0.3	2.6
12	MicroCADAM	-	91.7	129.2	40.9	2.0
13	Hewlett-Packard	104.0	108.9	117.8	8.2	1.9
14	SDRC	93.9	103.3	117.6	13.8	1.9
15	MacNeal-Schwendler	77.4	93.6	117.6	25.5	1.9
16	NEC	96.4	103.4	109.9	6.3	1.7
17	ESRI	76.1	95.0	109.2	15.0	1.7
18	Hitachi	85.1	88.9	94.5	6.4	1.5
19	Siemens Nixdorf Info systeme	86.8	91.4	93.2	2.0	1.5
20	Landmark Graphics	65.1	72.5	89.9	24.0	1.4
21	Bentley Systems	-	26.0	89.9	245.4	1.4
22	Matra Datavision	64.1	75.6	87.4	15.6	1.4
23	Toshiba*	136.7	78.1	86.0	10.1	1.4
24	Info. Services Int'l. Dentsu*	50.5	66.0	85.2	29.1	1.3
25	Viewlogic Systems	76.9	83.3	77.3	-7.3	1.2
26	Nihon Unisys	125.9	69.9	77.1	10.3	1.2
27	Zuken-Redac	73.6	67.7	72.4	7.0	1.1
28	Quickturn Design Systems	51.5	59.0	70.7	19.9	1.1
29	Nemetschek	47.9	58.1	65.8	13.1	1.0
30	C. Itoh Techno-Science*	52.5	59.0	52.9	-10.4	0.8
	All N.A. Companies	3,444.1	3,865.0	4,691.3	21.4	73.9
	All European Companies	632.4	698.7	796.1	13.9	12.5
	All Asian Companies	739.6	778.8	858.4	10.2	13.5
	All Companies	4,816.1	5,342.5	6,345.8	18.8	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table 8
Top 30 End User Software Revenue, Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Autodesk	692.7	763.3	1,086.9	42.4	12.4
2	IBM	856.5	425.1	531.3	25.0	6.1
3	Intergraph	370.4	381.6	370.9	-2.8	4.2
4	Parametric Technology	206.8	212.2	360.6	69.9	4.1
5	Cadence	194.1	244.2	314.1	28.6	3.6
6	Fujitsu	189.4	213.7	246.3	15.2	2.8
7	Hewlett-Packard	199.7	215.3	241.9	12.4	2.8
8	Computervision	206.0	224.1	235.2	4.9	2.7
9	ESRI	159.8	199.4	229.5	15.1	2.6
10	EDS Unigraphics	163.2	193.8	223.4	15.3	2.5
11	Mentor Graphics	187.1	199.7	200.0	0.1	2.3
12	Synopsys	117.4	146.4	198.6	35.7	2.3
13	Dassault	136.0	157.1	194.5	23.8	2.2
14	SDRC	142.4	161.9	183.2	13.1	2.1
15	Bentley Systems	-	27.8	170.4	512.1	1.9
16	MicroCADAM	-	106.3	149.8	40.9	1.7
17	MacNeal-Schwendler	87.1	111.5	146.4	31.3	1.7
18	NEC	112.3	134.2	137.9	2.7	1.6
19	Landmark Graphics	68.0	107.4	126.8	18.0	1.4
20	Toshiba*	195.0	111.7	123.2	10.3	1.4
21	Matra Datavision	80.8	90.8	117.5	29.4	1.3
22	Siemens Nixdorf Info systeme	98.3	104.4	115.7	10.9	1.3
23	Hitachi	102.8	107.3	114.1	6.4	1.3
24	Viewlogic Systems	88.5	96.1	97.8	1.7	1.1
25	Nihon Unisys	125.9	88.6	94.1	6.3	1.1
26	IEZ-Speedikon	44.7	57.3	90.1	57.1	1.0
27	Info. Services Int'l. Dentsu*	50.5	66.0	85.2	29.1	1.0
28	Zuken-Redac	92.4	77.1	84.3	9.3	1.0
29	Nemetschek	47.8	68.8	77.8	13.1	0.9
30	Quickturn Design Systems	60.0	70.2	77.8	10.8	0.9
	All N.A. Companies	4,862.7	5,138.1	6,478.0	26.1	73.8
	All European Companies	871.4	940.3	1,119.3	19.0	12.7
	All Asian Companies	988.5	1,044.9	1,182.1	13.1	13.5
	All Companies	6,722.6	7,123.4	8,779.4	23.2	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-1
1995 Top 30 Electronic Design Automation Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	189.5	200.8	257.7	28.3	16.6
2	Synopsys	113.7	142.7	193.5	35.6	12.5
3	Mentor Graphics	167.3	175.6	184.0	4.7	11.9
4	Viewlogic Systems	76.9	83.3	77.3	-7.3	5.0
5	Zuken-Redac	72.7	67.0	71.9	7.4	4.6
6	Quickturn Design Systems	51.5	59.0	70.7	19.9	4.6
7	Compass Design Automation	43.6	43.7	51.0	16.7	3.3
8	Hewlett-Packard	33.1	34.4	36.3	5.5	2.3
9	AVANT!	8.4	16.3	32.3	97.7	2.1
10	Marubeni Hytech*	24.7	25.7	29.7	15.4	1.9
11	Zycad	23.2	29.4	28.4	-3.4	1.8
12	Seiko*	32.0	21.9	27.8	26.5	1.8
13	Fujitsu	21.0	23.7	27.4	15.8	1.8
14	Intergraph	25.0	19.9	26.7	34.3	1.7
15	IKOS Systems	18.1	18.6	25.7	38.1	1.7
16	EPIC Design Technology	-	11.9	24.2	103.5	1.6
17	Yokogawa Digital Computer	35.9	21.4	24.0	12.4	1.6
18	Harris EDA	21.0	21.5	21.9	1.6	1.4
19	Autodesk	23.9	22.8	20.6	-9.5	1.3
20	CADIX	31.1	18.3	20.3	11.1	1.3
21	ALTERA	13.1	16.0	19.2	20.0	1.2
22	Xilinx Inc.	14.7	16.9	18.5	9.6	1.2
23	Meta-Software	9.4	14.4	17.5	21.2	1.1
24	Analogy	11.0	11.0	17.1	55.5	1.1
25	Okura*	10.8	14.3	17.0	18.6	1.1
26	Summitt Design	9.1	14.6	16.4	12.7	1.1
27	NEC	22.7	22.4	15.6	-30.1	1.0
28	Wacom	26.3	12.1	15.2	25.8	1.0
29	Cooper & Chyan Technology	5.2	9.3	14.2	53.3	0.9
30	Microsim	5.8	11.9	14.0	17.6	0.9
	All N.A. Companies	965.5	1,111.0	1,327.2	19.5	85.7
	All European Companies	40.4	23.8	26.5	11.3	1.7
	All Asian Companies	181.2	183.5	195.7	6.7	12.6
	All Companies	1,187.1	1,318.3	1,549.4	17.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-2
1995 Top 30 Electronic Design Automation Software Companies, Worldwide, UNIX (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	189.5	200.8	257.7	28.3	19.4
2	Synopsys	113.5	142.7	193.5	35.6	14.6
3	Mentor Graphics	164.8	172.4	172.0	-0.2	13.0
4	Quickturn Design Systems	51.5	59.0	70.7	19.9	5.3
5	Zuken-Redac	69.9	65.0	68.9	6.0	5.2
6	Compass Design Automation	43.6	43.7	51.0	16.7	3.8
7	Viewlogic Systems	46.9	51.9	48.6	-6.4	3.7
8	AVANT!	8.4	16.3	32.3	97.7	2.4
9	Hewlett-Packard	31.0	30.9	31.4	1.6	2.4
10	Zycad	23.2	29.4	28.4	-3.4	2.1
11	IKOS Systems	18.1	18.6	25.7	38.1	1.9
12	Fujitsu	19.0	22.0	25.4	15.8	1.9
13	Marubeni Hytech*	18.7	21.2	25.0	18.0	1.9
14	EPIC Design Technology	-	11.9	24.2	103.5	1.8
15	Yokogawa Digital Computer	35.9	21.4	24.0	12.4	1.8
16	Seiko*	32.0	20.4	23.1	13.1	1.7
17	CADIX	31.1	18.3	20.3	11.1	1.5
18	Harris EDA	18.2	18.5	19.0	3.2	1.4
19	Analogy	10.9	11.0	17.1	55.5	1.3
20	Okura*	10.8	14.3	17.0	18.6	1.3
21	Meta-Software	8.7	13.5	16.4	21.2	1.2
22	Summitt Design	8.7	14.0	15.7	12.7	1.2
23	Xilinx Inc.	6.8	11.1	14.5	30.7	1.1
24	LSI Logic	13.6	15.6	12.9	-17.2	1.0
25	NEC	18.7	18.1	12.5	-31.0	0.9
26	Cooper & Chyan Technology	5.1	7.1	10.9	52.9	0.8
27	Cascade Design Automation	8.6	10.3	9.9	-3.8	0.7
28	Minc Software	1.8	5.1	9.8	94.1	0.7
29	High Level Design Systems	3.2	3.3	9.3	178.1	0.7
30	C. Itoh Techno-Science*	8.7	9.8	8.4	-14.2	0.6
	All N.A. Companies	836.0	957.9	1,145.2	19.6	86.4
	All European Companies	19.9	9.2	8.0	-12.5	0.6
	All Asian Companies	159.6	164.1	172.0	4.8	13.0
	All Companies	1,015.5	1,131.1	1,325.3	17.2	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-3
1995 Top 15 Electronic Design Automation Software Companies, Worldwide, NT/Hybrid (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Intergraph	-	2.4	19.3	696.3	57.1
2	PADS Software	-	7.5	10.8	43.0	31.9
3	Seiko*	-	1.6	4.7	201.2	13.9
4	Viewlogic Systems	-	-	2.4	NA	7.2
5	ALTERA	-	-	1.9	NA	5.7
6	Hewlett-Packard	-	-	1.5	NA	4.5
7	Ansoft	-	0.6	0.8	41.1	2.3
8	SIMUCAD	0	0.1	0.4	410.3	1.2
9	Fintronic	-	-	0.3	NA	0.8
10	NOVASOFT Systems	-	-	0.2	NA	0.5
11	CAD Distribution	-	0	0.1	698.0	0.3
12	Frontline Design Automation	-	-	0.1	NA	0.2
13	InterHDL	-	0	0	5.0	0.1
14	Mentor Graphics	-	1.3	-	-100.0	-
15	Intusoft	-	0.9	-	-100.0	-
	All N.A. Companies	0	12.8	33.7	163.4	99.7
	All European Companies	-	0	0.1	698.0	0.3
	All Asian Companies	-	-	-	NA	-
	All Companies	0	12.8	33.8	163.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-4
1995 Top 30 Electronic Design Automation Software Companies, Worldwide, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Viewlogic Systems	30.1	31.4	26.2	-16.5	14.0
2	Autodesk	22.5	21.5	19.6	-8.6	10.5
3	ALTERA	13.1	16.0	17.3	8.0	9.2
4	Wacom	24.3	11.0	15.2	38.3	8.1
5	Microsim	4.6	10.2	12.0	17.6	6.4
6	Mentor Graphics	2.5	2.0	12.0	510.0	6.4
7	OrCAD EDA	8.0	8.0	10.6	32.7	5.7
8	Protel Technology	-	4.5	6.0	33.3	3.2
9	Accel Technologies	3.2	4.1	6.0	46.0	3.2
10	Data I/O	5.0	5.3	5.6	6.5	3.0
11	Marubeni Hytech*	5.9	4.5	4.6	2.8	2.5
12	Xilinx Inc.	7.9	5.7	4.0	-31.3	2.1
13	Intergraph	0.8	0.8	3.5	357.7	1.9
14	Hewlett-Packard	2.1	3.6	3.4	-3.7	1.8
15	Cooper & Chyan Technology	0.2	2.2	3.3	54.6	1.8
16	NEC	4.0	4.3	3.2	-26.4	1.7
17	Zuken-Redac	2.8	2.0	3.0	51.0	1.6
18	CAD-UL	2.7	2.3	2.9	24.7	1.5
19	ALS Design	2.2	2.3	2.8	18.9	1.5
20	ALDEC	2.4	2.4	2.8	13.6	1.5
21	ULTImate Technology	2.3	1.9	2.7	45.4	1.4
22	ACTEL	3.3	2.7	2.7	-0.5	1.4
23	Altium*	9.9	9.7	2.7	-72.5	1.4
24	IBM	9.9	9.7	2.7	-72.5	1.4
25	Harris EDA	2.1	2.7	2.5	-5.4	1.3
26	Sophia Systems*	2.7	2.8	2.4	-14.7	1.3
27	Norlinvest Ltd.	2.1	2.2	2.2	1.3	1.2
28	Ziegler Informatics	5.5	0.7	2.2	231.4	1.2
29	Intusoft	0.8	0.4	2.1	382.8	1.1
30	PADS Software	9.0	2.7	2.0	-26.0	1.1
	All N.A. Companies	127.5	138.1	146.4	6.0	78.0
	All European Companies	19.6	14.6	18.3	25.8	9.8
	All Asian Companies	21.0	18.7	22.9	22.6	12.2
	All Companies	168.2	171.3	187.7	9.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-5
1995 Top Eight Electronic Design Automation Software Companies, Worldwide, Host/Proprietary (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	MacNeal-Schwendler	0.6	1.5	1.2	-15.6	47.6
2	Fujitsu	0.6	0.7	0.8	15.8	32.5
3	C. Itoh Techno-Science*	0.5	0.4	0.7	98.2	27.5
4	Harris EDA	0.7	0.4	0.3	-19.9	13.4
5	Meta-Software	0.5	0.3	0.3	21.1	13.4
6	Hitachi	0.1	0.2	0.2	6.4	6.4
7	SIMUCAD	0	0.1	0.1	-33.0	2.1
8	NOVASOFT Systems	-	0.2	-	-100.0	-
	All N.A. Companies	1.9	2.3	1.8	-21.1	70.3
	All European Companies	-	-	-	NA	-
	All Asian Companies	0.6	0.7	0.8	10.8	29.7
	All Companies	3.4	3.0	2.6	-13.7	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-6
1995 Top 30 Electronic Design Automation Software Companies, North America, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	91.6	95.2	129.0	35.5	17.8
2	Synopsys	64.4	75.6	92.9	22.8	12.8
3	Mentor Graphics	93.5	93.5	91.7	-1.9	12.7
4	Viewlogic Systems	47.9	57.2	53.2	-7.0	7.4
5	Quickturn Design Systems	37.6	36.6	48.0	31.3	6.6
6	Zycad	16.7	19.1	21.9	14.5	3.0
7	AVANT!	5.8	11.2	21.6	93.7	3.0
8	Compass Design Automation	17.0	16.7	19.4	16.6	2.7
9	IKOS Systems	14.7	13.4	16.2	20.9	2.2
10	Intergraph	14.7	11.3	16.1	42.1	2.2
11	Hewlett-Packard	12.9	13.8	14.5	5.5	2.0
12	EPIC Design Technology	-	6.2	13.5	119.2	1.9
13	Xilinx Inc.	11.9	11.7	12.5	7.6	1.7
14	Meta-Software	5.3	8.1	10.8	34.2	1.5
15	LSI Logic	8.0	9.1	10.4	13.7	1.4
16	Analogy	5.0	6.6	10.2	55.5	1.4
17	Minc Software	1.9	5.3	10.2	94.1	1.4
18	Harris EDA	9.5	9.4	10.1	7.0	1.4
19	Microsim	5.2	7.1	8.4	17.6	1.2
20	Summitt Design	4.6	7.3	8.2	12.7	1.1
21	High Level Design Systems	2.3	2.8	7.9	184.8	1.1
22	Cooper & Chyan Technology	3.9	6.6	7.8	18.7	1.1
23	OrCAD EDA	6.3	4.9	7.5	52.3	1.0
24	PADS Software	4.7	5.6	6.8	20.9	0.9
25	SES Inc.	4.8	5.8	6.5	13.2	0.9
26	ALTERA	7.0	8.3	6.5	-21.5	0.9
27	Autodesk	11.5	7.7	5.7	-26.2	0.8
28	Ansoft	-	3.9	5.5	41.1	0.8
29	Accel Technologies	2.2	2.7	4.3	63.1	0.6
30	Cascade Design Automation	4.2	4.8	4.1	-16.0	0.6
	All N.A. Companies	543.2	599.5	716.4	19.5	99.0
	All European Companies	4.6	1.4	2.4	68.0	0.3
	All Asian Companies	5.4	5.3	4.6	-13.5	0.6
	All Companies	553.1	606.2	723.4	19.3	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-7
1995 Top 30 Electronic Design Automation Software Companies, North America, UNIX (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	91.6	95.2	129.0	35.5	20.5
2	Synopsys	64.2	75.6	92.9	22.8	14.8
3	Mentor Graphics	92.2	91.8	85.9	-6.5	13.6
4	Quickturn Design Systems	37.6	36.6	48.0	31.3	7.6
5	Viewlogic Systems	29.6	37.2	35.4	-4.8	5.6
6	Zycad	16.7	19.1	21.9	14.5	3.5
7	AVANT!	5.8	11.2	21.6	93.7	3.4
8	Compass Design Automation	17.0	16.7	19.4	16.6	3.1
9	IKOS Systems	14.7	13.4	16.2	20.9	2.6
10	EPIC Design Technology	-	6.2	13.5	119.2	2.2
11	Hewlett-Packard	12.1	12.4	12.6	1.6	2.0
12	LSI Logic	8.0	9.1	10.4	13.7	1.6
13	Analogy	4.9	6.6	10.2	55.5	1.6
14	Meta-Software	4.9	7.6	10.2	34.2	1.6
15	Xilinx Inc.	4.8	7.7	9.8	27.8	1.6
16	Harris EDA	7.9	7.9	8.7	10.7	1.4
17	Minc Software	1.6	4.4	8.6	94.1	1.4
18	High Level Design Systems	2.3	2.8	7.9	184.8	1.3
19	Summitt Design	4.4	7.0	7.9	12.7	1.2
20	SES Inc.	4.8	5.8	6.5	13.2	1.0
21	Cooper & Chyan Technology	3.8	5.1	6.0	18.4	1.0
22	Cascade Design Automation	4.2	4.8	4.1	-16.0	0.6
23	UniCAD	-	3.2	3.9	21.9	0.6
24	Ansoft	-	2.7	3.9	41.1	0.6
25	AT&T	2.4	2.7	3.7	37.0	0.6
26	MOTOROLA	2.5	2.9	3.3	13.2	0.5
27	Silicon Valley Research	3.3	2.5	3.1	20.5	0.5
28	Zuken-Redac	4.5	4.7	3.0	-34.8	0.5
29	Pacific Numerics	4.0	4.2	2.5	-41.2	0.4
30	Intergraph	14.1	9.3	2.4	-74.6	0.4
	All N.A. Companies	468.8	519.6	623.1	19.9	99.0
	All European Companies	3.5	1.0	1.9	92.0	0.3
	All Asian Companies	4.7	4.9	4.3	-11.9	0.7
	All Companies	477.0	525.5	629.3	19.8	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-8
1995 Top 13 Electronic Design Automation Software Companies, North America, NT/Hybrid (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Intergraph	-	1.5	11.6	680.5	61.9
2	PADS Software	-	3.9	5.4	38.0	28.7
3	Viewlogic Systems	-	-	1.7	NA	8.9
4	ALTERA	-	-	0.7	NA	3.5
5	Hewlett-Packard	-	-	0.6	NA	3.2
6	Ansoft	-	0.4	0.6	41.1	2.9
7	SIMUCAD	0	0.1	0.3	509.0	1.8
8	Fintronic	-	-	0.3	NA	1.4
9	NOVASOFT Systems	-	-	0.1	NA	0.4
10	Frontline Design Automation	-	-	0	NA	0.3
11	InterHDL	-	0	0	16.6	0.1
12	Intusoft	-	0.7	-	-100.0	-
13	Mentor Graphics	-	0.6	-	-100.0	-
	All N.A. Companies	0	7.2	18.8	161.9	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0	7.2	18.8	161.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-9
1995 Top 30 Electronic Design Automation Software Companies, North America, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Viewlogic Systems	18.3	20.0	16.1	-19.4	21.6
2	OrCAD EDA	6.1	4.9	7.5	52.3	9.9
3	Microsim	4.6	6.1	7.2	17.6	9.6
4	ALTERA	7.0	8.3	5.9	-29.4	7.8
5	Mentor Graphics	1.3	1.0	5.9	488.6	7.8
6	Autodesk	10.8	7.2	5.3	-26.2	7.1
7	Accel Technologies	2.2	2.7	4.1	55.0	5.5
8	Protel Technology	-	2.2	2.9	33.3	3.9
9	Xilinx Inc.	7.0	4.0	2.7	-31.5	3.6
10	Intergraph	0.5	0.5	2.1	317.2	2.7
11	Data I/O	3.4	3.6	1.9	-47.5	2.5
12	Cooper & Chyan Technology	0.1	1.5	1.8	19.8	2.4
13	ALDEC	1.3	1.4	1.8	32.3	2.4
14	Minc Software	0.3	0.8	1.6	94.1	2.2
15	Intusoft	0.8	0.4	1.5	317.7	2.0
16	Hewlett-Packard	0.8	1.4	1.4	-3.7	1.8
17	Harris EDA	1.4	1.4	1.3	-9.9	1.7
18	Tanner Research	0.7	0.8	1.1	36.9	1.5
19	Ansoft	-	0.8	1.1	41.1	1.5
20	ACTEL	2.0	1.2	1.1	-15.6	1.4
21	PADS Software	4.2	1.4	1.0	-27.6	1.4
22	Chronology	0.6	1.0	0.9	-5.1	1.2
23	Fintronic	1.4	1.4	0.9	-40.1	1.1
24	SIMUCAD	0.8	0.8	0.7	-6.9	0.9
25	Frontline Design Automation	-	0.5	0.7	52.4	0.9
26	APTIX	0.5	0.5	0.6	26.1	0.9
27	Meta-Software	0.1	0.3	0.4	34.3	0.6
28	Summitt Design	0.2	0.3	0.4	13.2	0.5
29	NOVASOFT Systems	-	0	0.3	634.3	0.4
30	Altium*	1.4	1.1	0.3	-72.5	0.4
	All N.A. Companies	73.7	72.3	74.2	2.6	99.0
	All European Companies	0.7	0.4	0.5	10.6	0.6
	All Asian Companies	0.7	0.4	0.3	-32.8	0.4
	All Companies	75.1	73.1	74.9	2.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-10
1995 Top Four Electronic Design Automation Software Companies, North America, Host/Proprietary (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Meta-Software	0.3	0.2	0.2	34.1	65.0
2	Harris EDA	0.2	0.2	0.1	-29.0	34.4
3	SIMUCAD	0	0.1	0	-35.5	11.1
4	NOVASOFT Systems	-	0.1	-	-100.0	-
	All N.A. Companies	0.6	0.5	0.3	-29.6	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	1.0	0.5	0.3	-29.6	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-11
1995 Top 30 Electronic Design Automation Software Companies, Europe, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	34.8	41.1	49.5	20.5	17.9
2	Cadence	38.8	38.6	45.3	17.2	16.4
3	Synopsys	26.6	30.0	38.1	27.2	13.8
4	Viewlogic Systems	15.4	15.9	15.5	-2.5	5.6
5	Compass Design Automation	11.7	11.4	13.3	16.5	4.8
6	Hewlett-Packard	8.9	9.6	10.2	5.5	3.7
7	Quickturn Design Systems	4.5	11.8	8.3	-29.8	3.0
8	Autodesk	7.9	7.8	8.0	3.0	2.9
9	Zuken-Redac	13.4	9.3	7.1	-23.3	2.6
10	Harris EDA	6.5	6.6	6.4	-3.7	2.3
11	Intergraph	6.7	5.5	5.8	5.7	2.1
12	IKOS Systems	1.8	2.4	5.1	112.5	1.9
13	Analogy	4.2	3.3	5.1	55.5	1.9
14	Zycad	3.0	2.6	3.7	39.6	1.3
15	Cooper & Chyan Technology	0.1	0.9	3.6	283.2	1.3
16	MacNeal-Schwendler	0.8	2.8	3.5	25.4	1.3
17	ALTERA	2.9	3.4	3.3	-2.9	1.2
18	CAD-UL	3.0	2.5	3.2	28.5	1.2
19	Microsim	0.3	2.7	3.2	17.6	1.2
20	ALS Design	2.2	2.3	2.8	18.1	1.0
21	EPIC Design Technology	-	1.9	2.7	39.9	1.0
22	Xilinx Inc.	1.4	2.7	2.5	-7.5	0.9
23	ULTImate Technology	1.8	1.6	2.5	55.1	0.9
24	Ziegler Informatics	5.3	0.7	2.2	228.6	0.8
25	ISDATA	2.3	1.9	2.0	1.9	0.7
26	PADS Software	1.2	1.6	1.9	19.1	0.7
27	i-Logix	1.2	1.6	1.8	16.1	0.7
28	Meta-Software	0.7	1.0	1.7	73.2	0.6
29	OrCAD EDA	1.0	2.1	1.7	-18.3	0.6
30	Norlinvest Ltd.	1.5	1.5	1.5	1.9	0.6
	All N.A. Companies	190.7	220.5	247.3	12.1	89.4
	All European Companies	31.6	20.6	22.4	8.4	8.1
	All Asian Companies	13.4	9.3	7.1	-23.3	2.6
	All Companies	235.7	250.4	276.8	10.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-12
1995 Top 30 Electronic Design Automation Software Companies, Europe, UNIX (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	34.3	40.3	46.2	14.6	21.3
2	Cadence	38.8	38.6	45.3	17.2	20.9
3	Synopsys	26.6	30.0	38.1	27.2	17.6
4	Compass Design Automation	11.7	11.4	13.3	16.5	6.1
5	Hewlett-Packard	8.4	8.6	8.8	1.6	4.1
6	Quickturn Design Systems	4.5	11.8	8.3	-29.8	3.8
7	Viewlogic Systems	9.1	8.1	7.6	-7.0	3.5
8	Zuken-Redac	11.3	8.1	5.9	-26.2	2.7
9	IKOS Systems	1.8	2.4	5.1	112.5	2.4
10	Analogy	4.2	3.3	5.1	55.5	2.4
11	Harris EDA	5.5	5.2	5.0	-4.4	2.3
12	Zycad	3.0	2.6	3.7	39.6	1.7
13	Cooper & Chyan Technology	0.1	0.7	2.7	282.2	1.3
14	EPIC Design Technology	-	1.9	2.7	39.9	1.2
15	MacNeal-Schwendler	0.2	1.3	2.3	69.8	1.1
16	Xilinx Inc.	1.1	1.8	2.0	13.8	0.9
17	i-Logix	1.2	1.6	1.8	16.1	0.8
18	Meta-Software	0.6	0.9	1.6	73.2	0.8
19	VEDA	1.9	1.9	1.4	-24.1	0.7
20	VLSI Libraries	0.5	1.3	1.4	6.5	0.7
21	AVANT!	0.5	0.7	1.3	75.1	0.6
22	Abstract Hardware	1.5	0.9	1.0	8.5	0.5
23	Intergraph	6.5	4.7	0.8	-82.1	0.4
24	Cascade Design Automation	0.8	0.8	0.8	-0.9	0.4
25	Sagantec	6.1	0.9	0.7	-27.3	0.3
26	Speed	0.7	0.8	0.6	-16.8	0.3
27	Pacific Numerics	0.5	0.5	0.6	17.0	0.3
28	Minc Software	0.1	0.3	0.6	94.1	0.3
29	Quantic Laboratories	0.4	0.8	0.5	-29.5	0.2
30	Design Acceleration	-	0.2	0.5	113.3	0.2
	All N.A. Companies	165.4	185.4	205.1	10.6	94.8
	All European Companies	13.9	7.4	5.3	-28.7	2.4
	All Asian Companies	11.3	8.1	5.9	-26.2	2.7
	All Companies	190.6	200.9	216.4	7.7	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-13
1995 Top 12 Electronic Design Automation Software Companies, Europe, NT/Hybrid (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Intergraph	-	0.6	4.1	561.3	65.7
2	PADS Software	-	1.1	1.5	38.5	24.3
3	Viewlogic Systems	-	-	0.5	NA	7.7
4	Hewlett-Packard	-	-	0.4	NA	6.7
5	ALTERA	-	-	0.3	NA	5.2
6	CAD Distribution	-	0	0.1	698.0	1.4
7	NOVASOFT Systems	-	-	0	NA	0.8
8	Ansoft	-	0	0	41.1	0.6
9	Frontline Design Automation	-	-	0	NA	0.1
10	Mentor Graphics	-	0.3	-	-100.0	-
11	Intusoft	-	0.1	-	-100.0	-
12	InterHDL	-	0	-	-100.0	-
	All N.A. Companies	-	2.2	6.2	177.9	98.5
	All European Companies	-	0	0.1	698.0	1.5
	All Asian Companies	-	-	-	NA	-
	All Companies	-	2.2	6.3	180.7	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-14
1995 Top 30 Electronic Design Automation Software Companies, Europe, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Autodesk	7.4	7.3	7.7	5.4	14.5
2	Viewlogic Systems	6.3	7.8	7.5	-4.0	14.2
3	Mentor Graphics	0.6	0.5	3.4	567.8	6.3
4	ALTERA	2.9	3.4	2.9	-12.6	5.6
5	Microsim	-	2.3	2.8	17.6	5.2
6	ALS Design	2.1	2.3	2.7	18.1	5.2
7	CAD-UL	2.5	2.1	2.7	28.5	5.2
8	ULTImate Technology	1.8	1.6	2.5	55.1	4.7
9	Ziegler Informatics	5.3	0.7	2.2	228.6	4.1
10	ISDATA	1.5	1.4	1.8	26.5	3.4
11	OrCAD EDA	1.0	2.1	1.7	-18.3	3.2
12	Norlinvest Ltd.	1.5	1.5	1.5	1.9	2.9
13	Data I/O	0.5	0.5	1.4	166.4	2.6
14	Protel Technology	-	1.0	1.3	33.3	2.5
15	Harris EDA	0.8	1.3	1.3	-0.5	2.4
16	Zuken-Redac	2.1	1.2	1.2	-3.2	2.2
17	Hewlett-Packard	0.6	1.0	1.0	-3.7	1.8
18	Serbi	0.8	0.8	0.9	13.9	1.7
19	ABB Industria*	0.8	0.8	0.9	3.5	1.6
20	Intergraph	0.2	0.2	0.8	320.1	1.6
21	Cooper & Chyan Technology	0	0.2	0.8	286.5	1.6
22	Kloeckner-Moeller	1.3	1.0	0.8	-16.9	1.6
23	Just In Time Systems	0.5	0.6	0.8	32.3	1.4
24	Accel Technologies	0.5	0.6	0.7	16.8*	1.4
25	ACTEL	0.6	0.5	0.7	36.2	1.3
26	Number One Systems	-	0.5	0.6	6.6	1.1
27	Xilinx Inc.	0.4	1.0	0.5	-47.2	1.0
28	Altium*	2.0	1.7	0.5	-72.5	0.9
29	IBM	2.0	1.7	0.5	-72.5	0.9
30	Softronics	0.5	0.4	0.5	2.7	0.9
	All N.A. Companies	24.4	31.3	34.7	10.8	65.7
	All European Companies	17.4	13.2	17.0	28.5	32.2
	All Asian Companies	2.1	1.2	1.2	-3.2	2.2
	All Companies	44.0	45.7	52.8	15.6	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-15
1995 Top Four Electronic Design Automation Software Companies, Europe, Host/Proprietary (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	MacNeal-Schwendler	0.6	1.5	1.2	-15.6	93.9
2	Harris EDA	0.3	0.2	0.2	-6.1	11.8
3	Meta-Software	0	0	0	73.0	2.6
4	NOVASOFT Systems	-	0	-	-100.0	-
	All N.A. Companies	0.9	1.6	1.3	-16.5	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	1.1	1.6	1.3	-16.5	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-16
1995 Top 30 Electronic Design Automation Software Companies, Japan, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	40.9	51.9	62.2	19.8	13.9
2	Zuken-Redac	47.6	48.9	57.0	16.4	12.7
3	Synopsys	20.2	32.8	48.0	46.2	10.7
4	Mentor Graphics	25.8	28.4	31.1	9.6	7.0
5	Marubeni Hytech*	24.7	25.7	29.7	15.4	6.6
6	Fujitsu	21.0	23.7	27.4	15.8	6.1
7	Seiko*	22.4	21.9	27.4	24.9	6.1
8	Yokogawa Digital Computer	17.5	20.6	23.0	11.9	5.1
9	CADIX	15.5	18.3	18.3	0	4.1
10	Okura*	10.8	14.3	17.0	18.6	3.8
11	NEC	22.7	22.4	15.6	-30.1	3.5
12	Wacom	13.2	12.1	15.2	25.8	3.4
13	Compass Design Automation	9.1	9.6	11.2	17.1	2.5
14	Hewlett-Packard	9.9	9.6	10.2	5.5	2.3
15	C. Itoh Techno-Science*	9.2	10.1	9.1	-10.3	2.0
16	Summitt Design	4.6	7.3	8.2	12.7	1.8
17	ALTERA	2.0	3.0	7.9	158.9	1.8
18	Quickturn Design Systems	5.4	8.9	7.8	-12.1	1.7
19	Toshiba*	5.8	6.1	6.7	11.0	1.5
20	Viewlogic Systems	11.1	8.4	6.2	-26.6	1.4
21	AVANT!	1.2	2.8	5.5	99.3	1.2
22	Harris EDA	4.1	4.7	5.3	13.1	1.2
23	CrossCheck Technology	4.1	4.3	4.9	12.9	1.1
24	Cascade Design Automation	2.7	3.6	4.9	36.2	1.1
25	Autodesk	1.9	4.6	4.3	-4.9	1.0
26	EPIC Design Technology	-	3.2	4.1	28.1	0.9
27	Sophia Systems*	3.9	4.1	3.9	-5.2	0.9
28	IKOS Systems	1.4	2.0	3.9	88.4	0.9
29	Intergraph	2.8	2.5	3.5	41.4	0.8
30	PADS Software	3.7	2.6	3.4	30.3	0.8
	All N.A. Companies	171.2	226.5	269.5	19.0	60.2
	All European Companies	3.2	1.0	0.9	-9.9	0.2
	All Asian Companies	156.8	164.1	176.9	7.8	39.5
	All Companies	331.1	391.7	447.3	14.2	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-17
1995 Top 30 Electronic Design Automation Software Companies, Japan, UNIX (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	40.9	51.9	62.2	19.8	15.9
2	Zuken-Redac	47.6	48.9	55.7	14.0	14.2
3	Synopsys	20.2	32.8	48.0	46.2	12.3
4	Mentor Graphics	25.4	27.9	29.1	4.5	7.4
5	Fujitsu	19.0	22.0	25.4	15.8	6.5
6	Marubeni Hytech*	18.7	21.2	25.0	18.0	6.4
7	Yokogawa Digital Computer	17.5	20.6	23.0	11.9	5.9
8	Seiko*	22.4	20.4	22.7	11.4	5.8
9	CADIX	15.5	18.3	18.3	0	4.7
10	Okura*	10.8	14.3	17.0	18.6	4.3
11	NEC	18.7	18.1	12.5	-31.0	3.2
12	Compass Design Automation	9.1	9.6	11.2	17.1	2.9
13	Hewlett-Packard	9.3	8.6	8.8	1.6	2.2
14	C. Itoh Techno-Science*	8.7	9.8	8.4	-14.2	2.1
15	Summitt Design	4.4	7.0	7.9	12.7	2.0
16	Quickturn Design Systems	5.4	8.9	7.8	-12.1	2.0
17	Toshiba*	5.8	6.1	6.7	11.0	1.7
18	AVANT!	1.2	2.8	5.5	99.3	1.4
19	Harris EDA	4.0	4.6	5.3	13.5	1.3
20	CrossCheck Technology	4.1	4.3	4.9	12.9	1.3
21	Cascade Design Automation	2.7	3.6	4.9	36.2	1.2
22	EPIC Design Technology	-	3.2	4.1	28.1	1.1
23	Viewlogic Systems	6.7	5.5	4.1	-24.9	1.1
24	IKOS Systems	1.4	2.0	3.9	88.4	1.0
25	Meta-Software	3.0	4.5	3.0	-33.9	0.8
26	TSSI Japan*	1.6	2.2	2.5	18.6	0.7
27	Hitachi	2.2	2.3	2.4	6.4	0.6
28	Silicon Valley Research	1.8	2.0	2.4	20.5	0.6
29	Xilinx Inc.	0.8	1.5	2.3	57.3	0.6
30	Sharp*	2.3	2.0	2.2	8.4	0.6
	All N.A. Companies	149.5	197.7	235.5	19.1	60.2
	All European Companies	2.1	0.7	0.7	-3.1	0.2
	All Asian Companies	137.9	146.6	154.9	5.7	39.6
	All Companies	289.5	345.0	391.1	13.4	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-18
1995 Top 12 Electronic Design Automation Software Companies, Japan, NT/Hybrid (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Seiko*	-	1.6	4.7	201.2	74.3
2	PADS Software	-	1.8	2.7	49.0	42.8
3	Intergraph	-	0.2	2.6	935.7	40.3
4	ALTERA	-	-	0.8	NA	12.4
5	Hewlett-Packard	-	-	0.4	NA	6.7
6	Viewlogic Systems	-	-	0.2	NA	3.1
7	Ansoft	-	0.1	0.1	41.1	1.9
8	SIMUCAD	-	0	0	14.8	0.3
9	Frontline Design Automation	-	-	0	NA	0.3
10	Mentor Graphics	-	0.2	-	-100.0	-
11	Intusoft	-	0	-	-100.0	-
12	InterHDL	-	0	-	-100.0	-
	All N.A. Companies	0	2.4	6.3	166.4	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0	2.4	6.3	166.4	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-19
1995 Top 30 Electronic Design Automation Software Companies, Japan, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Wacom	12.2	11.0	15.2	38.3	31.2
2	ALTERA	2.0	3.0	7.1	133.1	14.5
3	Marubeni Hytech*	5.9	4.5	4.6	2.8	9.5
4	Autodesk	1.8	4.3	4.1	-4.9	8.4
5	NEC	4.0	4.3	3.2	-26.4	6.4
6	Sophia Systems*	2.7	2.8	2.4	-14.7	4.8
7	Microsim	-	1.7	2.0	17.6	4.2
8	Mentor Graphics	0.4	0.3	2.0	534.1	4.1
9	Viewlogic Systems	4.5	2.9	1.9	-36.4	3.8
10	Altium*	6.0	6.2	1.7	-72.5	3.5
11	IBM	6.0	6.2	1.7	-72.5	3.5
12	Data I/O	0.9	0.9	1.7	77.6	3.4
13	Zuken-Redac	-	0.1	1.3	1244.5	2.6
14	TECHSPERT*	0.6	1.5	1.2	-18.9	2.4
15	Fujitsu	1.4	1.0	1.1	15.8	2.3
16	Hewlett-Packard	0.6	1.0	1.0	-3.7	2.0
17	OrCAD EDA	0.6	0.6	0.9	32.7	1.7
18	Andor*	0.8	1.0	0.8	-16.6	1.6
19	Protel Technology	-	0.5	0.7	33.3	1.5
20	Hitachi	0.6	0.7	0.7	6.4	1.4
21	ACTEL	0.3	0.7	0.6	-4.4	1.3
22	Xilinx Inc.	0.3	0.7	0.6	-11.3	1.3
23	Cooper & Chyan Technology	0	0.4	0.6	63.7	1.2
24	ALDEC	0.5	0.5	0.6	12.8	1.1
25	PADS Software	3.3	0.6	0.5	-21.8	1.0
26	Intergraph	0.1	0.1	0.4	567.8	0.9
27	APTIX	0.3	0.4	0.4	14.9	0.8
28	Sumisho Electronics*	0.4	0.5	0.4	-19.1	0.7
29	Summitt Design	0.2	0.3	0.4	13.2	0.7
30	Accel Technologies	0.4	0.4	0.4	-12.4	0.7
	All N.A. Companies	21.4	26.3	27.5	4.6	56.2
	All European Companies	0.8	0.4	0.3	-22.7	0.6
	All Asian Companies	18.2	16.8	21.2	26.1	43.3
	All Companies	40.4	43.4	48.9	12.7	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-20
1995 Top Six Electronic Design Automation Software Companies, Japan, Host/Proprietary (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Fujitsu	0.6	0.7	0.8	15.8	92.0
2	C. Itoh Techno-Science*	0.5	0.4	0.7	98.2	77.8
3	Hitachi	0.1	0.2	0.2	6.4	18.0
4	Harris EDA	0.1	0.1	0.1	-5.9	8.7
5	Meta-Software	0.2	0.1	0.1	-33.9	6.8
6	SIMUCAD	0	0	0	-6.1	1.7
	All N.A. Companies	0.3	0.2	0.1	-19.4	15.9
	All European Companies	-	-	-	NA	-
	All Asian Companies	0.6	0.7	0.8	10.8	84.1
	All Companies	1.2	0.9	0.9	4.6	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-21
1995 Top 30 Electronic Design Automation Software Companies, Asia/Pacific, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	16.9	14.1	20.3	43.6	21.1
2	Synopsys	2.5	4.3	14.5	239.1	15.1
3	Mentor Graphics	13.2	12.7	11.6	-8.5	12.0
4	Compass Design Automation	5.7	6.0	7.0	17.1	7.3
5	Quickturn Design Systems	4.0	1.8	6.6	274.4	6.9
6	Zuken-Redac	6.5	3.7	4.5	22.1	4.7
7	AVANT!	0.9	1.7	3.9	131.3	4.0
8	EPIC Design Technology	-	0.4	3.9	985.5	4.0
9	Viewlogic Systems	2.5	1.7	2.3	32.3	2.4
10	Autodesk	1.7	2.1	2.3	8.6	2.3
11	Meta-Software	0.3	0.6	1.7	203.1	1.8
12	Hewlett-Packard	1.3	1.4	1.5	5.5	1.5
13	Zycad	2.3	2.4	1.4	-39.6	1.5
14	CrossCheck Technology	1.3	1.2	1.4	12.9	1.5
15	Pacific Numerics	-	-	1.2	NA	1.3
16	PADS Software	0.4	0.8	1.2	42.7	1.2
17	Protel Technology	-	0.8	1.0	33.3	1.1
18	CADIX	-	-	1.0	NA	1.1
19	ALTERA	0.6	1.0	1.0	-	1.0
20	Silicon Valley Research	0.8	0.7	0.8	20.5	0.9
21	Yokogawa Digital Computer	0.7	0.6	0.8	27.4	0.8
22	Ansoft	-	0.6	0.8	41.1	0.8
23	Intergraph	0.6	0.5	0.7	34.5	0.7
24	Accel Technologies	0.1	0.2	0.6	128.2	0.6
25	Sharp*	0.6	0.5	0.5	8.4	0.6
26	IKOS Systems	0.2	0.7	0.5	-30.9	0.5
27	ACTEL	0.4	0.4	0.4	3.8	0.5
28	SIMUCAD	0.2	0.3	0.4	51.6	0.4
29	VLSI Libraries	0.1	0.4	0.4	5.7	0.4
30	Quantic Laboratories	0.1	0.1	0.4	182.1	0.4
	All N.A. Companies	55.5	60.1	88.5	47.4	92.0
	All European Companies	0.6	0.5	0.6	20.9	0.6
	All Asian Companies	5.7	4.8	7.1	47.5	7.4
	All Companies	61.8	65.4	96.2	47.2	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-22
1995 Top 30 Electronic Design Automation Software Companies, Asia/Pacific, UNIX (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	16.9	14.1	20.3	43.6	23.5
2	Synopsys	2.5	4.3	14.5	239.1	16.8
3	Mentor Graphics	13.0	12.4	10.8	-12.9	12.5
4	Compass Design Automation	5.7	6.0	7.0	17.1	8.2
5	Quickturn Design Systems	4.0	1.8	6.6	274.4	7.7
6	Zuken-Redac	6.5	3.4	4.2	23.5	4.9
7	AVANT!	0.9	1.7	3.9	131.3	4.5
8	EPIC Design Technology	-	0.4	3.9	985.5	4.5
9	Meta-Software	0.3	0.5	1.6	203.1	1.9
10	Viewlogic Systems	1.5	1.1	1.5	35.4	1.8
11	Zycad	2.3	2.4	1.4	-39.6	1.6
12	CrossCheck Technology	1.3	1.2	1.4	12.9	1.6
13	Hewlett-Packard	1.2	1.2	1.3	1.6	1.5
14	Pacific Numerics	-	-	1.2	NA	1.4
15	CADIX	-	-	1.0	NA	1.2
16	Silicon Valley Research	0.8	0.7	0.8	20.5	1.0
17	Yokogawa Digital Computer	0.7	0.6	0.8	27.4	0.9
18	Ansoft	-	0.4	0.6	41.1	0.6
19	Sharp*	0.6	0.5	0.5	8.4	0.6
20	IKOS Systems	0.2	0.7	0.5	-30.9	0.6
21	VLSI Libraries	0.1	0.4	0.4	5.7	0.4
22	Quantic Laboratories	0.1	0.1	0.4	182.1	0.4
23	Seiko*	-	-	0.4	NA	0.4
24	UniCAD	-	-	0.3	NA	0.3
25	Cooper & Chyan Technology	0.1	0.1	0.2	52.9	0.3
26	Xilinx Inc.	0	0.1	0.2	44.1	0.2
27	Cascade Design Automation	0.9	1.1	0.2	-81.9	0.2
28	LV Software	-	-	0.2	NA	0.2
29	APTIX	0.2	0.1	0.2	150.1	0.2
30	Systems Science	0	0	0.2	239.2	0.2
	All N.A. Companies	49.7	52.8	79.2	50.1	91.9
	All European Companies	0.2	0.1	0.2	163.7	0.2
	All Asian Companies	5.7	4.5	6.8	50.3	7.9
	All Companies	55.6	57.4	86.2	50.2	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-23
1995 Top 10 Electronic Design Automation Software Companies, Asia/Pacific, NT/Hybrid (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	PADS Software	-	0.6	0.9	65.2	56.4
2	Intergraph	-	0	0.5	969.7	29.7
3	ALTERA	-	-	0.1	NA	5.7
4	Ansoft	-	0.1	0.1	41.1	4.7
5	Viewlogic Systems	-	-	0.1	NA	4.3
6	Hewlett-Packard	-	-	0.1	NA	3.6
7	SIMUCAD	-	0	0	509.9	2.9
8	InterHDL	-	0	0	15.4	0
9	Mentor Graphics	-	0.1	-	-100.0	-
10	Intusoft	-	0	-	-100.0	-
	All N.A. Companies	0	0.8	1.7	101.7	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0	0.8	1.7	101.7	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-24
1995 Top 30 Electronic Design Automation Software Companies, Asia/Pacific, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Autodesk	1.6	2.0	2.1	8.7	25.4
2	Protel Technology	-	0.8	1.0	33.3	12.2
3	ALTERA	0.6	1.0	0.9	-10.0	10.4
4	Mentor Graphics	0.2	0.2	0.8	410.3	9.3
5	Viewlogic Systems	1.0	0.6	0.7	14.6	8.4
6	Accel Technologies	0.1	0.2	0.5	119.0	6.5
7	Norlinvest Ltd.	0.3	0.3	0.3	1.9	4.0
8	Zuken-Redac	-	0.3	0.3	5.6	3.8
9	ACTEL	0.2	0.2	0.3	21.7	3.5
10	Data I/O	0.1	0.1	0.2	113.1	2.7
11	SIMUCAD	0.1	0.1	0.2	86.8	2.4
12	Altium*	0.6	0.7	0.2	-72.5	2.2
13	IBM	0.6	0.7	0.2	-72.5	2.2
14	PADS Software	0.4	0.2	0.2	-16.3	2.1
15	Ansoft	-	0.1	0.2	41.1	1.9
16	CAD-UL	0.1	0.1	0.1	34.9	1.7
17	ALDEC	0	0.1	0.1	-6.0	1.6
18	Hewlett-Packard	0.1	0.1	0.1	-3.7	1.6
19	Intusoft	-	0	0.1	664.6	1.3
20	Intergraph	0	0	0.1	588.0	0.9
21	Meta-Software	-	0	0.1	203.4	0.8
22	Cooper & Chyan Technology	0	0	0.1	54.6	0.8
23	APTIX	0.1	0.1	0.1	-13.2	0.7
24	ULTImate Technology	0.1	0	0.1	45.0	0.6
25	Xilinx Inc.	0.1	0.1	0.1	-36.6	0.6
26	Minc Software	-	0	0	94.1	0.2
27	Contec Microelectronics	0	0	0	100.3	0
28	Viagrafix	0	0	0	-62.9	0
29	InterHDL	-	0	0	15.4	0
30	Tanner Research	-	0	-	-100.0	-
	All N.A. Companies	5.7	6.4	7.6	18.6	91.3
	All European Companies	0.4	0.4	0.4	-1.0	4.9
	All Asian Companies	-	0.3	0.3	5.6	3.8
	All Companies	6.2	7.1	8.3	16.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-25
1995 Top Three Electronic Design Automation Software Companies, Asia/Pacific, Host/Proprietary (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Meta-Software	0	0	0	202.8	109.6
2	SIMUCAD	0	0	0	-69.2	7.9
3	Harris EDA	0	0	-	-100.0	-
	All N.A. Companies	0.1	0	0	-21.2	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.1	0	0	-21.2	100.0

NA = Not applicable
Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-26
1995 Top 26 Electronic Design Automation Software Companies, Rest of World, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	1.2	1.0	1.0	-0.8	17.9
2	Intergraph	0.2	0.1	0.7	454.6	12.2
3	LSI Logic	0.5	0.6	0.7	12.9	11.7
4	OrCAD EDA	0.1	0.4	0.6	59.3	11.2
5	ALTERA	0.6	0.3	0.6	80.0	10.1
6	Autodesk	1.0	0.7	0.4	-44.9	7.3
7	Data I/O	0	0.1	0.4	571.2	6.9
8	NOVASOFT Systems	-	0.1	0.3	144.8	5.6
9	Xilinx Inc.	0.1	0.1	0.3	129.6	4.4
10	Accel Technologies	0.1	0.2	0.2	52.1	4.4
11	PADS Software	0.1	0.2	0.2	8.2	4.1
12	Harris EDA	0.2	0.2	0.1	-29.0	2.0
13	Norlinvest Ltd.	0.1	0.1	0.1	1.9	1.7
14	i-Logix	0.1	0.1	0.1	16.1	1.6
15	ULTImate Technology	0	0	0.1	326.4	1.0
16	Ziegler Informatics	0	-	0	NA	0.3
17	Intusoft	-	-	0	NA	0.2
18	Number One Systems	-	0	0	4.7	0.2
19	ALDEC	0	0	0	12.8	0.1
20	Softdesk	0	0	0	0.4	0.1
21	EPIC Design Technology	-	0.2	-	-100.0	-
22	Royal Digital Centers	0.1	0.1	-	-100.0	-
23	ACTEL	0.3	0	-	-100.0	-
24	Siemens Nixdorf Info systeme	0	0	-	-100.0	-
25	CAD-UL	0	0	-	-100.0	-
26	GRAPHSOFT	-	0	-	-100.0	-
	All N.A. Companies	4.8	4.4	5.5	25.0	96.4
	All European Companies	0.4	0.2	0.2	-1.0	3.6
	All Asian Companies	-	-	-	NA	-
	All Companies	5.3	4.6	5.7	23.8	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-27
1995 Top 15 Electronic Design Automation Software Companies, Rest of World, UNIX (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	1.2	1.0	1.0	-0.8	43.5
2	LSI Logic	0.5	0.6	0.7	12.9	28.4
3	Xilinx Inc.	0	0.1	0.2	188.1	8.6
4	NOVASOFT Systems	-	0.1	0.2	83.6	6.9
5	Intergraph	0.2	0.1	0.1	5.2	5.0
6	Harris EDA	0.2	0.2	0.1	-29.0	4.9
7	i-Logix	0.1	0.1	0.1	16.1	3.9
8	Autodesk	0.1	0	0	-45.3	1.0
9	Accel Technologies	-	-	0	NA	0.4
10	EPIC Design Technology	-	0.2	-	-100.0	-
11	Royal Digital Centers	0.1	0.1	-	-100.0	-
12	Siemens Nixdorf Info systeme	0	0	-	-100.0	-
13	PADS Software	0	0	-	-100.0	-
14	ACTEL	0.1	0	-	-100.0	-
15	Data I/O	0	0	-	-100.0	-
	All N.A. Companies	2.6	2.3	2.3	-1.1	99.6
	All European Companies	0.2	0	0	-72.3	0.4
	All Asian Companies	-	-	-	NA	-
	All Companies	2.8	2.4	2.3	-2.2	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-28
1995 Top Four Electronic Design Automation Software Companies, Rest of World, NT/Hybrid (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Intergraph	-	0	0.5	3452.9	67.1
2	PADS Software	-	0.1	0.2	52.5	28.6
3	ALTERA	-	-	0.1	NA	8.3
4	NOVASOFT Systems	-	-	0	NA	4.6
	All N.A. Companies	-	0.2	0.7	292.7	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	0.2	0.7	292.7	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-29
1995 Top 19 Electronic Design Automation Software Companies, Rest of World, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	OrCAD EDA	0.1	0.4	0.6	59.3	24.1
2	ALTERA	0.6	0.3	0.5	62.0	19.5
3	Data I/O	0	0.1	0.4	645.8	14.8
4	Autodesk	0.9	0.7	0.4	-44.8	14.7
5	Accel Technologies	0.1	0.2	0.2	46.0	9.0
6	NOVASOFT Systems	-	-	0.1	NA	4.8
7	Intergraph	0	-	0.1	NA	4.1
8	Norlinvest Ltd.	0.1	0.1	0.1	1.9	3.7
9	ULTImate Technology	0	0	0.1	326.4	2.0
10	Xilinx Inc.	0.1	0	0.1	26.7	1.9
11	PADS Software	0.1	0.1	0	-46.6	1.3
12	Ziegler Informatics	0	-	0	NA	0.7
13	Intusoft	-	-	0	NA	0.5
14	Number One Systems	-	0	0	4.7	0.4
15	ALDEC	0	0	0	12.8	0.3
16	Softdesk	0	0	0	0.4	0.1
17	ACTEL	0.2	0	-	-100.0	-
18	CAD-UL	0	0	-	-100.0	-
19	GRAPHSOFT	-	0	-	-100.0	-
	All N.A. Companies	2.2	1.8	2.5	35.6	92.7
	All European Companies	0.2	0.2	0.2	15.0	7.3
	All Asian Companies	-	-	-	NA	-
	All Companies	2.4	2.0	2.7	33.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table B-1
All Electronic Design Automation Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	ABB Industria*	0.8	0.8	0.9	3.5	0.1
2	Abstract Hardware	1.5	1.1	1.2	8.5	0.1
3	Accel Technologies	3.2	4.1	6.3	53.2	0.4
4	ACTEL	5.3	4.7	4.0	-15.1	0.3
5	ALDEC	2.4	2.4	2.8	13.6	0.2
6	ALS Design	2.2	2.3	2.8	18.9	0.2
7	ALTERA	13.1	16.0	19.2	20.0	1.2
8	Altium*	9.9	9.7	2.7	-72.5	0.2
9	Analogy	11.0	11.0	17.1	55.5	1.1
10	Andor*	0.8	1.0	0.8	-16.6	0.1
11	Ansoft	-	5.6	7.9	41.1	0.5
12	APTIX	2.3	2.0	4.7	138.1	0.3
13	AT&T	2.4	3.0	3.7	23.3	0.2
14	Autodesk	23.9	22.8	20.6	-9.5	1.3
15	AVANT!	8.4	16.3	32.3	97.7	2.1
16	C. Itoh Techno-Science*	9.2	10.1	9.1	-10.3	0.6
17	CAD Distribution	1.5	0.6	0.5	-21.3	0
18	CAD-UL	3.3	2.7	3.4	26.1	0.2
19	Cadence	189.5	200.8	257.7	28.3	16.6
20	Cadis Software	-	0.4	1.2	200.0	0.1
21	CADIX	31.1	18.3	20.3	11.1	1.3
22	CAE Plus	-	1.0	1.3	30.0	0.1
23	Cascade Design Automation	8.6	10.3	9.9	-3.8	0.6
24	Century Research Center	1.7	0.9	1.0	14.6	0.1
25	Chronology	1.4	1.9	1.9	-1.6	0.1
26	Compass Design Automation	43.6	43.7	51.0	16.7	3.3
27	Computervision	2.1	1.0	-	-100.0	-
28	Contec Microelectronics	2.8	3.0	3.4	13.8	0.2
29	Cooper & Chyan Technology	5.2	9.3	14.2	53.3	0.9
30	CrossCheck Technology	11.2	6.2	7.0	12.9	0.5
31	Data I/O	5.5	5.8	5.6	-4.1	0.4
32	Design Acceleration	0.8	2.0	3.2	60.0	0.2
33	Eagle Design Automation	-	0.5	-	-100.0	-
34	EPIC Design Technology	-	11.9	24.2	103.5	1.6
35	Fintronic	1.4	1.4	1.7	19.7	0.1
36	Frontline Design Automation	-	1.5	3.5	133.3	0.2
37	Fujitsu	21.0	23.7	27.4	15.8	1.8
38	GRAPHSOFT	-	0	-	-100.0	-

(Continued)

Table B-1 (Continued)
All Electronic Design Automation Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
39	Harris EDA	21.0	21.5	21.9	1.6	1.4
40	Hewlett-Packard	33.1	34.4	36.3	5.5	2.3
41	High Level Design Systems	3.2	3.3	9.3	178.1	0.6
42	Hitachi	3.0	3.1	3.3	6.4	0.2
43	i-Logix	3.9	3.9	4.6	16.1	0.3
44	IBM	11.9	12.5	3.6	-70.9	0.2
45	ICL	0.2	0.2	0.2	11.8	0
46	IKOS Systems	18.1	18.6	25.7	38.1	1.7
47	Intergraph	25.0	19.9	26.7	34.3	1.7
48	InterHDL	0.5	1.3	1.5	15.0	0.1
49	Intusoft	0.8	1.3	2.1	60.9	0.1
50	ISD Software	0.3	0.2	0.3	36.0	0
51	ISDATA	2.5	2.1	2.2	3.0	0.1
52	ISKA	0.4	0.4	0.4	3.2	0
53	Just In Time Systems	0.5	0.6	0.8	32.3	0
54	Kloeckner-Moeller	1.3	1.0	0.8	-16.9	0.1
55	LSI Logic	13.6	15.6	12.9	-17.2	0.8
56	LV Software	-	-	1.9	NA	0.1
57	MacNeal-Schwendler	0.8	2.8	3.5	25.4	0.2
58	Marubeni Hytech*	24.7	25.7	29.7	15.4	1.9
59	Mentor Graphics	167.3	175.6	184.0	4.7	11.9
60	Meta-Software	9.4	14.4	17.5	21.2	1.1
61	Microsim	5.8	11.9	14.0	17.6	0.9
62	Minc Software	2.1	6.0	11.7	94.1	0.8
63	MOTOROLA	3.0	3.4	3.4	0.2	0.2
64	NEC	22.7	22.4	15.6	-30.1	1.0
65	Nextwave DA	0.4	0.5	1.5	200.0	0.1
66	Norlinvest Ltd.	2.1	2.2	2.2	1.3	0.1
67	NOVASOFT Systems	-	0.7	1.6	129.5	0.1
68	Number One Systems	-	0.6	0.7	6.5	0
69	OEA International	0.8	0.8	0.9	23.3	0.1
70	Okura*	10.8	14.3	17.0	18.6	1.1
71	Omron	1.6	0.9	0.6	-31.4	0
72	Optem Engineering	0.6	0.5	0.5	-0.8	0
73	OrCAD EDA	8.2	8.0	10.6	32.7	0.7
74	Pacific Numerics	4.8	5.1	6.2	22.5	0.4
75	PADS Software	10.1	10.8	13.4	24.3	0.9
76	Protel Technology	-	4.5	6.0	33.3	0.4

(Continued)

Table B-1 (Continued)
All Electronic Design Automation Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
77	Quantic Laboratories	2.5	3.1	3.5	12.9	0.2
78	Quickturn Design Systems	51.5	59.0	70.7	19.9	4.6
79	Royal Digital Centers	1.7	0.9	1.0	15.2	0.1
80	Sagantec	6.1	1.0	1.4	44.1	0.1
81	Seiko*	32.0	21.9	27.8	26.5	1.8
82	Serbi	1.6	0.8	0.9	13.9	0.1
83	SES Inc.	7.0	8.5	7.7	-8.9	0.5
84	Sharp*	2.8	2.5	2.7	8.4	0.2
85	Siemens Nixdorf Info systeme	1.3	1.0	-	-100.0	-
86	Silicon Valley Research	6.3	5.3	6.4	20.5	0.4
87	SIMUCAD	2.4	2.6	3.2	19.3	0.2
88	Simulation Technology	0.5	0.6	0.7	13.2	0
89	Softdesk	0.2	0.3	0.2	-26.1	0
90	Softronics	0.5	0.4	0.5	2.7	0
91	Sophia Systems*	3.9	4.1	3.9	-5.2	0.2
92	Speed	1.0	1.1	1.3	18.2	0.1
93	SpeedSim	-	-	1.3	NA	0.1
94	Star Informatic	0.8	0.8	0.3	-56.6	0
95	Sumisho Electronics*	1.2	1.3	1.3	0.6	0.1
96	Summitt Design	9.1	14.6	16.4	12.7	1.1
97	Synopsys	113.7	142.7	193.5	35.6	12.5
98	Systems Science	1.9	2.3	2.6	13.1	0.2
99	T D Technology	1.8	2.0	2.3	13.2	0.1
100	Tanner Research	0.8	1.3	1.7	32.2	0.1
101	Technische Computer Systeme	1.2	1.1	0.9	-24.2	0.1
102	TECHSPERT*	0.6	1.5	1.2	-18.9	0.1
103	Toshiba*	10.9	6.1	6.7	11.0	0.4
104	TSSI Japan*	1.6	2.2	2.5	18.6	0.2
105	Uchida Yoko	4.6	1.4	1.6	12.5	0.1
106	ULTImate Technology	2.3	1.9	2.7	45.4	0.2
107	UniCAD	-	4.3	5.4	27.0	0.3
108	VEDA	4.9	3.1	2.6	-17.2	0.2
109	Veritools	0.5	0.6	1.6	180.0	0.1
110	Viagrafix	0.7	0	0	-62.9	0
111	Viewlogic Systems	76.9	83.3	77.3	-7.3	5.0
112	VLSI Libraries	2.0	4.4	4.9	11.8	0.3
113	Wacom	26.3	12.1	15.2	25.8	1.0
114	Xilinx Inc.	14.7	16.9	18.5	9.6	1.2

(Continued)

Table B-1 (Continued)
All Electronic Design Automation Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
115	Yokogawa Digital Computer	35.9	21.4	24.0	12.4	1.6
116	Ziegler Informatics	5.5	0.7	2.2	231.4	0.1
117	Zuken-Redac	72.7	67.0	71.9	7.4	4.6
118	Zycad	23.2	29.4	28.4	-3.4	1.8
	All N.A. Companies	965.5	1,111.00	1,327.20	19.5	85.7
	All European Companies	40.4	23.8	26.5	11.3	1.7
	All Asian Companies	181.2	183.5	195.7	6.7	12.6
	All Companies	1,187.1	1,318.3	1,549.4	17.5	100.0

NA = Not applicable
Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table C-1
1995 Top 30 Electronic Design Automation Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Sun Microsystems	49,059	-	848.5	291.2	1,139.7	24.5
2	Hewlett-Packard	22,483	36.3	483.9	92.4	612.7	13.2
3	Cadence	-	257.7	-	268.1	525.8	11.3
4	Mentor Graphics	515	184.0	12.5	189.0	385.5	8.3
5	Synopsys	-	193.5	-	91.1	284.6	6.1
6	Zuken-Redac	1,425	71.9	23.7	48.0	148.4	3.2
7	IBM	13,223	3.6	122.8	8.2	134.9	2.9
8	Viewlogic Systems	-	77.3	-	43.7	121.0	2.6
9	Fujitsu	2,008	27.4	47.6	25.5	100.5	2.2
10	Digital Equipment	5,199	-	86.6	13.3	99.9	2.1
11	Quickturn Design Systems	-	70.7	-	11.1	81.8	1.8
12	NEC	3,020	15.6	25.5	6.5	62.0	1.3
13	Seiko*	349	27.8	10.4	22.1	61.5	1.3
14	Compass Design Automation	-	51.0	-	10.3	61.3	1.3
15	Intergraph	1,173	26.7	7.4	18.0	53.0	1.1
16	Zycad	114	28.4	-	22.7	51.1	1.1
17	Yokogawa Digital Computer	347	24.0	13.1	5.6	42.6	0.9
18	Marubeni Hytech*	174	29.7	3.9	-	39.2	0.8
19	AVANT!	-	32.3	-	5.7	38.0	0.8
20	Harris EDA	128	21.9	2.2	11.6	35.7	0.8
21	CADIX	81	20.3	4.7	5.5	35.0	0.8
22	Silicon Graphics	970	-	26.7	5.1	31.8	0.7
23	IKOS Systems	320	25.7	-	6.0	31.7	0.7
24	EPIC Design Technology	-	24.2	-	5.7	29.8	0.6
25	Meta-Software	-	17.5	-	7.8	25.3	0.5
26	ALTERA	-	19.2	-	4.8	24.0	0.5
27	Xilinx Inc.	-	18.5	-	4.4	22.9	0.5
28	Wacom	449	15.2	3.4	2.8	21.5	0.5
29	Autodesk	-	20.6	-	0.1	20.8	0.4
30	Analogy	-	17.1	-	3.5	20.6	0.4
	Other Companies	47,925	-	121.0	0.8	133.7	2.9
	All N.A. Companies	85,383	1,327.2	1,468.2	1,156.8	3,954.4	85.0
	All European Companies	370	26.5	1.7	4.5	33.7	0.7
	All Asian Companies	9,718	195.7	169.2	125.3	529.4	11.4
	All Companies	143,397	1,549.4	1,760.0	1,287.4	4,651.2	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table C-2
1995 Top 30 Electronic Design Automation Software Companies, Worldwide, UNIX (Revenue in Millions of Dollars, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Wacom	27	-	-	-	-	-
2	Sun Microsystems	49,059	-	848.5	291.2	1,139.70	28.1
3	Hewlett-Packard	16,886	31.4	466.3	88.9	586.6	14.4
4	Cadence	-	257.7	-	268.1	525.8	12.9
5	Mentor Graphics	515	172.0	12.5	173.5	357.9	8.8
6	Synopsys	-	193.5	-	91.1	284.6	7.0
7	Zuken-Redac	1,425	68.9	23.7	44.9	142.3	3.5
8	IBM	3,369	1.0	86.9	8.1	96.1	2.4
9	Fujitsu	1,825	25.4	46.5	23.8	95.8	2.4
10	Quickturn Design Systems	-	70.7	-	11.1	81.8	2.0
11	Viewlogic Systems	-	48.6	-	29.3	77.9	1.9
12	Compass Design Automation	-	51.0	-	10.3	61.3	1.5
13	Seiko*	349	23.1	9.4	19.3	52.9	1.3
14	Zycad	114	28.4	-	22.7	51.1	1.3
15	NEC	1,248	12.5	16.7	5.1	46.3	1.1
16	Yokogawa Digital Computer	347	24.0	13.1	5.6	42.6	1.0
17	AVANT!	-	32.3	-	5.7	38.0	0.9
18	CADIX	81	20.3	4.7	5.5	35.0	0.9
19	Marubeni Hytech*	174	25.0	3.9	-	34.5	0.8
20	Harris EDA	83	19.0	1.7	11.2	31.9	0.8
21	Silicon Graphics	970	-	26.7	5.1	31.8	0.8
22	IKOS Systems	320	25.7	-	6.0	31.7	0.8
23	Digital Equipment	1,025	-	26.5	4.5	31.0	0.8
24	EPIC Design Technology	-	24.2	-	5.7	29.8	0.7
25	Meta-Software	-	16.4	-	7.4	23.8	0.6
26	Analogy	-	17.1	-	3.5	20.6	0.5
27	Sony	1,020	-	9.2	-	19.7	0.5
28	Xilinx Inc.	-	14.5	-	3.5	18.1	0.4
29	Cascade Design Automation	-	9.9	-	7.8	17.7	0.4
30	Summitt Design	-	15.7	-	1.6	17.3	0.4
	All N.A. Companies	65,929	1,145.2	1,353.7	1,077.0	3,576.5	88.0
	All European Companies	42	8.0	0.8	3.4	12.4	0.3
	All Asian Companies	7,095	172.0	152.2	112.9	473.5	11.7
	All Companies	73,066	1,325.3	1,506.8	1,193.3	4,062.4	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table C-3
1995 Top 15 Electronic Design Automation Software Companies, Worldwide, NT/Hybrid (Revenue in Millions of Dollars, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Intergraph	594	19.3	4.2	13.2	37.1	50.4
2	PADS Software	-	10.8	-	2.8	13.6	18.5
3	Seiko*	-	4.7	1.0	2.8	8.6	11.7
4	Hewlett-Packard	133	1.5	1.5	0.7	3.7	5.0
5	Viewlogic Systems	-	2.4	-	-	2.4	3.3
6	ALTERA	-	1.9	-	0.5	2.4	3.3
7	Digital Equipment	133	-	1.5	0.3	1.8	2.4
8	Ansoft	-	0.8	-	-	0.8	1.1
9	SIMUCAD	-	0.4	-	0	0.4	0.6
10	Fintronic	-	0.3	-	-	0.3	0.3
11	NOVASOFT Systems	-	0.2	-	0	0.2	0.3
12	CAD Distribution	-	0.1	-	0	0.1	0.1
13	Frontline Design Automation	-	0.1	-	-	0.1	0.1
14	InterHDL	-	0	-	-	0	0
15	Intusoft	-	-	-	-	0	0
	Other Companies	986	-	9.9	-	9.9	13.5
	All N.A. Companies	860	33.7	7.2	17.4	59.7	81.0
	All European Companies	-	0.1	-	0	0.1	0.1
	All Asian Companies	-	-	1.0	2.8	3.9	5.4
	All Companies	1,846	33.8	18.1	20.2	73.6	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table C-4
1995 Top 30 Electronic Design Automation Software Companies, Worldwide, Personal Computer (Revenue in Millions of Dollars, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Viewlogic Systems	-	26.2	-	14.4	40.6	9.2
2	IBM	9,854	2.7	36.0	0.1	38.8	8.8
3	Mentor Graphics	-	12.0	-	15.6	27.5	6.3
4	Hewlett-Packard	5,464	3.4	16.1	2.8	22.4	5.1
5	ALTERA	-	17.3	-	4.3	21.6	4.9
6	Wacom	422	15.2	3.4	2.8	21.5	4.9
7	Autodesk	-	19.6	-	0.1	19.8	4.5
8	NEC	1,772	3.2	8.8	1.4	15.8	3.6
9	OrCAD EDA	-	10.6	-	3.0	13.7	3.1
10	Microsim	-	12.0	-	0.6	12.6	2.9
11	Digital Equipment	3,544	-	9.7	0.4	10.0	2.3
12	Accel Technologies	-	6.0	-	2.6	8.6	1.9
13	Intergraph	519	3.5	2.2	2.2	8.1	1.8
14	Data I/O	-	5.6	-	2.3	7.9	1.8
15	Altium*	1,113	2.7	3.4	0.1	6.2	1.4
16	Zuken-Redac	-	3.0	-	3.1	6.1	1.4
17	Protel Technology	-	6.0	-	-	6.0	1.4
18	Xilinx Inc.	-	4.0	-	0.9	4.8	1.1
19	Marubeni Hytech*	-	4.6	-	-	4.6	1.1
20	Cooper & Chyan Technology	-	3.3	-	0.8	4.1	0.9
21	Sophia Systems*	34	2.4	0.7	-	3.7	0.8
22	Harris EDA	42	2.5	0.5	0.4	3.5	0.8
23	ALS Design	25	2.8	0.1	0.4	3.2	0.7
24	Fujitsu	183	1.1	1.1	1.0	3.2	0.7
25	ALDEC	-	2.8	-	0.3	3.1	0.7
26	ACTEL	-	2.7	-	0.3	3.0	0.7
27	ABB Industria*	70	0.9	-	0.1	2.9	0.6
28	CAD-UL	-	2.9	-	-	2.8	0.6
29	ULTImate Technology	-	2.7	-	-	2.7	0.6
30	Norlinvest Ltd.	23	2.2	0.1	0.2	2.6	0.6
	Other Companies	46,921	-	107.7	-	107.7	24.5
	All N.A. Companies	18,129	146.4	61.2	53.0	261.0	59.4
	All European Companies	328	18.3	0.9	1.0	21.2	4.8
	All Asian Companies	2,599	22.9	15.4	8.7	49.6	11.3
	All Companies	67,977	187.7	185.3	62.8	439.5	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table C-5
1995 Top Nine Electronic Design Automation Software Companies, Worldwide, Host/Proprietary (Revenue in Millions of Dollars, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Digital Equipment	497	-	48.9	8.2	57.1	75.5
2	Fujitsu	-	0.8	-	0.7	1.5	2.0
3	C. Itoh Techno-Science*	-	0.7	0.3	0.2	1.4	1.8
4	MacNeal-Schwendler	-	1.2	-	0.1	1.4	1.8
5	Intergraph	-	-	-	0.8	0.8	1.1
6	Meta-Software	-	0.3	-	0.2	0.5	0.7
7	Hitachi	25	0.2	0.2	0	0.4	0.5
8	Harris EDA	3	0.3	0	-	0.3	0.4
9	SIMUCAD	-	0.1	-	-	0.1	0.1
	Other Companies	18	-	3.3	0.8	16.1	21.3
	All N.A. Companies	466	1.8	46.1	9.3	57.2	75.7
	All European Companies	-	-	-			-
	All Asian Companies	25	0.8	0.5	1.0	2.3	3.1
	All Companies	508	2.6	49.9	11.1	75.6	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-30
1995 Top 30 Electronic CAE Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	113.7	142.7	193.5	35.6	19.0
2	Cadence	91.4	96.4	123.2	27.7	12.1
3	Mentor Graphics	100.4	100.1	109.0	8.9	10.7
4	Viewlogic Systems	76.9	83.3	77.3	-7.3	7.6
5	Quickturn Design Systems	51.5	59.0	70.7	19.9	6.9
6	Hewlett-Packard	33.1	34.4	36.3	5.5	3.6
7	Zycad	23.2	29.4	28.4	-3.4	2.8
8	Marubeni Hytech*	23.5	24.3	28.0	15.2	2.7
9	IKOS Systems	18.1	18.6	25.7	38.1	2.5
10	EPIC Design Technology	-	11.9	24.2	103.5	2.4
11	Compass Design Automation	24.0	20.1	23.2	15.2	2.3
12	Autodesk	23.9	22.8	20.6	-9.5	2.0
13	ALTERA	13.1	16.0	19.2	20.0	1.9
14	Meta-Software	9.4	14.4	17.5	21.2	1.7
15	Analogy	11.0	11.0	17.1	55.5	1.7
16	Intergraph	13.7	11.5	16.5	42.9	1.6
17	Summitt Design	9.1	14.6	16.4	12.7	1.6
18	Microsim	5.8	11.9	14.0	17.6	1.4
19	Wacom	23.7	10.6	13.6	28.1	1.3
20	Seiko*	12.9	12.0	13.4	11.8	1.3
21	Xilinx Inc.	9.3	11.0	12.6	14.8	1.2
22	Zuken-Redac	20.7	12.3	11.8	-3.7	1.2
23	Minc Software	2.1	6.0	11.7	94.1	1.1
24	LSI Logic	12.3	14.0	11.5	-17.6	1.1
25	NEC	12.9	13.9	11.2	-19.4	1.1
26	Harris EDA	8.7	9.6	9.9	3.1	1.0
27	Ansoft	-	5.6	7.9	41.1	0.8
28	SES Inc.	7.0	8.5	7.7	-8.9	0.8
29	CrossCheck Technology	11.2	6.2	7.0	12.9	0.7
30	C. Itoh Techno-Science*	5.7	6.2	5.7	-8.9	0.6
	All N.A. Companies	698.9	805.8	964.2	19.6	94.5
	All European Companies	21.6	14.9	15.2	2.3	1.5
	All Asian Companies	46.7	40.4	40.7	0.8	4.0
	All Companies	767.3	861.1	1,020.0	18.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-31
1995 Top 30 Electronic CAE Software Companies, Worldwide, UNIX
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	113.5	142.7	193.5	35.6	22.7
2	Cadence	91.4	96.4	123.2	27.7	14.4
3	Mentor Graphics	97.9	96.9	97.1	0.2	11.4
4	Quickturn Design Systems	51.5	59.0	70.7	19.9	8.3
5	Viewlogic Systems	46.9	51.9	48.6	-6.4	5.7
6	Hewlett-Packard	31.0	30.9	31.4	1.6	3.7
7	Zycad	23.2	29.4	28.4	-3.4	3.3
8	IKOS Systems	18.1	18.6	25.7	38.1	3.0
9	EPIC Design Technology	-	11.9	24.2	103.5	2.8
10	Marubeni Hytech*	17.6	19.8	23.3	18.0	2.7
11	Compass Design Automation	24.0	20.1	23.2	15.2	2.7
12	Analogy	10.9	11.0	17.1	55.5	2.0
13	Meta-Software	8.7	13.5	16.4	21.2	1.9
14	Summitt Design	8.7	14.0	15.7	12.7	1.8
15	Zuken-Redac	20.7	12.3	11.8	-3.7	1.4
16	LSI Logic	12.3	14.0	11.5	-17.6	1.4
17	Xilinx Inc.	3.4	7.0	10.1	44.1	1.2
18	Seiko*	12.9	10.4	10.1	-3.6	1.2
19	Minc Software	1.8	5.1	9.8	94.1	1.2
20	NEC	10.5	11.3	9.0	-20.5	1.1
21	SES Inc.	7.0	8.5	7.7	-8.9	0.9
22	Harris EDA	6.4	6.8	7.3	7.2	0.9
23	CrossCheck Technology	11.2	6.2	7.0	12.9	0.8
24	Ansoft	-	3.9	5.5	41.1	0.6
25	C. Itoh Techno-Science*	5.4	6.0	5.2	-12.8	0.6
26	VLSI Libraries	2.0	4.4	4.9	11.8	0.6
27	i-Logix	3.9	3.9	4.6	16.1	0.5
28	Fujitsu	3.2	3.6	4.2	15.8	0.5
29	Quantic Laboratories	2.5	3.1	3.5	12.9	0.4
30	APTIX	1.0	1.0	3.5	250.1	0.4
	All N.A. Companies	597.5	687.6	821.6	19.5	96.4
	All European Companies	10.8	7.8	6.2	-21.0	0.7
	All Asian Companies	33.4	28.2	24.9	-11.6	2.9
	All Companies	641.7	723.6	852.6	17.8	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-32
1995 Top 15 Electronic CAE Software Companies, Worldwide, NT/Hybrid (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Intergraph	-	1.1	12.0	961.8	66.3
2	Seiko*	-	1.6	3.4	115.1	18.6
3	Viewlogic Systems	-	-	2.4	NA	13.4
4	ALTERA	-	-	1.9	NA	10.6
5	Hewlett-Packard	-	-	1.5	NA	8.4
6	PADS Software	-	0.7	1.1	44.5	5.9
7	Ansoft	-	0.6	0.8	41.1	4.4
8	SIMUCAD	0	0.1	0.4	410.3	2.3
9	Fintronic	-	-	0.3	NA	1.4
10	NOVASOFT Systems	-	-	0.2	NA	0.9
11	CAD Distribution	-	0	0.1	698	0.5
12	Frontline Design Automation	-	-	0.1	NA	0.4
13	InterHDL	-	0	0	5.0	0.2
14	Mentor Graphics	-	1.3	-	-100.0	-
15	Intusoft	-	0.9	-	-100.0	-
	All N.A. Companies	0	4.7	18.0	282.6	99.5
	All European Companies	-	0	0.1	698.0	0.5
	All Asian Companies	-	-	-	NA	-
	All Companies	0	4.7	18.1	283.6	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-33
1995 Top 30 Electronic CAE Software Companies, Worldwide, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Viewlogic Systems	30.1	31.4	26.2	-16.5	17.7
2	Autodesk	22.5	21.5	19.6	-8.6	13.3
3	ALTERA	13.1	16	17.3	8.0	11.7
4	Wacom	21.9	9.6	13.6	41.2	9.2
5	Microsim	4.6	10.2	12.0	17.6	8.1
6	Mentor Graphics	2.5	2.0	12.0	510.0	8.1
7	Data I/O	5.0	5.3	5.6	6.5	3.8
8	OrCAD EDA	4.9	4.0	5.3	32.7	3.6
9	Marubeni Hytech*	5.9	4.5	4.6	2.8	3.1
10	Hewlett-Packard	2.1	3.6	3.4	-3.7	2.3
11	ALDEC	2.4	2.4	2.8	13.6	1.9
12	ACTEL	3.3	2.7	2.7	-0.5	1.8
13	Xilinx Inc.	5.9	4.0	2.5	-36.6	1.7
14	Harris EDA	2.1	2.7	2.5	-5.4	1.7
15	Protel Technology	-	1.8	2.4	33.3	1.6
16	NEC	2.4	2.6	2.2	-14.6	1.5
17	Intergraph	-	-	2.2	NA	1.5
18	Intusoft	0.8	0.4	2.1	382.8	1.4
19	Sophia Systems*	2.4	2.4	2.1	-14.2	1.4
20	ISDATA	1.6	1.6	2.0	28.0	1.4
21	ALS Design	1.4	1.7	1.9	11.3	1.3
22	Minc Software	0.3	1.0	1.9	94.1	1.3
23	Ziegler Informatics	3.0	0.3	1.8	453.2	1.2
24	Ansoft	-	1.1	1.6	41.1	1.1
25	Accel Technologies	0.6	0.8	1.2	46.0	0.8
26	APTIX	1.3	1.0	1.2	21.5	0.8
27	Chronology	0.6	1.1	1.1	-1.6	0.8
28	SIMUCAD	1.2	1.1	1.1	2.6	0.8
29	Frontline Design Automation	-	1.5	1.0	-34.7	0.7
30	Serbi	1.6	0.8	0.9	13.9	0.6
	All N.A. Companies	99.9	111.4	123	10.3	83.3
	All European Companies	10.2	7.0	8.9	27.0	6.0
	All Asian Companies	13.4	12.2	15.8	29.3	10.7
	All Companies	123.4	130.7	147.7	13	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-34
1995 Top Six Electronic CAE Software Companies, Worldwide, Host/Proprietary (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	MacNeal-Schwendler	0.6	1.5	1.2	-15.6	74.2
2	C. Itoh Techno-Science*	0.3	0.2	0.4	93.0	26.7
3	Meta-Software	0.5	0.3	0.3	21.1	20.8
4	Harris EDA	0.2	0.2	0.1	-24.5	7.7
5	SIMUCAD	0	0.1	0.1	-33.0	3.3
6	NOVASOFT Systems	-	0.2	-	-100.0	-
	All N.A. Companies	1.6	2.1	1.7	-21.1	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	2.1	2.1	1.7	-21.1	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-35
1995 Top 30 Electronic CAE Software Companies, North America, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	64.4	75.6	92.9	22.8	17.5
2	Cadence	42.8	45.2	61.6	36.5	11.6
3	Mentor Graphics	52.3	50.8	55.0	8.4	10.4
4	Viewlogic Systems	47.9	57.2	53.2	-7.0	10.1
5	Quickturn Design Systems	37.6	36.6	48.0	31.3	9.1
6	Zycad	16.7	19.1	21.9	14.5	4.1
7	IKOS Systems	14.7	13.4	16.2	20.9	3.1
8	Hewlett-Packard	12.9	13.8	14.5	5.5	2.7
9	EPIC Design Technology	-	6.2	13.5	119.2	2.6
10	Meta-Software	5.3	8.1	10.8	34.2	2.0
11	Analogy	5.0	6.6	10.2	55.5	1.9
12	Minc Software	1.9	5.3	10.2	94.1	1.9
13	Compass Design Automation	10.3	8.7	10.0	15.2	1.9
14	Intergraph	8.1	6.6	10.0	51.9	1.9
15	LSI Logic	7.2	8.2	9.3	13.1	1.8
16	Microsim	5.2	7.1	8.4	17.6	1.6
17	Summitt Design	4.6	7.3	8.2	12.7	1.6
18	Xilinx Inc.	7.9	7.5	7.9	6.4	1.5
19	SES Inc.	4.8	5.8	6.5	13.2	1.2
20	ALTERA	7.0	8.3	6.5	-21.5	1.2
21	Autodesk	11.5	7.7	5.7	-26.2	1.1
22	Ansoft	-	3.9	5.5	41.1	1.0
23	Harris EDA	4.6	4.8	5.1	5.8	1.0
24	OrCAD EDA	3.6	2.4	3.7	52.3	0.7
25	MOTOROLA	2.5	2.9	3.3	13.2	0.6
26	AT&T	2.1	2.2	3.0	37.0	0.6
27	APTIX	0.9	1.0	2.6	147.1	0.5
28	Frontline Design Automation	-	0.5	2.5	444.4	0.5
29	T D Technology	1.8	2.0	2.3	13.2	0.4
30	Design Acceleration	0.8	1.6	2.3	42.0	0.4
	All N.A. Companies	400.8	442.8	527.9	19.2	99.7
	All European Companies	3.1	1.1	1.6	52.4	0.3
	All Asian Companies	1.8	0.8	0.2	-74.7	0
	All Companies	405.7	444.6	529.7	19.1	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-36
1995 Top 30 Electronic CAE Software Companies, North America, UNIX
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	64.2	75.6	92.9	22.8	20.3
2	Cadence	42.8	45.2	61.6	36.5	13.5
3	Mentor Graphics	51.0	49.1	49.2	0.1	10.7
4	Quickturn Design Systems	37.6	36.6	48.0	31.3	10.5
5	Viewlogic Systems	29.6	37.2	35.4	-4.8	7.7
6	Zycad	16.7	19.1	21.9	14.5	4.8
7	IKOS Systems	14.7	13.4	16.2	20.9	3.5
8	EPIC Design Technology	-	6.2	13.5	119.2	3.0
9	Hewlett-Packard	12.1	12.4	12.6	1.6	2.7
10	Analogy	4.9	6.6	10.2	55.5	2.2
11	Meta-Software	4.9	7.6	10.2	34.2	2.2
12	Compass Design Automation	10.3	8.7	10.0	15.2	2.2
13	LSI Logic	7.2	8.2	9.3	13.1	2.0
14	Minc Software	1.6	4.4	8.6	94.1	1.9
15	Summitt Design	4.4	7.0	7.9	12.7	1.7
16	SES Inc.	4.8	5.8	6.5	13.2	1.4
17	Xilinx Inc.	2.3	4.8	6.4	33.5	1.4
18	Ansoft	-	2.7	3.9	41.1	0.8
19	Harris EDA	3.1	3.4	3.8	13.0	0.8
20	MOTOROLA	2.5	2.9	3.3	13.2	0.7
21	AT&T	2.1	2.2	3.0	37.0	0.6
22	T D Technology	1.8	2.0	2.3	13.2	0.5
23	Design Acceleration	0.8	1.6	2.3	42.0	0.5
24	i-Logix	2.1	1.9	2.3	16.1	0.5
25	Systems Science	1.4	1.9	2.1	10.3	0.4
26	Quantic Laboratories	1.5	1.6	2.0	21.7	0.4
27	APTIX	0.5	0.5	1.9	263.4	0.4
28	VLSI Libraries	0.9	1.5	1.7	13.0	0.4
29	Frontline Design Automation	-	-	1.7	NA	0.4
30	Veritools	0.5	0.6	1.6	180	0.4
	All N.A. Companies	338.8	378.8	456.6	20.5	99.6
	All European Companies	2.6	0.9	1.4	57.4	0.3
	All Asian Companies	1.8	0.8	0.2	-74.7	0
	All Companies	343.2	380.5	458.3	20.4	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-37
1995 Top 13 Electronic CAE Software Companies, North America, NT/Hybrid (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Intergraph	-	0.7	7.3	971.7	70.1
2	Viewlogic Systems	-	-	1.7	NA	16.1
3	ALTERA	-	-	0.7	NA	6.3
4	Hewlett-Packard	-	-	0.6	NA	5.8
5	Ansoft	-	0.4	0.6	41.1	5.3
6	PADS Software	-	0.4	0.5	42.3	5.3
7	SIMUCAD	0	0.1	0.3	509.0	3.3
8	Fintronic	-	-	0.3	NA	2.5
9	NOVASOFT Systems	-	-	0.1	NA	0.8
10	Frontline Design Automation	-	-	0	NA	0.5
11	InterHDL	-	0	0	16.6	0.3
12	Intusoft	-	0.7	-	-100.0	-
13	Mentor Graphics	-	0.6	-	-100.0	-
	All N.A. Companies	0	2.8	10.4	264.9	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0	2.8	10.4	264.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-38
1995 Top 30 Electronic CAE Software Companies, North America, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Viewlogic Systems	18.3	20.0	16.1	-19.4	26.5
2	Microsim	4.6	6.1	7.2	17.6	11.8
3	ALTERA	7.0	8.3	5.9	-29.4	9.7
4	Mentor Graphics	1.3	1.0	5.9	488.6	9.6
5	Autodesk	10.8	7.2	5.3	-26.2	8.7
6	OrCAD EDA	3.6	2.4	3.7	52.3	6.1
7	Data I/O	3.4	3.6	1.9	-47.5	3.1
8	ALDEC	1.3	1.4	1.8	32.3	3.0
9	Minc Software	0.3	0.8	1.6	94.1	2.7
10	Xilinx Inc.	5.6	2.7	1.6	-41.3	2.6
11	Intusoft	0.8	0.4	1.5	317.7	2.4
12	Hewlett-Packard	0.8	1.4	1.4	-3.7	2.2
13	Intergraph	-	-	1.3	NA	2.1
14	Harris EDA	1.4	1.4	1.3	-9.9	2.1
15	Protel Technology	-	0.9	1.2	33.3	1.9
16	Ansoft	-	0.8	1.1	41.1	1.8
17	ACTEL	2.0	1.2	1.1	-15.6	1.7
18	Chronology	0.6	1.0	0.9	-5.1	1.5
19	Fintronic	1.4	1.4	0.9	-40.1	1.4
20	Accel Technologies	0.4	0.5	0.8	55.0	1.4
21	SIMUCAD	0.8	0.8	0.7	-6.9	1.2
22	Frontline Design Automation	-	0.5	0.7	52.4	1.1
23	APTIX	0.5	0.5	0.6	26.1	1.1
24	Meta-Software	0.1	0.3	0.4	34.3	0.7
25	Summitt Design	0.2	0.3	0.4	13.2	0.6
26	Tanner Research	0.2	0.2	0.3	36.9	0.6
27	NOVASOFT Systems	-	0	0.3	634.3	0.5
28	Softdesk	0.2	0.2	0.2	-16.2	0.3
29	InterHDL	-	0.1	0.1	16.6	0.2
30	PADS Software	0.5	0.1	0.1	-25.3	0.2
	All N.A. Companies	61.4	60.8	60.6	-0.2	99.7
	All European Companies	0.4	0.2	0.2	23.9	0.3
	All Asian Companies	-	-	-	NA	-
	All Companies	61.8	60.9	60.8	-0.1	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-39
1995 Top Four Electronic CAE Software Companies, North America, Host/Proprietary (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Meta-Software	0.3	0.2	0.2	34.1	84.0
2	Harris EDA	0.1	0.1	0	-35.4	15.2
3	SIMUCAD	0	0.1	0	-35.5	14.3
4	NOVASOFT Systems	-	0.1	-	-100.0	-
	All N.A. Companies	0.5	0.4	0.3	-30.8	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.7	0.4	0.3	-30.8	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-40
1995 Top 30 Electronic CAE Software Companies, Europe, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	26.6	30.0	38.1	27.2	19.3
2	Mentor Graphics	22.3	25.6	29.6	15.6	15.0
3	Cadence	21.5	18.8	21.6	14.8	11.0
4	Viewlogic Systems	15.4	15.9	15.5	-2.5	7.9
5	Hewlett-Packard	8.9	9.6	10.2	5.5	5.1
6	Quickturn Design Systems	4.5	11.8	8.3	-29.8	4.2
7	Autodesk	7.9	7.8	8.0	3.0	4.0
8	Compass Design Automation	7.4	6.2	7.2	15.2	3.6
9	IKOS Systems	1.8	2.4	5.1	112.5	2.6
10	Analogy	4.2	3.3	5.1	55.5	2.6
11	Zycad	3.0	2.6	3.7	39.6	1.9
12	Intergraph	3.7	3.4	3.6	7.5	1.8
13	MacNeal-Schwendler	0.8	2.8	3.5	25.4	1.8
14	ALTERA	2.9	3.4	3.3	-2.9	1.7
15	Microsim	0.3	2.7	3.2	17.6	1.6
16	Harris EDA	2.5	2.9	3.0	4.6	1.5
17	EPIC Design Technology	-	1.9	2.7	39.9	1.3
18	Xilinx Inc.	0.9	2.2	2.5	14.8	1.3
19	ISDATA	2.3	1.9	2.0	1.9	1.0
20	ALS Design	1.4	1.8	1.9	10.4	1.0
21	i-Logix	1.2	1.6	1.8	16.1	0.9
22	Ziegler Informatics	2.9	0.3	1.8	447.7	0.9
23	Meta-Software	0.7	1.0	1.7	73.2	0.9
24	VEDA	1.9	1.9	1.4	-24.1	0.7
25	VLSI Libraries	0.5	1.3	1.4	6.5	0.7
26	Data I/O	0.5	0.6	1.4	139.7	0.7
27	ACTEL	1.0	0.9	1.0	16.2	0.5
28	Abstract Hardware	1.5	0.9	1.0	8.5	0.5
29	Serbi	0.8	0.8	0.9	13.9	0.5
30	OrCAD EDA	0.7	1.0	0.9	-18.3	0.4
	All N.A. Companies	143.4	164.9	184.3	11.7	93.3
	All European Companies	16.6	12.8	12.6	-1.5	6.4
	All Asian Companies	3.9	1.8	0.6	-69.8	0.3
	All Companies	163.9	179.6	197.5	9.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-41
1995 Top 30 Electronic CAE Software Companies, Europe, UNIX
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	26.6	30.0	38.1	27.2	24.9
2	Mentor Graphics	21.8	24.8	26.3	6.0	17.1
3	Cadence	21.5	18.8	21.6	14.8	14.1
4	Hewlett-Packard	8.4	8.6	8.8	1.6	5.7
5	Quickturn Design Systems	4.5	11.8	8.3	-29.8	5.4
6	Viewlogic Systems	9.1	8.1	7.6	-7.0	4.9
7	Compass Design Automation	7.4	6.2	7.2	15.2	4.7
8	IKOS Systems	1.8	2.4	5.1	112.5	3.4
9	Analogy	4.2	3.3	5.1	55.5	3.3
10	Zycad	3.0	2.6	3.7	39.6	2.4
11	EPIC Design Technology	-	1.9	2.7	39.9	1.7
12	MacNeal-Schwendler	0.2	1.3	2.3	69.8	1.5
13	Xilinx Inc.	0.8	1.4	2.0	44.1	1.3
14	i-Logix	1.2	1.6	1.8	16.1	1.2
15	Harris EDA	1.7	1.6	1.7	9.3	1.1
16	Meta-Software	0.6	0.9	1.6	73.2	1.1
17	VEDA	1.9	1.9	1.4	-24.1	0.9
18	VLSI Libraries	0.5	1.3	1.4	6.5	0.9
19	Abstract Hardware	1.5	0.9	1.0	8.5	0.6
20	Speed	0.7	0.8	0.6	-16.8	0.4
21	Minc Software	0.1	0.3	0.6	94.1	0.4
22	Zuken-Redac	3.9	1.8	0.6	-69.8	0.4
23	Quantic Laboratories	0.4	0.8	0.5	-29.5	0.3
24	Design Acceleration	-	0.2	0.5	113.3	0.3
25	Intergraph	3.7	3.1	0.5	-83.4	0.3
26	Microsim	0.3	0.4	0.4	17.6	0.3
27	Technische Computer Systeme	0.5	0.6	0.4	-29.7	0.3
28	ISKA	0.4	0.4	0.4	3.2	0.2
29	Star Informatic	0.8	0.8	0.3	-56.6	0.2
30	ACTEL	0.4	0.4	0.3	-11.5	0.2
	All N.A. Companies	122.4	136	148.6	9.2	97.0
	All European Companies	6.8	6.2	4.1	-33.4	2.7
	All Asian Companies	3.9	1.8	0.6	-69.8	0.4
	All Companies	133.1	144.1	153.2	6.4	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-42
1995 Top 12 Electronic CAE Software Companies, Europe, NT/Hybrid (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Intergraph	-	0.3	2.6	783.1	71.6
2	Viewlogic Systems	-	-	0.5	NA	13.5
3	Hewlett-Packard	-	-	0.4	NA	11.8
4	ALTERA	-	-	0.3	NA	9.1
5	PADS Software	-	0.1	0.1	42.9	3.3
6	CAD Distribution	-	0	0.1	698.0	2.4
7	NOVASOFT Systems	-	-	0	NA	1.3
8	Ansoft	-	0	0	41.1	1.1
9	Frontline Design Automation	-	-	0	NA	0.1
10	Mentor Graphics	-	0.3	-	-100.0	-
11	Intusoft	-	0.1	-	-100.0	-
12	InterHDL	-	0	-	-100.0	-
	All N.A. Companies	-	0.9	3.5	300.4	97.3
	All European Companies	-	0	0.1	698.0	2.7
	All Asian Companies	-	-	-	NA	-
	All Companies	-	0.9	3.6	305.8	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-43
1995 Top 30 Electronic CAE Software Companies, Europe, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Autodesk	7.4	7.3	7.7	5.4	19.5
2	Viewlogic Systems	6.3	7.8	7.5	-4.0	19.0
3	Mentor Graphics	0.6	0.5	3.4	567.8	8.5
4	ALTERA	2.9	3.4	2.9	-12.6	7.5
5	Microsim	-	2.3	2.8	17.6	7.0
6	ALS Design	1.4	1.7	1.9	10.3	4.9
7	Ziegler Informatics	2.9	0.3	1.8	447.7	4.6
8	ISDATA	1.5	1.4	1.8	26.5	4.5
9	Data I/O	0.5	0.5	1.4	166.4	3.6
10	Harris EDA	0.8	1.3	1.3	-0.5	3.2
11	Hewlett-Packard	0.6	1.0	1.0	-3.7	2.4
12	Serbi	0.8	0.8	0.9	13.9	2.3
13	OrCAD EDA	0.7	1.0	0.9	-18.3	2.2
14	Kloeckner-Moeller	1.3	1.0	0.8	-16.9	2.1
15	ACTEL	0.6	0.5	0.7	36.2	1.8
16	ABB Industria*	0.6	0.6	0.6	0.8	1.6
17	Intergraph	-	-	0.5	NA	1.3
18	Protel Technology	-	0.4	0.5	33.3	1.3
19	Xilinx Inc.	0.1	0.8	0.5	-36.6	1.3
20	Softronics	0.5	0.4	0.5	2.7	1.1
21	Intusoft	-	0.1	0.4	478.1	1.1
22	CAD Distribution	1.4	0.6	0.4	-32.1	1.0
23	Technische Computer Systeme	0.5	0.4	0.3	-30.3	0.7
24	ISD Software	0.3	0.2	0.3	36.0	0.7
25	Number One Systems	-	0.2	0.3	9.1	0.6
26	ALDEC	0.6	0.4	0.2	-40.3	0.6
27	Norlinvest Ltd.	0.2	0.2	0.2	1.9	0.5
28	NOVASOFT Systems	-	-	0.2	NA	0.5
29	Accel Technologies	0.1	0.1	0.1	16.8	0.4
30	Minc Software	0	0.1	0.1	94.1	0.3
	All N.A. Companies	20.2	26.5	31.0	16.8	78.6
	All European Companies	9.5	6.7	8.4	26.6	21.4
	All Asian Companies	-	-	-	NA	-
	All Companies	29.8	33.2	39.4	18.8	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-44
1995 Top Four Electronic CAE Software Companies, Europe, Host/Proprietary (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	MacNeal-Schwendler	0.6	1.5	1.2	-15.6	97.0
2	Harris EDA	0.1	0.1	0.1	-13.6	4.1
3	Meta-Software	0	0	0	73.0	2.7
4	NOVASOFT Systems	-	0	-	-100	-
	All N.A. Companies	0.8	1.5	1.3	-17.0	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	1.0	1.5	1.3	-17	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-45
1995 Top 30 Electronic CAE Software Companies, Japan, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	20.2	32.8	48.0	46.2	21.0
2	Cadence	19.0	25.1	29.7	18.2	13.0
3	Marubeni Hytech*	23.5	24.3	28.0	15.2	12.2
4	Mentor Graphics	16.9	16.0	17.5	9.8	7.7
5	Wacom	11.8	10.6	13.6	28.1	5.9
6	Seiko*	12.9	12.0	13.4	11.8	5.9
7	NEC	12.9	13.9	11.2	-19.4	4.9
8	Zuken-Redac	10.9	9.1	10.9	20.0	4.8
9	Hewlett-Packard	9.9	9.6	10.2	5.5	4.5
10	Summitt Design	4.6	7.3	8.2	12.7	3.6
11	ALTERA	2.0	3.0	7.9	158.9	3.4
12	Quickturn Design Systems	5.4	8.9	7.8	-12.1	3.4
13	Viewlogic Systems	11.1	8.4	6.2	-26.6	2.7
14	C. Itoh Techno-Science*	5.7	6.2	5.7	-8.9	2.5
15	CrossCheck Technology	4.1	4.3	4.9	12.9	2.1
16	Autodesk	1.9	4.6	4.3	-4.9	1.9
17	Fujitsu	3.2	3.6	4.2	15.8	1.8
18	EPIC Design Technology	-	3.2	4.1	28.1	1.8
19	IKOS Systems	1.4	2.0	3.9	88.4	1.7
20	Compass Design Automation	3.8	3.2	3.7	15.2	1.6
21	Meta-Software	3.2	4.8	3.1	-33.9	1.4
22	Sophia Systems*	3.1	3.2	2.9	-6.6	1.3
23	Microsim	0.3	2.0	2.4	17.6	1.0
24	Intergraph	1.5	1.3	1.9	47.4	0.8
25	Harris EDA	1.3	1.5	1.7	17.3	0.8
26	Analogy	1.0	1.1	1.7	55.5	0.7
27	Contec Microelectronics	1.3	1.5	1.7	16.4	0.7
28	Data I/O	1.0	1.1	1.7	59.8	0.7
29	APTIX	0.7	0.7	1.6	125.2	0.7
30	Xilinx Inc.	0.2	1.0	1.6	65.9	0.7
	All N.A. Companies	115.5	157.1	187.7	19.5	82.3
	All European Companies	1.4	0.8	0.8	-0.1	0.3
	All Asian Companies	38.7	37.2	39.7	6.9	17.4
	All Companies	155.7	195.0	228.2	17.0	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-46
1995 Top 30 Electronic CAE Software Companies, Japan, UNIX
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	20.2	32.8	48.0	46.2	25.8
2	Cadence	19.0	25.1	29.7	18.2	16.0
3	Marubeni Hytech*	17.6	19.8	23.3	18.0	12.6
4	Mentor Graphics	16.5	15.5	15.6	0.6	8.4
5	Zuken-Redac	10.9	9.1	10.9	20.0	5.8
6	Seiko*	12.9	10.4	10.1	-3.6	5.4
7	NEC	10.5	11.3	9.0	-20.5	4.8
8	Hewlett-Packard	9.3	8.6	8.8	1.6	4.7
9	Summitt Design	4.4	7.0	7.9	12.7	4.2
10	Quickturn Design Systems	5.4	8.9	7.8	-12.1	4.2
11	C. Itoh Techno-Science*	5.4	6.0	5.2	-12.8	2.8
12	CrossCheck Technology	4.1	4.3	4.9	12.9	2.6
13	Fujitsu	3.2	3.6	4.2	15.8	2.3
14	EPIC Design Technology	-	3.2	4.1	28.1	2.2
15	Viewlogic Systems	6.7	5.5	4.1	-24.9	2.2
16	IKOS Systems	1.4	2.0	3.9	88.4	2.1
17	Compass Design Automation	3.8	3.2	3.7	15.2	2.0
18	Meta-Software	3.0	4.5	3.0	-33.9	1.6
19	Analogy	1.0	1.1	1.7	55.5	0.9
20	Harris EDA	1.3	1.4	1.7	17.9	0.9
21	LSI Logic	1.2	1.4	1.6	18.1	0.9
22	Contec Microelectronics	1.3	1.4	1.6	18.1	0.9
23	Zycad	1.2	5.3	1.4	-73.2	0.8
24	VLSI Libraries	0.5	1.2	1.4	17.9	0.8
25	Xilinx Inc.	0.2	0.6	1.3	108.1	0.7
26	APTIX	0.3	0.4	1.2	231.2	0.7
27	SES Inc.	0.8	1.0	1.2	18.1	0.6
28	Cascade Design Automation	0.7	0.8	1.0	20.9	0.5
29	Pacific Numerics	-	-	0.9	NA	0.5
30	Sophia Systems*	0.7	0.8	0.9	17.7	0.5
	All N.A. Companies	103.7	138.4	161.3	16.5	86.8
	All European Companies	1.1	0.7	0.6	-10.6	0.3
	All Asian Companies	25.3	25.0	23.9	-4.1	12.9
	All Companies	130.2	164.0	185.8	13.3	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-47
1995 Top 12 Electronic CAE Software Companies, Japan, NT/Hybrid
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Seiko*	-	1.6	3.4	115.1	112.0
2	Intergraph	-	0.1	1.4	955.6	47.7
3	ALTERA	-	-	0.8	NA	26.3
4	Hewlett-Packard	-	-	0.4	NA	14.1
5	PADS Software	-	0.2	0.3	42.9	9.9
6	Viewlogic Systems	-	-	0.2	NA	6.5
7	Ansoft	-	0.1	0.1	41.1	4.0
8	SIMUCAD	-	0	0	14.8	0.6
9	Frontline Design Automation	-	-	0	NA	0.6
10	Mentor Graphics	-	0.2	-	-100.0	-
11	Intusoft	-	0	-	-100.0	-
12	InterHDL	-	0	-	-100.0	-
	All N.A. Companies	0	0.7	3.0	356.7	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0	0.7	3.0	356.7	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-48
1995 Top 30 Electronic CAE Software Companies, Japan, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Wacom	11.0	9.6	13.6	41.2	34.5
2	ALTERA	2.0	3.0	7.1	133.1	18.0
3	Marubeni Hytech*	5.9	4.5	4.6	2.8	11.8
4	Autodesk	1.8	4.3	4.1	-4.9	10.5
5	NEC	2.4	2.6	2.2	-14.6	5.6
6	Sophia Systems*	2.4	2.4	2.1	-14.2	5.2
7	Microsim	-	1.7	2.0	17.6	5.2
8	Mentor Graphics	0.4	0.3	2.0	534.1	5.1
9	Viewlogic Systems	4.5	2.9	1.9	-36.4	4.8
10	Data I/O	0.9	0.9	1.7	77.6	4.3
11	Hewlett-Packard	0.6	1.0	1.0	-3.7	2.4
12	ACTEL	0.3	0.7	0.6	-4.4	1.6
13	ALDEC	0.5	0.5	0.6	12.8	1.4
14	OrCAD EDA	0.4	0.3	0.4	32.7	1.1
15	APTIX	0.3	0.4	0.4	14.9	1.0
16	Summitt Design	0.2	0.3	0.4	13.2	0.9
17	Xilinx Inc.	-	0.4	0.3	-8.5	0.8
18	Protel Technology	-	0.2	0.3	33.3	0.7
19	Intergraph	-	-	0.3	NA	0.6
20	Frontline Design Automation	-	1.1	0.2	-76.7	0.6
21	Ansoft	-	0.2	0.2	41.1	0.6
22	SIMUCAD	0.2	0.2	0.2	-6.3	0.5
23	ISDATA	-	0.1	0.2	44.0	0.5
24	Meta-Software	0.1	0.2	0.1	-33.8	0.3
25	Minc Software	0	0.1	0.1	94.1	0.3
26	Intusoft	-	-	0.1	NA	0.3
27	Chronology	-	0.1	0.1	10.7	0.3
28	Accel Technologies	0.1	0.1	0.1	-12.4	0.2
29	Contec Microelectronics	0.1	0.1	0.1	-15.7	0.2
30	PADS Software	0.3	0.1	0.1	-25.0	0.1
	All N.A. Companies	11.6	17.9	23.3	30.3	59.4
	All European Companies	0.2	0.1	0.2	63.7	0.5
	All Asian Companies	13.4	12.2	15.8	29.3	40.2
	All Companies	25.2	30.2	39.3	30.0	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-49
1995 Top Four Electronic CAE Software Companies, Japan, Host/Proprietary (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	C. Itoh Techno-Science*	0.3	0.2	0.4	93.0	429.4
2	Meta-Software	0.2	0.1	0.1	-33.9	60.4
3	Harris EDA	0	0	0	-6.0	36.4
4	SIMUCAD	0	0	0	-6.1	14.7
	All N.A. Companies	0.2	0.1	0.1	-23.9	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.3	0.1	0.1	-23.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-50
1995 Top 30 Electronic CAE Software Companies, Asia/Pacific, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	2.5	4.3	14.5	239.1	24.0
2	Cadence	7.6	6.8	9.7	43.2	16.0
3	Mentor Graphics	8.9	7.8	6.9	-11.6	11.3
4	Quickturn Design Systems	4.0	1.8	6.6	274.4	11.0
5	EPIC Design Technology	-	0.4	3.9	985.5	6.4
6	Compass Design Automation	2.4	2.0	2.3	15.2	3.8
7	Viewlogic Systems	2.5	1.7	2.3	32.3	3.8
8	Autodesk	1.7	2.1	2.3	8.6	3.7
9	Meta-Software	0.3	0.6	1.7	203.1	2.9
10	Hewlett-Packard	1.3	1.4	1.5	5.5	2.4
11	Zycad	2.3	2.4	1.4	-39.6	2.3
12	CrossCheck Technology	1.3	1.2	1.4	12.9	2.3
13	ALTERA	0.6	1.0	1.0	-	1.6
14	Ansoft	-	0.6	0.8	41.1	1.3
15	Pacific Numerics	-	-	0.6	NA	1.0
16	IKOS Systems	0.2	0.7	0.5	-30.9	0.9
17	ACTEL	0.4	0.4	0.4	3.8	0.7
18	Protel Technology	-	0.3	0.4	33.3	0.7
19	SIMUCAD	0.2	0.3	0.4	51.6	0.7
20	Intergraph	0.3	0.3	0.4	38.5	0.6
21	VLSI Libraries	0.1	0.4	0.4	5.7	0.6
22	Quantic Laboratories	0.1	0.1	0.4	182.1	0.6
23	Xilinx Inc.	0.1	0.2	0.3	14.8	0.4
24	APTIX	0.3	0.1	0.2	70.1	0.4
25	Data I/O	0.1	0.1	0.2	91.8	0.4
26	LV Software	-	-	0.2	NA	0.3
27	Zuken-Redac	4.0	0.6	0.2	-68.4	0.3
28	Systems Science	0	0	0.2	239.2	0.3
29	ALDEC	0	0.1	0.1	-6.0	0.2
30	Minc Software	-	0.1	0.1	94.1	0.2
	All N.A. Companies	35.5	37.9	60.2	59.1	99.6
	All European Companies	0.2	0.1	0.1	-18.9	0.1
	All Asian Companies	2.3	0.6	0.2	-68.4	0.3
	All Companies	38.0	38.5	60.5	56.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-51
1995 Top 30 Electronic CAE Software Companies, Asia/Pacific, UNIX
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	2.5	4.3	14.5	239.1	27.1
2	Cadence	7.6	6.8	9.7	43.2	18.0
3	Quickturn Design Systems	4.0	1.8	6.6	274.4	12.4
4	Mentor Graphics	8.6	7.5	6.1	-19.0	11.4
5	EPIC Design Technology	-	0.4	3.9	985.5	7.2
6	Compass Design Automation	2.4	2.0	2.3	15.2	4.3
7	Meta-Software	0.3	0.5	1.6	203.1	3.1
8	Viewlogic Systems	1.5	1.1	1.5	35.4	2.9
9	Zycad	2.3	2.4	1.4	-39.6	2.6
10	CrossCheck Technology	1.3	1.2	1.4	12.9	2.6
11	Hewlett-Packard	1.2	1.2	1.3	1.6	2.3
12	Pacific Numerics	-	-	0.6	NA	1.2
13	Ansoft	-	0.4	0.6	41.1	1.0
14	IKOS Systems	0.2	0.7	0.5	-30.9	1.0
15	VLSI Libraries	0.1	0.4	0.4	5.7	0.7
16	Quantic Laboratories	0.1	0.1	0.4	182.1	0.7
17	Xilinx Inc.	0	0.1	0.2	44.1	0.4
18	LV Software	-	-	0.2	NA	0.4
19	Zuken-Redac	4.0	0.6	0.2	-68.4	0.4
20	APTIX	0.2	0.1	0.2	150.1	0.3
21	Systems Science	0	0	0.2	239.2	0.3
22	SIMUCAD	0.1	0.1	0.1	5.0	0.3
23	ACTEL	0.1	0.2	0.1	-20.9	0.3
24	Autodesk	0.1	0.1	0.1	7.6	0.2
25	i-Logix	0.2	0.1	0.1	16.1	0.2
26	Minc Software	-	0.1	0.1	94.1	0.2
27	UniCAD	-	-	0.1	NA	0.2
28	Intergraph	0.3	0.2	0.1	-78.7	0.1
29	Cascade Design Automation	0.2	0.2	0	-79.8	0.1
30	Contec Microelectronics	0.1	0	0	4.5	0.1
	All N.A. Companies	30.8	32.7	53.4	63.4	99.6
	All European Companies	0.1	0	0	-38.8	0.1
	All Asian Companies	2.3	0.6	0.2	-68.4	0.4
	All Companies	33.3	33.3	53.6	60.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-52
1995 Top 10 Electronic CAE Software Companies, Asia/Pacific, NT/Hybrid (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Intergraph	-	0	0.3	1115.6	42.9
2	ALTERA	-	-	0.1	NA	14.9
3	PADS Software	-	0.1	0.1	46.2	14.6
4	Ansoft	-	0.1	0.1	41.1	12.2
5	Viewlogic Systems	-	-	0.1	NA	11.2
6	Hewlett-Packard	-	-	0.1	NA	9.4
7	SIMUCAD	-	0	0	509.9	7.5
8	InterHDL	-	0	0	15.4	0.1
9	Mentor Graphics	-	0.1	-	-100.0	-
10	Intusoft	-	0	-	-100.0	-
	All N.A. Companies	0	0.3	0.6	118.7	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0	0.3	0.6	118.7	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-53
1995 Top 25 Electronic CAE Software Companies, Asia/Pacific, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Autodesk	1.6	2.0	2.1	8.7	34.2
2	ALTERA	0.6	1.0	0.9	-10.0	13.9
3	Mentor Graphics	0.2	0.2	0.8	410.3	12.5
4	Viewlogic Systems	1.0	0.6	0.7	14.6	11.3
5	Protel Technology	-	0.3	0.4	33.3	6.6
6	ACTEL	0.2	0.2	0.3	21.7	4.8
7	Data I/O	0.1	0.1	0.2	113.1	3.6
8	SIMUCAD	0.1	0.1	0.2	86.8	3.3
9	Ansoft	-	0.1	0.2	41.1	2.6
10	ALDEC	0	0.1	0.1	-6.0	2.2
11	Hewlett-Packard	0.1	0.1	0.1	-3.7	2.2
12	Accel Technologies	0	0	0.1	119.0	1.7
13	Intusoft	-	0	0.1	664.6	1.7
14	Meta-Software	-	0	0.1	203.4	1.1
15	APTIX	0.1	0.1	0.1	-13.2	0.9
16	Xilinx Inc.	0.1	0.1	0.1	-36.6	0.8
17	Intergraph	-	-	0	NA	0.7
18	Norlinvest Ltd.	0	0	0	1.9	0.7
19	Minc Software	-	0	0	94.1	0.3
20	PADS Software	0	0	0	-50.9	0.2
21	Contec Microelectronics	0	0	0	100.3	0
22	Viagrafix	0	0	0	-62.9	0
23	InterHDL	-	0	0	15.4	0
24	Tanner Research	-	0	-	-100.0	-
25	Softdesk	0	0	-	-100.0	-
	All N.A. Companies	4.6	4.9	6.2	26.5	99.3
	All European Companies	0.1	0	0	2.7	0.7
	All Asian Companies	-	-	-	NA	-
	All Companies	4.7	4.9	6.2	26.3	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-54
1995 Top Three Electronic CAE Software Companies, Asia/Pacific, Host/Proprietary (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Meta-Software	0	0	0	202.8	109.6
2	SIMUCAD	0	0	0	-69.2	7.9
3	Harris EDA	0	0	-	-100.0	-
	All N.A. Companies	0.1	0	0	26.4	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.1	0	0	26.4	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-55
1995 Top 21 Electronic CAE Software Companies, Rest of World, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Intergraph	0.1	0.1	0.6	1033.3	15.6
2	LSI Logic	0.5	0.5	0.6	12.3	14.5
3	ALTERA	0.6	0.3	0.6	80.0	14.0
4	Cadence	0.6	0.5	0.5	-1.2	11.8
5	Autodesk	1.0	0.7	0.4	-44.9	10.1
6	Data I/O	0	0.1	0.4	571.2	9.6
7	NOVASOFT Systems	-	0.1	0.3	144.8	7.8
8	OrCAD EDA	0.1	0.2	0.3	59.3	7.8
9	Xilinx Inc.	0.1	0.1	0.3	129.6	6.2
10	i-Logix	0.1	0.1	0.1	16.1	2.2
11	Accel Technologies	0	0	0	46.0	1.2
12	Harris EDA	0.1	0.1	0	-35.4	0.9
13	Ziegler Informatics	0	-	0	NA	0.4
14	PADS Software	0	0	0	-36.0	0.3
15	Intusoft	-	-	0	NA	0.3
16	Norlinvest Ltd.	0	0	0	1.9	0.3
17	ALDEC	0	0	0	12.8	0.2
18	Softdesk	0	0	0	-1.9	0.1
19	EPIC Design Technology	-	0.2	-	-100.0	-
20	ACTEL	0.3	0	-	-100.0	-
21	Siemens Nixdorf Info systeme	0	0	-	-100.0	-
	All N.A. Companies	3.8	3.1	4.0	29.3	98.6
	All European Companies	0.3	0.1	0.1	-18.5	1.4
	All Asian Companies	-	-	-	NA	-
	All Companies	4.1	3.2	4.1	28.3	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-56
1995 Top 13 Electronic CAE Software Companies, Rest of World, UNIX
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	LSI Logic	0.5	0.5	0.6	12.3	35.1
2	Cadence	0.6	0.5	0.5	-1.2	28.7
3	Xilinx Inc.	0	0.1	0.2	188.1	11.9
4	NOVASOFT Systems	-	0.1	0.2	83.6	9.5
5	Intergraph	0.1	0.1	0.1	87.1	6.2
6	i-Logix	0.1	0.1	0.1	16.1	5.4
7	Harris EDA	0.1	0.1	0	-35.4	2.3
8	Autodesk	0.1	0	0	-45.3	1.3
9	EPIC Design Technology	-	0.2	-	-100.0	-
10	Siemens Nixdorf Info systeme	0	0	-	-100.0	-
11	ACTEL	0.1	0	-	-100.0	-
12	Data I/O	0	0	-	-100.0	-
13	PADS Software	-	0	-	-100.0	-
	All N.A. Companies	1.8	1.6	1.7	3.2	99.4
	All European Companies	0.2	0	0	-69.0	0.6
	All Asian Companies	-	-	-	NA	-
	All Companies	2.0	1.7	1.7	1.7	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-57
1995 Top Four Electronic CAE Software Companies, Rest of World, NT/Hybrid (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Intergraph	-	-	0.4	NA	92.3
2	ALTERA	-	-	0.1	NA	12.5
3	NOVASOFT Systems	-	-	0	NA	6.9
4	PADS Software	-	0	0	1,500.0	3.0
	All N.A. Companies	-	0	0.5	1,381.9	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	0	0.5	1381.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-58
1995 Top 15 Electronic CAE Software Companies, Rest of World, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	ALTERA	0.6	0.3	0.5	62.0	26.6
2	Data I/O	0	0.1	0.4	645.8	20.1
3	Autodesk	0.9	0.7	0.4	-44.8	20.0
4	OrCAD EDA	0.1	0.2	0.3	59.3	16.4
5	NOVASOFT Systems	-	-	0.1	NA	6.6
6	Intergraph	-	-	0.1	NA	5.5
7	Xilinx Inc.	0.1	0	0.1	26.7	2.6
8	Accel Technologies	0	0	0	46.0	2.5
9	Ziegler Informatics	0	-	0	NA	0.9
10	Intusoft	-	-	0	NA	0.7
11	Norlinvest Ltd.	0	0	0	1.9	0.6
12	ALDEC	0	0	0	12.8	0.4
13	Softdesk	0	0	0	-1.9	0.1
14	ACTEL	0.2	0	-	-100.0	-
15	PADS Software	0	0	-	-100.0	-
	All N.A. Companies	2.0	1.4	1.9	33.5	97.7
	All European Companies	0.1	0	0	30.6	2.3
	All Asian Companies	-	-	-	NA	-
	All Companies	2.1	1.5	1.9	33.4	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table B-2
All Electronic CAE Software Companies, Worldwide, All Operating Systems
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	ABB Industria*	0.6	0.6	0.6	0.8	0.1
2	Abstract Hardware	1.5	1.1	1.2	8.5	0.1
3	Accel Technologies	0.6	0.8	1.2	51.3	0.1
4	ACTEL	5.3	4.7	4.0	-15.1	0.4
5	ALDEC	2.4	2.4	2.8	13.6	0.3
6	ALS Design	1.4	1.8	2.0	11.4	0.2
7	ALTERA	13.1	16.0	19.2	20.0	1.9
8	Analogy	11.0	11.0	17.1	55.5	1.7
9	Ansoft	-	5.6	7.9	41.1	0.8
10	APTIX	2.3	2.0	4.7	138.1	0.5
11	AT&T	2.1	2.4	3.0	23.3	0.3
12	Autodesk	23.9	22.8	20.6	-9.5	2.0
13	C. Itoh Techno-Science*	5.7	6.2	5.7	-8.9	0.6
14	CAD Distribution	1.5	0.6	0.5	-21.3	0.0
15	Cadence	91.4	96.4	123.2	27.7	12.1
16	Cadis Software	-	0.4	1.2	200.0	0.1
17	CAE Plus	-	1.0	1.3	30.0	0.1
18	Cascade Design Automation	1.9	2.2	2.0	-9.5	0.2
19	Century Research Center	1.0	0.5	0.6	17.5	0.1
20	Chronology	1.4	1.9	1.9	-1.6	0.2
21	Compass Design Automation	24.0	20.1	23.2	15.2	2.3
22	Contec Microelectronics	2.8	3.0	3.4	13.8	0.3
23	CrossCheck Technology	11.2	6.2	7.0	12.9	0.7
24	Data I/O	5.5	5.8	5.6	-4.1	0.5
25	Design Acceleration	0.8	2.0	3.2	60.0	0.3
26	Eagle Design Automation	-	0.5	-	-100.0	-
27	EPIC Design Technology	-	11.9	24.2	103.5	2.4
28	Fintronic	1.4	1.4	1.7	19.7	0.2
29	Frontline Design Automation	-	1.5	3.5	133.3	0.3
30	Fujitsu	3.2	3.6	4.2	15.8	0.4
31	Harris EDA	8.7	9.6	9.9	3.1	1.0
32	Hewlett-Packard	33.1	34.4	36.3	5.5	3.6
33	i-Logix	3.9	3.9	4.6	16.1	0.4
34	IBM	1.9	2.8	1.0	-65.3	0.1
35	IKOS Systems	18.1	18.6	25.7	38.1	2.5
36	Intergraph	13.7	11.5	16.5	42.9	1.6
37	InterHDL	0.5	1.3	1.5	15.0	0.1
38	Intusoft	0.8	1.3	2.1	60.9	0.2
39	ISD Software	0.3	0.2	0.3	36.0	0.0

(Continued)

Table B-2 (Continued)
All Electronic CAE Software Companies, Worldwide, All Operating Systems
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
40	ISDATA	2.5	2.1	2.2	3.0	0.2
41	ISKA	0.4	0.4	0.4	3.2	0.0
42	Kloeckner-Moeller	1.3	1.0	0.8	-16.9	0.1
43	LSI Logic	12.3	14.0	11.5	-17.6	1.1
44	LV Software	-	-	1.9	NA	0.2
45	MacNeal-Schwendler	0.8	2.8	3.5	25.4	0.3
46	Marubeni Hytech*	23.5	24.3	28.0	15.2	2.7
47	Mentor Graphics	100.4	100.1	109.0	8.9	10.7
48	Meta-Software	9.4	14.4	17.5	21.2	1.7
49	Microsim	5.8	11.9	14.0	17.6	1.4
50	Minc Software	2.1	6.0	11.7	94.1	1.1
51	MOTOROLA	3.0	3.4	3.4	0.2	0.3
52	NEC	12.9	13.9	11.2	-19.4	1.1
53	Nextwave DA	0.4	0.5	1.5	200.0	0.1
54	Norlinvest Ltd.	0.3	0.3	0.3	-2.5	0.0
55	NOVASOFT Systems	-	0.7	1.6	129.5	0.2
56	Number One Systems	-	0.3	0.3	9.1	0.0
57	OEA International	0.8	0.8	0.9	23.3	0.1
58	Optem Engineering	0.6	0.5	0.5	-0.8	0.0
59	OrCAD EDA	4.9	4.0	5.3	32.7	0.5
60	Pacific Numerics	1.0	1.1	3.1	176.8	0.3
61	PADS Software	1.0	1.1	1.3	19.0	0.1
62	Protel Technology	-	1.8	2.4	33.3	0.2
63	Quantic Laboratories	2.5	3.1	3.5	12.9	0.3
64	Quickturn Design Systems	51.5	59.0	70.7	19.9	6.9
65	Sagantec	-	0.2	0.3	31.1	0.0
66	Seiko*	12.9	12.0	13.4	11.8	1.3
67	Serbi	1.6	0.8	0.9	13.9	0.1
68	SES Inc.	7.0	8.5	7.7	-8.9	0.8
69	Siemens Nixdorf Info systeme	1.3	1.0	-	-100.0	-
70	SIMUCAD	2.4	2.6	3.2	19.3	0.3
71	Simulation Technology	0.5	0.6	0.7	13.2	0.1
72	Softdesk	0.2	0.2	0.2	-26.1	0.0
73	Softronics	0.5	0.4	0.5	2.7	0.0
74	Sophia Systems*	3.1	3.2	2.9	-6.6	0.3
75	Speed	1.0	1.1	1.3	18.2	0.1
76	SpeedSim	-	-	1.3	NA	0.1
77	Star Informatic	0.8	0.8	0.3	-56.6	0.0
78	Summitt Design	9.1	14.6	16.4	12.7	1.6

(Continued)

Table B-2 (Continued)
All Electronic CAE Software Companies, Worldwide, All Operating Systems
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
79	Synopsys	113.7	142.7	193.5	35.6	19.0
80	Systems Science	1.9	2.3	2.6	13.1	0.3
81	T D Technology	1.8	2.0	2.3	13.2	0.2
82	Tanner Research	0.2	0.4	0.5	28.8	0.0
83	Technische Computer Systeme	1.2	1.1	0.9	-24.2	0.1
84	UniCAD	-	1.3	1.6	27.0	0.2
85	VEDA	4.9	3.1	2.6	-17.2	0.3
86	Veritools	0.5	0.6	1.6	180.0	0.2
87	Viagrafix	0.5	0	0	-62.9	0.0
88	Viewlogic Systems	76.9	83.3	77.3	-7.3	7.6
89	VLSI Libraries	2.0	4.4	4.9	11.8	0.5
90	Wacom	23.7	10.6	13.6	28.1	1.3
91	Xilinx Inc.	9.3	11.0	12.6	14.8	1.2
92	Yokogawa Digital Computer	-	0.4	0.5	11.9	0.0
93	Ziegler Informatics	3.0	0.3	1.8	453.2	0.2
94	Zuken-Redac	20.7	12.3	11.8	-3.7	1.2
95	Zycad	23.2	29.4	28.4	-3.4	2.8
	All N.A. Companies	698.9	805.8	964.2	19.6	94.5
	All European Companies	21.6	14.9	15.2	2.3	1.5
	All Asian Companies	46.7	40.4	40.7	0.8	4.0
	All Companies	767.3	861.1	1,020.0	18.5	100.0

NA = Not applicable
Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table C-6
1995 Top 30 Electronic CAE Software Companies, Worldwide, All Operating Systems (Revenue in $M, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Sun Microsystems	34,595	-	553.4	194.7	748.1	25.5
2	Hewlett-Packard	12,715	36.3	297.2	59.4	393.0	13.4
3	Synopsys	-	193.5	-	91.1	284.6	9.7
4	Cadence	-	123.2	-	128.2	251.3	8.6
5	Mentor Graphics	292	109.0	7.1	113.3	229.4	7.8
6	Viewlogic Systems	-	77.3	-	43.7	121.0	4.1
7	IBM	11,717	1.0	100.5	6.3	108.0	3.7
8	Quickturn Design Systems	-	70.7	-	11.1	81.8	2.8
9	Zycad	114	28.4	-	22.7	51.1	1.7
10	NEC	2,141	11.2	18.2	4.7	44.3	1.5
11	Marubeni Hytech*	165	28.0	3.7	-	37.0	1.3
12	Digital Equipment	2,227	-	31.3	4.7	36.0	1.2
13	Intergraph	750	16.5	4.7	11.2	32.9	1.1
14	IKOS Systems	320	25.7	-	6.0	31.7	1.1
15	EPIC Design Technology	-	24.2	-	5.7	29.8	1.0
16	Compass Design Automation	-	23.2	-	4.7	27.9	0.9
17	Silicon Graphics	814	-	22.0	4.2	26.2	0.9
18	Zuken-Redac	254	11.8	4.5	8.3	25.4	0.9
19	Meta-Software	-	17.5	-	7.8	25.3	0.9
20	Seiko*	98	13.4	2.9	7.9	24.7	0.8
21	ALTERA	-	19.2	-	4.8	24.0	0.8
22	Autodesk	-	20.6	-	0.1	20.8	0.7
23	Analogy	-	17.1	-	3.5	20.6	0.7
24	Wacom	396	13.6	3.1	2.5	19.1	0.7
25	Summitt Design	-	16.4	-	1.6	18.0	0.6
26	Xilinx Inc.	-	12.6	-	4.4	17.0	0.6
27	Harris EDA	77	9.9	1.2	5.1	16.2	0.6
28	Fujitsu	287	4.2	7.3	3.9	15.5	0.5
29	LSI Logic	22	11.5	0.9	2.4	14.8	0.5
30	Microsim	-	14.0	-	0.7	14.7	0.5
	Other Companies	36,840	-	88.5	0.3	93.4	3.2
	All N.A. Companies	60,339	964.2	964.1	752.5	2,682.1	91.3
	All European Companies	312	15.2	1.3	4.0	21.3	0.7
	All Asian Companies	4,150	40.7	50.6	29.5	141.9	4.8
	All Companies	101,641	1,020.0	1,104.5	786.3	2,938.7	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table C-7
1995 Top 30 Electronic CAE Software Companies, Worldwide, UNIX
(Revenue in $M, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Sun Microsystems	34,595	-	553.4	194.7	748.1	29.6
2	Hewlett-Packard	8,137	31.4	282.6	56.4	370.5	14.7
3	Synopsys	-	193.5	-	91.1	284.6	11.3
4	Cadence	-	123.2	-	128.2	251.3	10.0
5	Mentor Graphics	292	97.1	7.1	97.8	201.9	8.0
6	Quickturn Design Systems	-	70.7	-	11.1	81.8	3.2
7	Viewlogic Systems	-	48.6	-	29.3	77.9	3.1
8	IBM	2,580	1.0	66.9	6.3	74.4	2.9
9	Zycad	114	28.4	-	22.7	51.1	2.0
10	NEC	896	9.0	12.0	3.7	33.2	1.3
11	Maruberi Hytech*	165	23.3	3.7	-	32.3	1.3
12	IKOS Systems	320	25.7	-	6.0	31.7	1.3
13	EPIC Design Technology	-	24.2	-	5.7	29.8	1.2
14	Compass Design Automation	-	23.2	-	4.7	27.9	1.1
15	Silicon Graphics	814	-	22.0	4.2	26.2	1.0
16	Zuken-Redac	254	11.8	4.5	8.3	25.4	1.0
17	Meta-Software	-	16.4	-	7.4	23.8	0.9
18	Analogy	-	17.1	-	3.5	20.6	0.8
19	Seiko*	98	10.1	2.2	5.9	18.5	0.7
20	Summitt Design	-	15.7	-	1.6	17.3	0.7
21	Fujitsu	287	4.2	7.3	3.9	15.5	0.6
22	LSI Logic	22	11.5	0.9	2.4	14.8	0.6
23	Sony	755	-	6.8	-	14.6	0.6
24	Xilinx Inc.	-	10.1	-	3.5	13.6	0.5
25	Harris EDA	35	7.3	0.7	4.7	12.7	0.5
26	Digital Equipment	400	-	10.3	1.7	12.1	0.5
27	Minc Software	-	9.8	-	1.1	10.9	0.4
28	C. Itoh Techno-Science*	-	5.2	2.5	1.8	10.0	0.4
29	SES Inc.	-	7.7	-	-	7.7	0.3
30	Wacom	24	-	-	-	-	-
	All N.A. Companies	44,626	821.6	892.8	692.8	2,407.6	95.3
	All European Companies	29	6.2	0.6	3.3	10.1	0.4
	All Asian Companies	2,505	24.9	39.9	23.9	107.9	4.3
	All Companies	47,160	852.6	933.2	720.0	2,525.6	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table C-8
1995 Top 15 Electronic CAE Software Companies, Worldwide, NT/Hybrid (Revenue in $M, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Intergraph	384	12.0	2.6	8.2	23.1	56.7
2	Seiko*	-	3.4	0.7	2.0	6.2	15.1
3	Hewlett-Packard	133	1.5	1.5	0.7	3.7	9.0
4	Viewlogic Systems	-	2.4	-	-	2.4	5.9
5	ALTERA	-	1.9	-	0.5	2.4	5.9
6	PADS Software	-	1.1	-	0.3	1.4	3.3
7	Digital Equipment	80	-	0.9	0.2	1.1	2.6
8	Ansoft	-	0.8	-	-	0.8	1.9
9	SIMUCAD	-	0.4	-	0	0.4	1.0
10	Fintronic	-	0.3	-	-	0.3	0.6
11	NOVASOFT Systems	-	0.2	-	0	0.2	0.5
12	CAD Distribution	-	0.1	-	0	0.1	0.3
13	Frontline Design Automation	-	0.1	-	-	0.1	0.2
14	InterHDL	-	0	-	-	0	0.1
15	Intusoft	-	-	-	-	0	0.1
	Other Companies	417	-	4.2	-	4.2	10.3
	All N.A. Companies	597	18.0	5.0	9.9	33.7	82.6
	All European Companies	-	0.1	-	0	0.1	0.3
	All Asian Companies	-	-	0.7	2.0	2.8	6.9
	All Companies	1,014	18.1	9.9	11.8	40.8	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table C-9
1995 Top 30 Electronic CAE Software Companies, Worldwide, Personal Computer (Revenue in $M, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Viewlogic Systems	-	26.2	-	14.4	40.6	11.7
2	IBM	9,136	-	33.6	-	33.6	9.7
3	Mentor Graphics	-	12.0	-	15.6	27.5	8.0
4	ALTERA	-	17.3	-	4.3	21.6	6.2
5	Autodesk	-	19.6	-	0.1	19.8	5.7
6	Wacom	371	13.6	3.1	2.5	19.1	5.5
7	Hewlett-Packard	4,445	3.4	13.1	2.3	18.8	5.4
8	Microsim	-	12.0	-	0.6	12.6	3.7
9	NEC	1,245	2.2	6.2	1.0	11.1	3.2
10	Data I/O	-	5.6	-	2.3	7.9	2.3
11	OrCAD EDA	-	5.3	-	1.5	6.8	2.0
12	Intergraph	328	2.2	1.4	1.4	5.1	1.5
13	Marubeni Hytech*	-	4.6	-	-	4.6	1.3
14	Digital Equipment	1,586	-	4.3	0.2	4.5	1.3
15	Harris EDA	42	2.5	0.5	0.4	3.5	1.0
16	Xilinx Inc.	-	2.5	-	0.9	3.4	1.0
17	Sophia Systems*	29	2.1	0.6	-	3.2	0.9
18	ALDEC	-	2.8	-	0.3	3.1	0.9
19	ACTEL	-	2.7	-	0.3	3.0	0.9
20	Protel Technology	-	2.4	-	-	2.4	0.7
21	ALS Design	18	1.9	0	0.3	2.3	0.7
22	ABB Industria*	53	0.6	-	0.1	2.2	0.6
23	ISDATA	-	2.0	-	0.1	2.1	0.6
24	Intusoft	-	2.1	-	-	2.1	0.6
25	Minc Software	-	1.9	-	0.2	2.1	0.6
26	Ziegler Informatics	-	1.8	-	-	1.8	0.5
27	Accel Technologies	-	1.2	-	0.5	1.7	0.5
28	Ansoft	-	1.6	-	-	1.6	0.5
29	Serbi	150	0.9	0.5	-	1.4	0.4
30	Chronology	-	1.1	-	0.2	1.3	0.4
	Other Companies	36,415	-	83.0	-	83.0	24.0
	All N.A. Companies	14,965	123.0	51.5	46.3	221.0	63.9
	All European Companies	283	8.9	0.8	0.7	11.1	3.2
	All Asian Companies	1,645	15.8	9.8	3.5	30.7	8.9
	All Companies	53,308	147.7	145.1	50.5	345.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table C-10
1995 Top Seven Electronic CAE Software Companies, Worldwide, Host/Proprietary (Revenue in $M, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Digital Equipment	161	-	15.7	2.6	18.4	69.4
2	MacNeal-Schwendler	-	1.2	-	0.1	1.4	5.2
3	C. Itoh Techno-Science*	-	0.4	0.2	0.2	0.9	3.2
4	Meta-Software	-	0.3	-	0.2	0.5	1.9
5	Intergraph	-	-	-	0.5	0.5	1.9
6	Harris EDA	1	0.1	0	-	0.1	0.4
7	SIMUCAD	-	0.1	-	-	0.1	0.2
	Other Companies	8	-	1.3	0.3	6.1	23.2
	All N.A. Companies	151	1.7	14.8	3.4	19.9	75.3
	All European Companies	-	-	-			-
	All Asian Companies	-	-	0.2	0.2	0.4	1.5
	All Companies	159	1.7	16.3	3.9	26.4	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-59
1995 Top 19 IC Layout Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	81.4	88.3	118.5	34.2	45.0
2	Mentor Graphics	26.5	34.6	32.9	-4.8	12.5
3	AVANT!	8.4	16.3	32.3	97.7	12.3
4	Compass Design Automation	19.6	23.5	27.8	18.0	10.5
5	Okura*	10.8	14.3	17.0	18.6	6.4
6	Seiko*	19.1	9.9	13.0	30.8	4.9
7	High Level Design Systems	3.2	3.3	9.3	178.1	3.5
8	Cascade Design Automation	6.7	8.1	7.9	-2.2	3.0
9	Silicon Valley Research	6.3	5.3	6.4	20.5	2.4
10	Fujitsu	4.8	5.5	6.3	15.8	2.4
11	Xilinx Inc.	5.5	5.9	5.9	-0.2	2.2
12	Cooper & Chyan Technology	-	1.9	3.1	68.6	1.2
13	TSSI Japan*	1.6	2.2	2.5	18.6	1.0
14	Intergraph	1.7	1.4	2.3	61.0	0.9
15	Maruberi Hytech*	1.2	1.5	1.7	18.5	0.7
16	LSI Logic	1.4	1.6	1.3	-14.1	0.5
17	Tanner Research	0.6	0.9	1.2	33.7	0.5
18	Sagantec	6.1	0.8	1.2	47.3	0.4
19	AT&T	-	0.3	0.4	23.3	0.1
	All N.A. Companies	154.8	188.6	244.8	29.8	92.9
	All European Companies	6.1	0.8	1.2	47.3	0.4
	All Asian Companies	14.5	14.0	17.5	25.3	6.7
	All Companies	175.4	203.3	263.5	29.6	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-60
1995 Top 19 IC Layout Software Companies, Worldwide, UNIX
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	81.4	88.3	118.5	34.2	45.8
2	Mentor Graphics	26.5	34.6	32.9	-4.8	12.7
3	AVANT!	8.4	16.3	32.3	97.7	12.5
4	Compass Design Automation	19.6	23.5	27.8	18.0	10.7
5	Okura*	10.8	14.3	17.0	18.6	6.6
6	Seiko*	19.1	9.9	13.0	30.8	5.0
7	High Level Design Systems	3.2	3.3	9.3	178.1	3.6
8	Cascade Design Automation	6.7	8.1	7.9	-2.2	3.1
9	Silicon Valley Research	6.3	5.3	6.4	20.5	2.5
10	Fujitsu	3.5	4.5	5.2	15.8	2.0
11	Xilinx Inc.	3.4	4.1	4.5	7.9	1.7
12	Cooper & Chyan Technology	-	1.9	3.1	68.6	1.2
13	TSSI Japan*	1.6	2.2	2.5	18.6	1.0
14	Marubeni Hytech*	1.2	1.5	1.7	18.5	0.7
15	LSI Logic	1.4	1.6	1.3	-14.1	0.5
16	Sagantec	6.1	0.8	1.2	47.3	0.5
17	AT&T	-	0.3	0.4	23.3	0.1
18	Intergraph	1.7	1.4	0.3	-76.7	0.1
19	Tanner Research	0.1	0.1	0.2	64.7	0.1
	All N.A. Companies	152.4	186.0	240.7	29.4	93.1
	All European Companies	6.1	0.8	1.2	47.3	0.5
	All Asian Companies	13.4	13.3	16.7	26.1	6.5
	All Companies	171.9	200.1	258.6	29.3	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue note counted in total.

Source: Dataquest (June 1996)

Table A-61
1995 Top IC Layout Software Company, Worldwide, NT/Hybrid
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Intergraph	-	-	1.7	NA	121.6
	All N.A. Companies	-	-	1.4	NA	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	-	1.4	NA	100.0

NA = Not applicable
Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-62
1995 Top Four IC Layout Software Companies, Worldwide, Personal Computer
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Xilinx Inc.	2.0	1.8	1.4	-19.2	40.8
2	Fujitsu	1.4	1.0	1.1	15.8	32.5
3	Tanner Research	0.5	0.8	1.0	28.3	28.4
4	Intergraph	-	-	0.3	NA	8.7
	All N.A. Companies	2.4	2.5	2.7	5.4	76.6
	All European Companies	-	-	-	NA	-
	All Asian Companies	1.1	0.7	0.8	12.1	23.4
	All Companies	3.5	3.3	3.5	6.9	100.0

NA = Not applicable
Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-63
1995 Top 14 IC Layout Software Companies, North America, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	41.3	42.3	59.3	40.1	47.2
2	AVANT!	5.8	11.2	21.6	93.7	17.2
3	Mentor Graphics	15.5	18.6	14.0	-24.6	11.1
4	Compass Design Automation	6.7	8.0	9.4	18.0	7.5
5	High Level Design Systems	2.3	2.8	7.9	184.8	6.3
6	Xilinx Inc.	4.0	4.2	4.6	9.9	3.7
7	Cascade Design Automation	3.3	3.8	3.3	-15.1	2.6
8	Silicon Valley Research	3.3	2.5	3.1	20.5	2.4
9	Cooper & Chyan Technology	-	1.3	1.7	30.6	1.4
10	LSI Logic	0.8	0.9	1.1	18.6	0.9
11	Tanner Research	0.6	0.7	1.0	42.6	0.8
12	Intergraph	0.5	0.4	0.8	87.0	0.6
13	Sagantec	-	0.1	0.5	489.1	0.4
14	AT&T	-	0.3	0.4	37.0	0.3
	All N.A. Companies	81.8	94.9	125.3	32.0	99.6
	All European Companies	-	0.1	0.5	489.1	0.4
	All Asian Companies	-	-	-	NA	-
	All Companies	81.8	95.0	125.8	32.4	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-64
1995 Top 14 IC Layout Software Companies, North America, UNIX
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	41.3	42.3	59.3	40.1	48.1
2	AVANT!	5.8	11.2	21.6	93.7	17.6
3	Mentor Graphics	15.5	18.6	14.0	-24.6	11.4
4	Compass Design Automation	6.7	8.0	9.4	18.0	7.7
5	High Level Design Systems	2.3	2.8	7.9	184.8	6.4
6	Xilinx Inc.	2.6	2.9	3.5	18.6	2.8
7	Cascade Design Automation	3.3	3.8	3.3	-15.1	2.6
8	Silicon Valley Research	3.3	2.5	3.1	20.5	2.5
9	Cooper & Chyan Technology	-	1.3	1.7	30.6	1.4
10	LSI Logic	0.8	0.9	1.1	18.6	0.9
11	Sagantec	-	0.1	0.5	489.1	0.4
12	AT&T	-	0.3	0.4	37.0	0.3
13	Tanner Research	0.1	0.1	0.2	75.7	0.1
14	Intergraph	0.5	0.4	0.1	-73.0	0.1
	All N.A. Companies	79.9	93.1	122.8	31.9	99.6
	All European Companies	-	0.1	0.5	489.1	0.4
	All Asian Companies	-	-	-	NA	-
	All Companies	79.9	93.2	123.3	32.3	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-65
1995 Top IC Layout Software Company, North America, NT/Hybrid
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Intergraph	-	-	0.6	NA	121.6
	All N.A. Companies	-	-	0.5	NA	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	-	0.5	NA	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-66
1995 Top Three IC Layout Software Companies, North America, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Xilinx Inc.	1.4	1.3	1.1	-10.4	56.0
2	Tanner Research	0.5	0.6	0.8	36.9	39.7
3	Intergraph	-	-	0.1	NA	5.2
	All N.A. Companies	2.0	1.8	2.0	9.2	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	2.0	1.8	2.0	9.2	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-67
1995 Top 12 IC Layout Software Companies, Europe, All Operating Systems
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	14.1	16.7	20.8	24.4	56.4
2	Mentor Graphics	3.4	5.2	6.9	33.4	18.8
3	Compass Design Automation	4.3	5.2	6.1	18.0	16.6
4	AVANT!	0.5	0.7	1.3	75.1	3.5
5	Cooper & Chyan Technology	-	0.2	0.8	321.5	2.1
6	Cascade Design Automation	0.6	0.6	0.6	2.3	1.7
7	Sagantec	6.1	0.7	0.5	-26.4	1.4
8	Intergraph	0.5	0.4	0.5	35.9	1.4
9	Tanner Research	0	0.1	0.1	-10.9	0.3
10	Silicon Valley Research	0.4	0.1	0.1	20.5	0.2
11	Xilinx Inc.	0.6	0.5	-	-100.0	-
12	LSI Logic	0.3	0.3	-	-100.0	-
	All N.A. Companies	23.3	29.7	36.4	22.5	98.6
	All European Companies	6.1	0.7	0.5	-26.4	1.4
	All Asian Companies	-	-	-	NA	-
	All Companies	29.3	30.4	36.9	21.3	100.0

NA = Not applicable
Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-68
1995 Top 12 IC Layout Software Companies, Europe, UNIX
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	14.1	16.7	20.8	24.4	57.1
2	Mentor Graphics	3.4	5.2	6.9	33.4	19.0
3	Compass Design Automation	4.3	5.2	6.1	18.0	16.8
4	AVANT!	0.5	0.7	1.3	75.1	3.5
5	Cooper & Chyan Technology	-	0.2	0.8	321.5	2.1
6	Cascade Design Automation	0.6	0.6	0.6	2.3	1.7
7	Sagantec	6.1	0.7	0.5	-26.4	1.5
8	Intergraph	0.5	0.4	0.1	-80.7	0.2
9	Silicon Valley Research	0.4	0.1	0.1	20.5	0.2
10	Tanner Research	0	0	0	9.8	0.1
11	Xilinx Inc.	0.3	0.4	-	-100.0	-
12	LSI Logic	0.3	0.3	-	-100.0	-
	All N.A. Companies	23.1	29.4	35.9	22.1	98.5
	All European Companies	6.1	0.7	0.5	-26.4	1.5
	All Asian Companies	-	-	-	NA	-
	All Companies	29.2	30.1	36.4	20.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-69
1995 Top IC Layout Software Company, Europe, NT/Hybrid
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Intergraph	-	-	0.4	NA	121.6
	All N.A. Companies	-	-	0.3	NA	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	-	0.3	NA	100.0

NA = Not applicable
Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-70
1995 Top Three IC Layout Software Companies, Europe, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Tanner Research	-	0.1	0.1	-14.4	62.5
2	Intergraph	-	-	0.1	NA	45.5
3	Xilinx Inc.	0.3	0.2	-	-100.0	-
	All N.A. Companies	0.1	0.3	0.2	-42.2	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.1	0.3	0.2	-42.2	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-71
1995 Top 19 IC Layout Software Companies, Japan, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	17.8	22.6	28.6	26.5	35.8
2	Okura*	10.8	14.3	17.0	18.6	21.3
3	Seiko*	9.6	9.9	12.6	27.2	15.8
4	Mentor Graphics	6.4	9.2	10.8	17.6	13.6
5	Compass Design Automation	5.3	6.4	7.5	18.0	9.4
6	Fujitsu	4.8	5.5	6.3	15.8	7.9
7	AVANT!	1.2	2.8	5.5	99.3	6.9
8	Cascade Design Automation	2.0	2.8	3.9	40.6	4.9
9	TSSI Japan*	1.6	2.2	2.5	18.6	3.2
10	Silicon Valley Research	1.8	2.0	2.4	20.5	3.0
11	Marubeni Hytech*	1.2	1.5	1.7	18.5	2.2
12	High Level Design Systems	0.5	0.6	1.4	145.4	1.7
13	Xilinx Inc.	0.9	1.2	1.3	8.8	1.6
14	Intergraph	0.6	0.6	0.9	59.1	1.1
15	Cooper & Chyan Technology	-	0.3	0.6	78.5	0.7
16	LSI Logic	0.1	0.2	0.2	18.5	0.3
17	Tanner Research	-	0.1	0.1	48.5	0.2
18	Sagantec	-	-	0.1	NA	0.1
19	AT&T	-	0	-	-100.0	-
	All N.A. Companies	35.6	48.3	62.6	29.6	78.4
	All European Companies	-	-	0.1	NA	0.1
	All Asian Companies	14.5	14.0	17.2	22.8	21.5
	All Companies	50.1	62.3	79.8	28.1	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue note counted in total.

Source: Dataquest (June 1996)

Table A-72
1995 Top 19 IC Layout Software Companies, Japan, UNIX
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	17.8	22.6	28.6	26.5	36.7
2	Okura*	10.8	14.3	17.0	18.6	21.8
3	Seiko*	9.6	9.9	12.6	27.2	16.2
4	Mentor Graphics	6.4	9.2	10.8	17.6	13.9
5	Compass Design Automation	5.3	6.4	7.5	18.0	9.6
6	AVANT!	1.2	2.8	5.5	99.3	7.0
7	Fujitsu	3.5	4.5	5.2	15.8	6.7
8	Cascade Design Automation	2.0	2.8	3.9	40.6	5.0
9	TSSI Japan*	1.6	2.2	2.5	18.6	3.3
10	Silicon Valley Research	1.8	2.0	2.4	20.5	3.1
11	Marubeni Hytech*	1.2	1.5	1.7	18.5	2.2
12	High Level Design Systems	0.5	0.6	1.4	145.4	1.8
13	Xilinx Inc.	0.6	0.8	1.0	18.6	1.3
14	Cooper & Chyan Technology	-	0.3	0.6	78.5	0.7
15	LSI Logic	0.1	0.2	0.2	18.5	0.3
16	Intergraph	0.6	0.6	0.1	-76.9	0.2
17	Sagantec	-	-	0.1	NA	0.1
18	Tanner Research	-	0	0	83.0	0.0
19	AT&T	-	0	-	-100.0	-
	All N.A. Companies	35.3	47.9	61.6	28.6	78.9
	All European Companies	-	-	0.1	NA	0.1
	All Asian Companies	13.4	13.3	16.4	23.4	21.0
	All Companies	48.8	61.1	78.0	27.5	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue note counted in total.

Source: Dataquest (June 1996)

Table A-73
1995 Top IC Layout Software Company, Japan, NT/Hybrid
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Intergraph	-	-	0.6	NA	121.6
	All N.A. Companies	-	-	0.5	NA	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	-	0.5	NA	100.0

NA = Not applicable
Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-74
1995 Top Four IC Layout Software Companies, Japan, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Fujitsu	1.4	1.0	1.1	15.8	86.7
2	Xilinx Inc.	0.3	0.4	0.3	-14.1	23.2
3	Intergraph	-	-	0.1	NA	8.5
4	Tanner Research	-	0.1	0.1	42.6	7.6
	All N.A. Companies	0.3	0.4	0.5	16.9	37.7
	All European Companies	-	-	-	NA	-
	All Asian Companies	1.1	0.7	0.8	12.1	62.3
	All Companies	1.4	1.2	1.3	13.8	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-75
1995 Top 12 IC Layout Software Companies, Asia/Pacific, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	7.6	6.2	9.3	50.4	45.5
2	Compass Design Automation	3.3	4.0	4.7	18.0	23.1
3	AVANT!	0.9	1.7	3.9	131.3	18.9
4	Mentor Graphics	1.2	1.6	1.1	-28.9	5.5
5	Silicon Valley Research	0.8	0.7	0.8	20.5	4.1
6	Seiko*	-	-	0.4	NA	1.7
7	Cascade Design Automation	0.7	0.9	0.2	-82.3	0.8
8	Intergraph	0.1	0.1	0.1	53.0	0.7
9	Sagantec	-	-	0.1	NA	0.6
10	Cooper & Chyan Technology	-	0	0.1	68.6	0.3
11	LSI Logic	0	0.1	-	-100.0	-
12	Tanner Research	-	0	-	-100.0	-
	All N.A. Companies	13.6	15.1	20.0	32.1	97.7
	All European Companies	-	-	0.1	NA	0.6
	All Asian Companies	-	-	0.4	NA	1.7
	All Companies	13.6	15.1	20.5	35.2	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue note counted in total.

Source: Dataquest (June 1996)

Table A-76
1995 Top 12 IC Layout Software Companies, Asia/Pacific, UNIX
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	7.6	6.2	9.3	50.4	45.7
2	Compass Design Automation	3.3	4.0	4.7	18.0	23.2
3	AVANT!	0.9	1.7	3.9	131.3	19.0
4	Mentor Graphics	1.2	1.6	1.1	-28.9	5.6
5	Silicon Valley Research	0.8	0.7	0.8	20.5	4.1
6	Seiko*	-	-	0.4	NA	1.7
7	Cascade Design Automation	0.7	0.9	0.2	-82.3	0.8
8	Sagantec	-	-	0.1	NA	0.6
9	Cooper & Chyan Technology	-	0	0.1	68.6	0.3
10	Intergraph	0.1	0.1	0	-76.9	0.1
11	LSI Logic	0	0.1	-	-100.0	-
12	Tanner Research	-	0	-	-100.0	-
	All N.A. Companies	13.6	15.1	19.9	31.5	97.7
	All European Companies	-	-	0.1	NA	0.6
	All Asian Companies	-	-	0.4	NA	1.7
	All Companies	13.6	15.1	20.4	34.6	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue note counted in total.

Source: Dataquest (June 1996)

Table A-77
1995 Top IC Layout Software Company, Asia/Pacific, NT/Hybrid
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Intergraph	-	-	0.1	NA	121.6
	All N.A. Companies	-	-	0.1	NA	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	-	0.1	NA	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-78
1995 Top Two IC Layout Software Companies, Asia/Pacific, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Intergraph	-	-	0	NA	82.5
2	Tanner Research	-	0	-	-100.0	-
	All N.A. Companies	-	0	0	152.9	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	0	0	152.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-79
1995 Top Two IC Layout Software Companies, Rest of World, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	0.5	0.5	0.5	3.8	85.8
2	LSI Logic	0	0.1	0.1	17.4	12.9
	All N.A. Companies	0.5	0.5	0.5	5.4	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.5	0.5	0.5	5.4	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-80
1995 Top Two IC Layout Software Companies, Rest of World, UNIX
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	0.5	0.5	0.5	3.8	85.8
2	LSI Logic	0	0.1	0.1	17.4	12.9
	All N.A. Companies	0.5	0.5	0.5	5.4	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.5	0.5	0.5	5.4	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table B-3
All IC Layout Software Companies, Worldwide, All Operating Systems
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	AT&T	-	0.3	0.4	23.3	0.1
2	AVANT	8.4	16.3	32.3	97.7	12.3
3	Cadence	81.4	88.3	118.5	34.2	45.0
4	Cascade Design Automation	6.7	8.1	7.9	-2.2	3.0
5	Compass Design Automation	19.6	23.5	27.8	18.0	10.5
6	Cooper & Chyan Technology	-	1.9	3.1	68.6	1.2
7	Fujitsu	4.8	5.5	6.3	15.8	2.4
8	High Level Design Systems	3.2	3.3	9.3	178.1	3.5
9	Intergraph	1.7	1.4	2.3	61.0	0.9
10	LSI Logic	1.4	1.6	1.3	-14.1	0.5
11	Maruberi Hytech*	1.2	1.5	1.7	18.5	0.7
12	Mentor Graphics	26.5	34.6	32.9	-4.8	12.5
13	Okura*	10.8	14.3	17.0	18.6	6.4
14	Sagantec	6.1	0.8	1.2	47.3	0.4
15	Seiko*	19.1	9.9	13.0	30.8	4.9
16	Silicon Valley Research	6.3	5.3	6.4	20.5	2.4
17	Tanner Research	0.6	0.9	1.2	33.7	0.5
18	TSSI Japan*	1.6	2.2	2.5	18.6	1.0
19	Xilinx Inc.	5.5	5.9	5.9	-0.2	2.2
	All N.A. Companies	154.8	188.6	244.8	29.8	92.9
	All European Companies	6.1	0.8	1.2	47.3	0.4
	All Asian Companies	14.5	14.0	17.5	25.3	6.7
	All Companies	175.4	203.3	263.5	29.6	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table C-11
1995 Top 25 IC Layout Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Sun Microsystems	9,278	-	201.2	71.4	272.6	30.8
2	Cadence	-	118.5	-	123.3	241.9	27.3
3	Hewlett-Packard	2,767	-	72.7	9.7	82.4	9.3
4	Mentor Graphics	99	32.9	2.4	33.1	68.4	7.7
5	Digital Equipment	563	-	34.2	5.8	39.9	4.5
6	AVANT!v	-	32.3	-	5.7	38.0	4.3
7	Seiko*	251	13.0	7.2	13.4	34.3	3.9
8	Compass Design Automation	-	27.8	-	5.6	33.4	3.8
9	Fujitsu	571	6.3	11.0	5.9	23.2	2.6
10	Okura*	-	17.0	-	-	17.0	1.9
11	IBM	606	-	15.2	1.3	16.5	1.9
12	Cascade Design Automation	-	7.9	-	6.2	14.2	1.6
13	High Level Design Systems	-	9.3	-	1.7	11.0	1.2
14	Silicon Valley Research	-	6.4	-	3.6	10.0	1.1
15	Xilinx Inc.	-	5.9	-	-	5.9	0.7
16	Intergraph	76	2.3	0.7	1.6	4.6	0.5
17	Cooper & Chyan Technology	-	3.1	-	0.8	3.9	0.4
18	Silicon Graphics	94	-	3.1	0.5	3.6	0.4
19	TSSI Japan*	-	2.5	-	-	2.5	0.3
20	Marubeni Hytech*	9	1.7	0.2	-	2.2	0.2
21	LSI Logic	2	1.3	0.1	0.3	1.7	0.2
22	Tanner Research	-	1.2	-	0.2	1.4	0.2
23	Sagantec	-	1.2	-	0.1	1.3	0.1
24	Sony	30	-	0.3	-	0.6	0.1
25	AT&T	-	0.4	-	0.1	0.4	0
	Other Companies	1,027	-	2.3	-	2.3	0.3
	All N.A. Companies	12,577	244.8	309.5	270.9	825.3	93.2
	All European Companies	-	1.2	-	0.1	1.3	0.1
	All Asian Companies	861	17.5	18.7	19.3	56.6	6.4
	All Companies	14,465	263.5	330.5	290.3	885.5	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table C-12
1995 Top 25 IC Layout Software Companies, Worldwide, UNIX
(Revenue in Millions of Dollars, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Sun Microsystems	9,278	-	201.2	71.4	272.6	32.1
2	Cadence	-	118.5	-	123.3	241.9	28.5
3	Hewlett-Packard	2,767	-	72.7	9.7	82.4	9.7
4	Mentor Graphics	99	32.9	2.4	33.1	68.4	8.1
5	AVANT!	-	32.3	-	5.7	38.0	4.5
6	Seiko*	251	13.0	7.2	13.4	34.3	4.0
7	Compass Design Automation	-	27.8	-	5.6	33.4	3.9
8	Fujitsu	388	5.2	9.9	4.9	20.0	2.4
9	Okura*	-	17.0	-	-	17.0	2.0
10	IBM	602	-	15.2	1.3	16.5	1.9
11	Cascade Design Automation	-	7.9	-	6.2	14.2	1.7
12	Digital Equipment	333	-	11.3	1.9	13.2	1.6
13	High Level Design Systems	-	9.3	-	1.7	11.0	1.3
14	Silicon Valley Research	-	6.4	-	3.6	10.0	1.2
15	Xilinx Inc.	-	4.5	-	-	4.5	0.5
16	Cooper & Chyan Technology	-	3.1	-	0.8	3.9	0.5
17	Silicon Graphics	94	-	3.1	0.5	3.6	0.4
18	TSSI Japan*	-	2.5	-	-	2.5	0.3
19	Marubeni Hytech*	9	1.7	0.2	-	2.2	0.3
20	LSI Logic	2	1.3	0.1	0.3	1.7	0.2
21	Sagantec	-	1.2	-	0.1	1.3	0.2
22	Intergraph	4	0.3	0.1	0.2	0.6	0.1
23	Sony	30	-	0.3	-	0.6	0.1
24	AT&T	-	0.4	-	0.1	0.4	0
25	Tanner Research	-	0.2	-	0.1	0.3	0
	All N.A. Companies	12,287	240.7	287.3	265.5	793.6	93.5
	All European Companies	-	1.2	-	0.1	1.3	0.2
	All Asian Companies	678	16.7	17.6	18.3	53.7	6.3
	All Companies	12,965	258.6	304.9	283.9	848.6	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table C-13
1995 Top IC Layout Software Company, Worldwide, NT/Hybrid
(Revenue in Millions of Dollars, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Intergraph	32	1.7	0.4	1.1	3.2	103.0
	Other Companies	12	-	0.1	-	0.1	3.9
	All N.A. Companies	32	1.4	0.4	1.1	3.0	96.1
	All European Companies	-	-	-			-
	All Asian Companies	-	-	-			-
	All Companies	43	1.4	0.5	1.1	3.1	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table C-14
1995 Top Five IC Layout Software Companies, Worldwide, Personal Computer (Revenue in Millions of Dollars, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Fujitsu	183	1.1	1.1	1.0	3.2	38.9
2	Xilinx Inc.	-	1.4	-	-	1.4	17.2
3	Tanner Research	-	1.0	-	0.1	1.1	13.3
4	Intergraph	41	0.3	0.2	0.2	0.7	8.4
5	IBM	4	-	0	-	0	0.2
	Other Companies	1,015	-	2.2	-	2.2	26.4
	All N.A. Companies	44	2.7	0.2	0.3	3.2	38.5
	All European Companies	-	-	-			-
	All Asian Companies	183	0.8	1.1	1.0	2.9	35.1
	All Companies	1,243	3.5	3.5	1.3	8.3	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-81
1995 Top 30 PCB/MCM/Hybrid Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Zuken-Redac	52.0	54.7	60.1	9.8	22.6
2	Mentor Graphics	40.4	41.0	42.0	2.6	15.8
3	Yokogawa Digital Computer	35.9	21.0	23.6	12.4	8.9
4	CADIX	31.1	18.3	20.3	11.1	7.6
5	Fujitsu	12.9	14.6	16.9	15.8	6.3
6	Cadence	16.7	16.1	16.0	-0.6	6.0
7	PADS Software	9.1	9.7	12.1	24.9	4.6
8	Harris EDA	12.2	11.9	12.0	0.4	4.5
9	Cooper & Chyan Technology	5.2	7.4	11.1	49.4	4.2
10	Intergraph	9.6	6.9	7.9	14.3	3.0
11	Toshiba*	10.9	6.1	6.7	11.0	2.5
12	OrCAD EDA	3.3	4.0	5.3	32.7	2.0
13	Accel Technologies	2.6	3.3	5.0	53.7	1.9
14	NEC	8.6	8.5	4.5	-47.6	1.7
15	UniCAD	-	3.0	3.8	27.0	1.4
16	Protel Technology	-	2.7	3.6	33.3	1.4
17	C. Itoh Techno-Science*	3.5	3.9	3.4	-12.4	1.3
18	CAD-UL	3.3	2.7	3.4	26.1	1.3
19	Hitachi	3.0	3.1	3.3	6.4	1.2
20	Pacific Numerics	3.9	3.9	3.1	-21.3	1.2
21	Sharp*	2.8	2.5	2.7	8.4	1.0
22	ULTImate Technology	2.3	1.9	2.7	45.4	1.0
23	Altium*	9.9	9.7	2.7	-72.5	1.0
24	IBM	9.9	9.7	2.7	-72.5	1.0
25	Norlinvest Ltd.	1.8	1.9	1.9	1.9	0.7
26	Wacom	2.6	1.5	1.7	9.9	0.6
27	Uchida Yoko	4.6	1.4	1.6	12.5	0.6
28	Seiko*	-	-	1.3	NA	0.5
29	Sumisho Electronics*	1.2	1.3	1.3	0.6	0.5
30	TECHSPERT*	0.6	1.5	1.2	-18.9	0.4
	All N.A. Companies	111.7	116.6	118.2	1.4	44.5
	All European Companies	12.7	8.1	10.1	24.3	3.8
	All Asian Companies	120.0	129.1	137.5	6.5	51.7
	All Companies	244.4	253.9	265.8	4.7	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-82
1995 Top 29 PCB/MCM/Hybrid Software Companies, Worldwide, UNIX (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Zuken-Redac	49.2	52.7	57.1	8.3	26.7
2	Mentor Graphics	40.4	41.0	42.0	2.6	19.6
3	Yokogawa Digital Computer	35.9	21.0	23.6	12.4	11.0
4	CADIX	31.1	18.3	20.3	11.1	9.5
5	Fujitsu	12.3	13.8	16.0	15.8	7.5
6	Cadence	16.7	16.1	16.0	-0.6	7.5
7	Harris EDA	11.8	11.7	11.8	0.8	5.5
8	Cooper & Chyan Technology	5.1	5.3	7.8	47.3	3.6
9	Toshiba*	10.9	6.1	6.7	11.0	3.1
10	UniCAD	-	3.0	3.8	27.0	1.8
11	NEC	7.0	6.8	3.5	-48.3	1.6
12	C. Itoh Techno-Science*	3.3	3.8	3.2	-16.5	1.5
13	Pacific Numerics	3.6	3.6	3.1	-14.6	1.4
14	Sharp*	2.8	2.5	2.7	8.4	1.3
15	Hitachi	2.2	2.3	2.4	6.4	1.1
16	Uchida Yoko	3.9	1.4	1.6	12.5	0.8
17	Intergraph	8.8	4.8	1.2	-75.0	0.6
18	Royal Digital Centers	1.7	0.9	1.0	15.2	0.5
19	Sumisho Electronics*	0.8	0.9	0.9	11.0	0.4
20	Sophia Systems*	0.5	0.6	0.6	11.2	0.3
21	PADS Software	1.0	0.5	0.6	22.3	0.3
22	Omron	1.6	0.9	0.6	-31.4	0.3
23	CAD-UL	0.6	0.4	0.5	34.2	0.2
24	Century Research Center	0.8	0.4	0.4	11.0	0.2
25	AT&T	0.2	0.3	0.4	23.3	0.2
26	Accel Technologies	-	-	0.3	NA	0.1
27	ICL	0.2	0.2	0.2	11.8	0.1
28	Computervision	2.1	1.0	-	-100.0	-
29	Wacom	0.2	0.1	-	-100.0	-
	All N.A. Companies	86.1	84.2	82.9	-1.5	38.8
	All European Companies	3.0	0.6	0.7	20.7	0.3
	All Asian Companies	112.8	122.7	130.4	6.3	60.9
	All Companies	201.9	207.5	214.0	3.1	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-83
1995 Top Three PCB/MCM/Hybrid Software Companies, Worldwide, NT/Hybrid (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	PADS Software	-	6.8	9.7	42.9	67.6
2	Intergraph	-	1.3	5.6	335.3	39.3
3	Seiko*	-	-	1.3	NA	9.4
	All N.A. Companies	-	8.1	14.4	77.3	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	8.1	14.4	77.3	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-84
1995 Top 27 PCB/MCM/Hybrid Software Companies, Worldwide, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	OrCAD EDA	3.1	4.0	5.3	32.7	14.6
2	Accel Technologies	2.6	3.3	4.8	46.0	13.1
3	Protel Technology	-	2.7	3.6	33.3	9.9
4	Cooper & Chyan Technology	0.2	2.2	3.3	54.6	9.1
5	Zuken-Redac	2.8	2.0	3.0	51.0	8.3
6	CAD-UL	2.7	2.3	2.9	24.7	7.9
7	ULTImate Technology	2.3	1.9	2.7	45.4	7.4
8	Altium*	9.9	9.7	2.7	-72.5	7.3
9	IBM	9.9	9.7	2.7	-72.5	7.3
10	Norlinvest Ltd.	1.8	1.9	1.9	1.9	5.3
11	PADS Software	8.1	2.4	1.8	-25.0	5.0
12	Wacom	2.4	1.4	1.7	18.4	4.6
13	TECHSPERT*	0.6	1.5	1.2	-18.9	3.3
14	Intergraph	0.8	0.8	1.0	33.9	2.8
15	NEC	1.6	1.7	0.9	-44.5	2.6
16	ALS Design	0.8	0.6	0.8	41.6	2.2
17	Andor*	0.8	1.0	0.8	-16.6	2.2
18	Just In Time Systems	0.5	0.6	0.8	32.3	2.1
19	Hitachi	0.6	0.7	0.7	6.4	1.9
20	Number One Systems	-	0.4	0.4	4.7	1.1
21	Sumisho Electronics*	0.4	0.5	0.4	-19.1	1.0
22	Ziegler Informatics	2.5	0.3	0.4	9.5	1.0
23	Sophia Systems*	0.3	0.4	0.3	-18.1	0.8
24	ABB Industria*	0.2	0.2	0.2	12.1	0.6
25	Softdesk	0.1	0.1	0.1	-26.1	0.2
26	Pacific Numerics	0.3	0.3	-	-100.0	-
27	GRAPHSOFT	-	0	-	-100.0	-
	All N.A. Companies	25.3	24.1	20.8	-13.8	56.9
	All European Companies	9.4	7.6	9.4	24.6	25.8
	All Asian Companies	6.6	5.8	6.3	9.7	17.3
	All Companies	41.3	37.4	36.5	-2.4	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-85
1995 Top Four PCB/MCM/Hybrid Software Companies, Worldwide, Host/Proprietary (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Fujitsu	0.6	0.7	0.8	15.8	90.8
2	C. Itoh Techno-Science*	0.2	0.1	0.3	107.4	29.0
3	Harris EDA	0.4	0.3	0.2	-16.9	23.7
4	Hitachi	0.1	0.2	0.2	6.4	17.8
	All N.A. Companies	0.3	0.2	0.2	-20.9	17.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	0.6	0.7	0.8	10.8	83.0
	All Companies	1.2	0.9	0.9	3.7	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-86
1995 Top 24 PCB/MCM/Hybrid Software Companies, North America, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	25.6	24.2	22.7	-6.0	33.5
2	Cadence	7.5	7.7	8.0	4.4	11.8
3	Cooper & Chyan Technology	3.9	5.3	6.1	15.8	9.0
4	PADS Software	4.2	5.0	6.1	20.3	9.0
5	Intergraph	6.0	4.3	5.3	22.8	7.8
6	Harris EDA	5.0	4.6	5.0	8.2	7.4
7	OrCAD EDA	2.6	2.4	3.7	52.3	5.5
8	Accel Technologies	1.8	2.1	3.5	63.1	5.1
9	Zuken-Redac	3.4	4.3	3.1	-27.6	4.6
10	UniCAD	-	2.2	2.7	21.9	4.0
11	Protel Technology	-	1.3	1.8	33.3	2.6
12	Pacific Numerics	3.4	3.4	1.2	-63.6	1.8
13	CADIX	-	-	1.0	NA	1.5
14	Royal Digital Centers	1.3	0.8	0.9	19.4	1.4
15	AT&T	0.2	0.3	0.4	37.0	0.5
16	Altium*	1.4	1.1	0.3	-72.5	0.4
17	IBM	1.4	1.1	0.3	-72.5	0.4
18	Yokogawa Digital Computer	0.2	0.2	0.2	11.9	0.3
19	Norlinvest Ltd.	0.2	0.2	0.2	1.9	0.3
20	Softdesk	0.1	0.1	0.1	-16.2	0.1
21	ULTImate Technology	0	0.1	0.1	-3.3	0.1
22	Number One Systems	-	0	0	4.7	0.1
23	Computervision	1.1	0.7	-	-100.0	-
24	GRAPHSOFT	-	0	-	-100.0	-
	All N.A. Companies	60.5	61.8	63.2	2.3	93.2
	All European Companies	1.5	0.3	0.3	2.3	0.4
	All Asian Companies	3.6	4.5	4.4	-3.3	6.4
	All Companies	65.6	66.6	67.8	1.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-87
1995 Top 15 PCB/MCM/Hybrid Software Companies, North America, UNIX
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	25.6	24.2	22.7	-6.0	47.6
2	Cadence	7.5	7.7	8.0	4.4	16.8
3	Harris EDA	4.9	4.5	4.9	8.9	10.3
4	Cooper & Chyan Technology	3.8	3.7	4.3	14.1	9.0
5	Zuken-Redac	2.7	3.9	2.9	-27.1	6.0
6	UniCAD	-	2.2	2.7	21.9	5.7
7	Pacific Numerics	3.1	3.1	1.2	-60.0	2.6
8	CADIX	-	-	1.0	NA	2.1
9	Royal Digital Centers	1.3	0.8	0.9	19.4	2.0
10	Intergraph	5.5	3.0	0.8	-73.0	1.7
11	AT&T	0.2	0.3	0.4	37.0	0.8
12	PADS Software	0.5	0.3	0.3	20.3	0.6
13	Yokogawa Digital Computer	0.2	0.2	0.2	11.9	0.5
14	Accel Technologies	-	-	0.2	NA	0.4
15	Computervision	1.1	0.7	-	-100.0	-
	All N.A. Companies	50.1	47.7	43.6	-8.5	91.4
	All European Companies	-	-	-	NA	-
	All Asian Companies	2.9	4.1	4.1	-0.5	8.6
	All Companies	53.9	51.8	47.7	-7.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-88
1995 Top Two PCB/MCM/Hybrid Software Companies, North America, NT/Hybrid (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	PADS Software	-	3.5	4.9	37.5	60.8
2	Intergraph	-	0.8	3.8	367.3	47.7
	All N.A. Companies	-	4.3	8.0	83.8	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	4.3	8.0	83.8	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-89
1995 Top 15 PCB/MCM/Hybrid Software Companies, North America, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	OrCAD EDA	2.5	2.4	3.7	52.3	30.9
2	Accel Technologies	1.8	2.1	3.3	55.0	27.4
3	Cooper & Chyan Technology	0.1	1.5	1.8	19.8	15.2
4	Protel Technology	-	1.3	1.8	33.3	14.6
5	PADS Software	3.7	1.3	0.9	-27.8	7.6
6	Intergraph	0.5	0.5	0.7	40.2	5.7
7	Altium*	1.4	1.1	0.3	-72.5	2.4
8	IBM	1.4	1.1	0.3	-72.5	2.4
9	Zuken-Redac	0.7	0.4	0.3	-32.8	2.2
10	Norlinvest Ltd.	0.2	0.2	0.2	1.9	1.6
11	Softdesk	0.1	0.1	0.1	-16.2	0.5
12	ULTImate Technology	0	0.1	0.1	-3.3	0.4
13	Number One Systems	-	0	0	4.7	0.4
14	Pacific Numerics	0.3	0.3	-	-100.0	-
15	GRAPHSOFT	-	0	-	-100.0	-
	All N.A. Companies	10.3	9.7	11.5	19.4	95.6
	All European Companies	0.4	0.3	0.3	2.3	2.2
	All Asian Companies	0.7	0.4	0.3	-32.8	2.2
	All Companies	11.4	10.3	12.1	16.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-90
1995 Top PCB/MCM/Hybrid Software Company, North America, Host/Proprietary
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Harris EDA	0.1	0.1	0.1	-25.1	100.0
	All N.A. Companies	0.1	0.1	0.1	-25.1	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.3	0.1	0.1	-25.1	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-91
1995 Top 26 PCB/MCM/Hybrid Software Companies, Europe, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	9.1	10.3	13.0	25.9	30.6
2	Zuken-Redac	9.5	7.4	6.5	-11.6	15.4
3	Harris EDA	4.0	3.7	3.3	-10.1	7.9
4	CAD-UL	3.0	2.5	3.2	28.5	7.6
5	Cadence	3.2	3.0	2.8	-7.2	6.6
6	Cooper & Chyan Technology	0.1	0.7	2.8	273.6	6.5
7	ULTImate Technology	1.8	1.6	2.5	55.1	5.9
8	PADS Software	1.1	1.5	1.8	20.8	4.2
9	Intergraph	2.5	1.8	1.7	-4.1	4.0
10	Norlinvest Ltd.	1.3	1.3	1.3	1.9	3.1
11	OrCAD EDA	0.3	1.0	0.9	-18.3	2.0
12	ALS Design	0.8	0.6	0.8	41.6	1.9
13	Protel Technology	-	0.6	0.8	33.3	1.9
14	Just In Time Systems	0.5	0.6	0.8	32.3	1.8
15	Accel Technologies	0.4	0.5	0.6	22.9	1.4
16	Altium*	2.0	1.7	0.5	-72.5	1.1
17	IBM	2.0	1.7	0.5	-72.5	1.1
18	Ziegler Informatics	2.4	0.3	0.4	9.5	0.9
19	Number One Systems	-	0.3	0.3	4.7	0.8
20	Pacific Numerics	0.5	0.5	0.3	-41.5	0.7
21	ABB Industria*	0.2	0.2	0.2	12.1	0.5
22	UniCAD	-	0.7	0.2	-74.6	0.4
23	ICL	0.2	0.2	0.2	11.8	0.4
24	Computervision	0.9	0.3	-	-100.0	-
25	Softdesk	0	0	-	-100.0	-
26	GRAPHSOFT	-	0	-	-100.0	-
	All N.A. Companies	24.1	25.9	26.7	2.9	62.9
	All European Companies	8.9	7.1	9.2	29.9	21.7
	All Asian Companies	9.5	7.4	6.5	-11.6	15.4
	All Companies	42.5	40.4	42.4	4.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-92
1995 Top 13 PCB/MCM/Hybrid Software Companies, Europe, UNIX
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	9.1	10.3	13.0	25.9	48.6
2	Zuken-Redac	7.4	6.2	5.4	-13.3	20.2
3	Harris EDA	3.8	3.6	3.2	-10.4	12.1
4	Cadence	3.2	3.0	2.8	-7.2	10.5
5	Cooper & Chyan Technology	0.1	0.5	1.9	268.3	7.3
6	CAD-UL	0.5	0.4	0.5	28.5	1.8
7	Pacific Numerics	0.5	0.5	0.3	-41.5	1.2
8	Intergraph	2.4	1.2	0.3	-79.2	1.0
9	UniCAD	-	0.7	0.2	-74.6	0.7
10	ICL	0.2	0.2	0.2	11.8	0.6
11	PADS Software	0.1	0.1	0.1	20.8	0.3
12	Accel Technologies	-	-	0	NA	0.1
13	Computervision	0.9	0.3	-	-100.0	-
	All N.A. Companies	20.0	20.0	20.7	3.3	77.4
	All European Companies	1.0	0.5	0.7	23.7	2.4
	All Asian Companies	7.4	6.2	5.4	-13.3	20.2
	All Companies	28.3	26.7	26.7	-0.2	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-93
1995 Top Two PCB/MCM/Hybrid Software Companies, Europe, NT/Hybrid (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	PADS Software	-	1.0	1.4	38.1	58.8
2	Intergraph	-	0.3	1.2	259.8	50.1
	All N.A. Companies	-	1.4	2.4	77.0	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	1.4	2.4	77.0	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-94
1995 Top 19 PCB/MCM/Hybrid Software Companies, Europe, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	CAD-UL	2.5	2.1	2.7	28.5	20.6
2	ULTImate Technology	1.8	1.6	2.5	55.1	18.8
3	Norlinvest Ltd.	1.3	1.3	1.3	1.9	10.0
4	Zuken-Redac	2.1	1.2	1.2	-3.2	8.8
5	OrCAD EDA	0.3	1.0	0.9	-18.3	6.4
6	Cooper & Chyan Technology	0	0.2	0.8	286.5	6.3
7	ALS Design	0.8	0.6	0.8	41.6	6.2
8	Protel Technology	-	0.6	0.8	33.3	6.0
9	Just In Time Systems	0.5	0.6	0.8	32.3	5.7
10	Accel Technologies	0.4	0.5	0.6	16.8	4.3
11	Altium*	2.0	1.7	0.5	-72.5	3.6
12	IBM	2.0	1.7	0.5	-72.5	3.6
13	Ziegler Informatics	2.4	0.3	0.4	9.5	2.7
14	Number One Systems	-	0.3	0.3	4.7	2.5
15	PADS Software	1.0	0.4	0.3	-27.5	2.0
16	Intergraph	0.2	0.2	0.2	20.0	1.8
17	ABB Industria*	0.2	0.2	0.2	12.1	1.7
18	Softdesk	0	0	-	-100.0	-
19	GRAPHSOFT	-	0	-	-100.0	-
	All N.A. Companies	4.0	4.5	3.6	-21.1	26.9
	All European Companies	7.9	6.5	8.5	30.4	64.3
	All Asian Companies	2.1	1.2	1.2	-3.2	8.8
	All Companies	14.1	12.3	13.3	8.1	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-95
1995 Top PCB/MCM/Hybrid Software Company, Europe, Host/Proprietary (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Harris EDA	0.2	0.1	0.1	-1.8	251.2
	All N.A. Companies	0.1	0	0	2.5	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.1	0	0	2.5	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-96
1995 Top 30 PCB/MCM/Hybrid Software Companies, Japan, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Zuken-Redac	36.7	39.9	46.1	15.6	33.1
2	Yokogawa Digital Computer	17.5	20.1	22.5	11.9	16.2
3	CADIX	15.5	18.3	18.3	0	13.1
4	Fujitsu	12.9	14.6	16.9	15.8	12.1
5	Toshiba*	5.8	6.1	6.7	11.0	4.8
6	NEC	8.6	8.5	4.5	-47.6	3.2
7	Cadence	4.2	4.1	3.8	-7.5	2.8
8	Harris EDA	2.8	3.2	3.6	11.2	2.6
9	C. Itoh Techno-Science*	3.5	3.9	3.4	-12.4	2.5
10	Hitachi	3.0	3.1	3.3	6.4	2.4
11	PADS Software	3.4	2.3	3.0	31.1	2.2
12	Mentor Graphics	2.5	3.2	2.7	-14.3	2.0
13	Sharp*	2.3	2.0	2.2	8.4	1.6
14	Cooper & Chyan Technology	1.1	1.3	2.0	58.2	1.4
15	Altium*	6.0	6.2	1.7	-72.5	1.2
16	IBM	6.0	6.2	1.7	-72.5	1.2
17	Wacom	1.3	1.5	1.7	9.9	1.2
18	Uchida Yoko	2.3	1.4	1.6	12.5	1.2
19	Seiko*	-	-	1.3	NA	1.0
20	Sumisho Electronics*	1.2	1.3	1.3	0.6	0.9
21	TECHSPERT*	0.6	1.5	1.2	-18.9	0.9
22	Pacific Numerics	-	-	0.9	NA	0.7
23	Sophia Systems*	0.8	0.9	0.9	-0.4	0.7
24	Andor*	0.8	1.0	0.8	-16.6	0.6
25	UniCAD	-	-	0.7	NA	0.5
26	Intergraph	0.7	0.6	0.7	11.2	0.5
27	Omron	0.8	0.9	0.6	-31.4	0.4
28	Century Research Center	0.4	0.4	0.4	11.0	0.3
29	Protel Technology	-	0.3	0.4	33.3	0.3
30	OrCAD EDA	0.2	0.3	0.4	32.7	0.3
	All N.A. Companies	20.0	21.1	19.2	-9.1	13.8
	All European Companies	1.8	0.3	0.1	-62.6	0.1
	All Asian Companies	103.6	113.0	120.0	6.2	86.2
	All Companies	125.3	134.3	139.3	3.7	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-97
1995 Top 25 PCB/MCM/Hybrid Software Companies, Japan, UNIX
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Zuken-Redac	36.7	39.8	44.8	12.7	35.2
2	Yokogawa Digital Computer	17.5	20.1	22.5	11.9	17.7
3	CADIX	15.5	18.3	18.3	0	14.3
4	Fujitsu	12.3	13.8	16.0	15.8	12.6
5	Toshiba*	5.8	6.1	6.7	11.0	5.3
6	Cadence	4.2	4.1	3.8	-7.5	3.0
7	Harris EDA	2.8	3.2	3.6	11.4	2.8
8	NEC	7.0	6.8	3.5	-48.3	2.8
9	C. Itoh Techno-Science*	3.3	3.8	3.2	-16.5	2.5
10	Mentor Graphics	2.5	3.2	2.7	-14.3	2.2
11	Hitachi	2.2	2.3	2.4	6.4	1.9
12	Sharp*	2.3	2.0	2.2	8.4	1.7
13	Uchida Yoko	2.0	1.4	1.6	12.5	1.3
14	Cooper & Chyan Technology	1.0	0.9	1.4	56.0	1.1
15	Sumisho Electronics*	0.8	0.9	0.9	11.0	0.7
16	Pacific Numerics	-	-	0.9	NA	0.7
17	UniCAD	-	-	0.7	NA	0.5
18	Sophia Systems*	0.5	0.6	0.6	11.2	0.5
19	Omron	0.8	0.9	0.6	-31.4	0.5
20	Century Research Center	0.4	0.4	0.4	11.0	0.3
21	PADS Software	0.4	0.1	0.2	31.1	0.1
22	Intergraph	0.7	0.4	0.1	-76.8	0.1
23	Accel Technologies	-	-	0	NA	0
24	Wacom	0.1	0.1	-	-100.0	-
25	AT&T	-	0	-	-100.0	-
	All N.A. Companies	10.5	11.4	12.7	11.3	10.0
	All European Companies	1.0	0	-	-100.0	-
	All Asian Companies	99.1	108.4	114.6	5.7	90.0
	All Companies	110.6	119.8	127.3	6.3	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-98
1995 Top Three PCB/MCM/Hybrid Software Companies, Japan, NT/Hybrid (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	PADS Software	-	1.6	2.4	49.8	86.0
2	Seiko*	-	-	1.3	NA	48.0
3	Intergraph	-	0.1	0.5	330.0	17.0
	All N.A. Companies	-	1.7	2.8	62.9	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	1.7	2.8	62.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-99
1995 Top 21 PCB/MCM/Hybrid Software Companies, Japan, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Altium*	6.0	6.2	1.7	-72.5	20.4
2	IBM	6.0	6.2	1.7	-72.5	20.4
3	Wacom	1.2	1.4	1.7	18.4	20.1
4	Zuken-Redac	-	0.1	1.3	1244.5	15.2
5	TECHSPERT*	0.6	1.5	1.2	-18.9	14.3
6	NEC	1.6	1.7	0.9	-44.5	11.3
7	Andor*	0.8	1.0	0.8	-16.6	9.6
8	Hitachi	0.6	0.7	0.7	6.4	8.3
9	Cooper & Chyan Technology	0	0.4	0.6	63.7	7.2
10	PADS Software	3.0	0.6	0.5	-21.4	5.4
11	Protel Technology	-	0.3	0.4	33.3	5.2
12	OrCAD EDA	0.2	0.3	0.4	32.7	5.1
13	Sumisho Electronics*	0.4	0.5	0.4	-19.1	4.4
14	Sophia Systems*	0.3	0.4	0.3	-18.1	3.6
15	Accel Technologies	0.3	0.3	0.3	-12.4	3.4
16	Intergraph	0.1	0.1	0.1	23.0	1.0
17	ULTImate Technology	0.4	0.1	0.1	-63.8	0.7
18	Norlinvest Ltd.	0	0	0	1.9	0.3
19	Softdesk	0	0	0	-19.5	0
20	CAD-UL	0.1	0.1	-	-100.0	-
21	GRAPHSOFT	-	0	-	-100.0	-
	All N.A. Companies	9.5	8.0	3.7	-53.9	44.0
	All European Companies	0.6	0.2	0.1	-61.1	1.1
	All Asian Companies	3.8	3.9	4.6	18.5	54.8
	All Companies	13.9	12.1	8.3	-30.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-100
1995 Top Four PCB/MCM/Hybrid Software Companies, Japan, Host/Proprietary (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Fujitsu	0.6	0.7	0.8	15.8	103.7
2	C. Itoh Techno-Science*	0.2	0.1	0.3	107.4	33.2
3	Hitachi	0.1	0.2	0.2	6.4	20.3
4	Harris EDA	0.1	0	0	-5.8	5.2
	All N.A. Companies	0.1	0	0	-5.8	5.2
	All European Companies	-	-	-	NA	-
	All Asian Companies	0.6	0.7	0.8	10.8	94.8
	All Companies	0.8	0.7	0.8	9.8	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-101
1995 Top 21 PCB/MCM/Hybrid Software Companies, Asia/Pacific, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Zuken-Redac	2.5	3.1	4.3	39.5	28.4
2	Mentor Graphics	3.1	3.3	3.6	8.6	23.5
3	Cadence	1.7	1.2	1.3	10.2	8.4
4	PADS Software	0.3	0.7	1.1	48.3	7.0
5	CADIX	-	-	1.0	NA	6.6
6	Yokogawa Digital Computer	0.7	0.6	0.8	27.4	5.2
7	Pacific Numerics	-	-	0.6	NA	4.1
8	Protel Technology	-	0.5	0.6	33.3	4.0
9	Sharp*	0.6	0.5	0.5	8.4	3.6
10	Accel Technologies	0.1	0.2	0.5	130.5	3.0
11	Norlinvest Ltd.	0.3	0.3	0.3	1.9	1.9
12	Cooper & Chyan Technology	0.1	0.1	0.2	49.4	1.5
13	UniCAD	-	-	0.2	NA	1.2
14	Altium*	0.6	0.7	0.2	-72.5	1.2
15	IBM	0.6	0.7	0.2	-72.5	1.2
16	CAD-UL	0.2	0.1	0.2	52.3	1.2
17	Intergraph	0.2	0.1	0.2	14.6	1.1
18	Royal Digital Centers	0.2	0.1	0.1	68.7	0.6
19	ULTImate Technology	0.1	0	0.1	45.0	0.4
20	Harris EDA	0.3	0.3	-	-100.0	-
21	Softdesk	0	0	-	-100.0	-
	All N.A. Companies	6.5	7.1	8.3	17.3	54.2
	All European Companies	0.4	0.4	0.4	-0.3	2.6
	All Asian Companies	3.4	4.2	6.6	55.7	43.2
	All Companies	10.3	11.7	15.3	30.6	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-102
1995 Top 15 PCB/MCM/Hybrid Software Companies, Asia/Pacific, UNIX
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Zuken-Redac	2.5	2.8	4.0	43.1	33.0
2	Mentor Graphics	3.1	3.3	3.6	8.6	29.4
3	Cadence	1.7	1.2	1.3	10.2	10.5
4	CADIX	-	-	1.0	NA	8.3
5	Yokogawa Digital Computer	0.7	0.6	0.8	27.4	6.6
6	Pacific Numerics	-	-	0.6	NA	5.1
7	Sharp*	0.6	0.5	0.5	8.4	4.5
8	UniCAD	-	-	0.2	NA	1.5
9	Cooper & Chyan Technology	0.1	0.1	0.2	47.3	1.3
10	Royal Digital Centers	0.2	0.1	0.1	68.7	0.7
11	PADS Software	0	0	0.1	88.0	0.4
12	CAD-UL	0	0	0	169.9	0.3
13	Intergraph	0.2	0.1	0	-76.8	0.2
14	Accel Technologies	-	-	0	NA	0.2
15	Harris EDA	0.2	0.3	-	-100.0	-
	All N.A. Companies	5.3	5.0	5.9	18.8	48.3
	All European Companies	0	0	0	23.2	0.2
	All Asian Companies	3.4	3.9	6.3	59.5	51.5
	All Companies	8.8	8.9	12.2	36.8	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-103
1995 Top Two PCB/MCM/Hybrid Software Companies, Asia/Pacific, NT/Hybrid (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	PADS Software	-	0.5	0.9	67.6	89.7
2	Intergraph	-	0	0.1	394.8	12.5
	All N.A. Companies	-	0.5	1.0	76.4	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	0.5	1.0	76.4	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-104
1995 Top 12 PCB/MCM/Hybrid Software Companies, Asia/Pacific, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Protel Technology	-	0.5	0.6	33.3	28.7
2	Accel Technologies	0.1	0.2	0.4	119.0	20.2
3	Zuken-Redac	-	0.3	0.3	5.6	14.9
4	Norlinvest Ltd.	0.3	0.3	0.3	1.9	13.7
5	Altium*	0.6	0.7	0.2	-72.5	8.7
6	IBM	0.6	0.7	0.2	-72.5	8.7
7	PADS Software	0.3	0.2	0.2	-12.0	7.5
8	CAD-UL	0.1	0.1	0.1	34.9	6.7
9	Cooper & Chyan Technology	0	0	0.1	54.6	3.1
10	ULTImate Technology	0.1	0	0.1	45.0	2.5
11	Intergraph	0	0	0	61.1	0.9
12	Softdesk	0	0	-	-100.0	-
	All N.A. Companies	1.1	1.6	1.4	-6.8	67.8
	All European Companies	0.4	0.4	0.4	-1.4	17.3
	All Asian Companies	-	0.3	0.3	5.6	14.9
	All Companies	1.5	2.2	2.1	-4.2	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-105
1995 Top 13 PCB/MCM/Hybrid Software Companies, Rest of World, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	OrCAD EDA	0	0.2	0.3	59.3	30.8
2	PADS Software	0.1	0.2	0.2	13.1	21.1
3	Accel Technologies	0.1	0.1	0.2	53.7	19.4
4	Norlinvest Ltd.	0.1	0.1	0.1	1.9	8.5
5	Harris EDA	0.1	0.1	0.1	-25.1	7.2
6	Cadence	0.1	0.1	0.1	-23.1	6.1
7	ULTImate Technology	0	0	0.1	326.4	5.2
8	Intergraph	0.1	0.1	0.1	-23.1	5.1
9	Number One Systems	-	0	0	4.7	1.1
10	Softdesk	0	0	0	6.3	0.1
11	Royal Digital Centers	0.1	0.1	-	-100.0	-
12	CAD-UL	0	0	-	-100.0	-
13	GRAPHSOFT	-	0	-	-100.0	-
	All N.A. Companies	0.5	0.7	0.9	20.5	85.7
	All European Companies	0.1	0.1	0.1	7.7	14.3
	All Asian Companies	-	-	-	NA	-
	All Companies	0.7	0.9	1.0	18.5	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-106
1995 Top Six PCB/MCM/Hybrid Software Companies, Rest of World, UNIX
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Harris EDA	0.1	0.1	0.1	-25.1	75.4
2	Cadence	0.1	0.1	0.1	-23.1	63.5
3	Intergraph	0.1	0.1	0	-78.6	11.9
4	Accel Technologies	-	-	0	NA	10.2
5	Royal Digital Centers	0.1	0.1	-	-100.0	-
6	PADS Software	0	0	-	-100.0	-
	All N.A. Companies	0.3	0.2	0.1	-51.2	100.0
	All European Companies	0	0	-	-100.0	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.3	0.2	0.1	-52.2	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-107
1995 Top Two PCB/MCM/Hybrid Software Companies, Rest of World, NT/Hybrid (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	PADS Software	-	0.1	0.2	42.9	79.4
2	Intergraph	-	0	0	200.2	16.9
	All N.A. Companies	-	0.1	0.2	59.6	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	0.1	0.2	59.6	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-108
1995 Top 10 PCB/MCM/Hybrid Software Companies, Rest of World, Personal Computer (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	OrCAD EDA	0	0.2	0.3	59.3	45.2
2	Accel Technologies	0.1	0.1	0.2	46.0	27.1
3	Norlinvest Ltd.	0.1	0.1	0.1	1.9	12.5
4	ULTImate Technology	0	0	0.1	326.4	7.7
5	PADS Software	0.1	0	0	-25.0	4.9
6	Number One Systems	-	0	0	4.7	1.6
7	Intergraph	0	-	0	NA	0.2
8	Softdesk	0	0	0	6.3	0.1
9	CAD-UL	0	0	-	-100.0	-
10	GRAPHSOFT	-	0	-	-100.0	-
	All N.A. Companies	0.2	0.4	0.6	43.4	79.0
	All European Companies	0.1	0.1	0.1	11.0	21.0
	All Asian Companies	-	-	-	NA	-
	All Companies	0.4	0.5	0.7	35.1	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table B-4
All PCB/MCM/Hybrid Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	ABB Industria*	0.2	0.2	0.2	12.1	0.1
2	Accel Technologies	2.6	3.3	5.0	53.7	1.9
3	ALS Design	0.8	0.6	0.8	41.6	0.3
4	Altium*	9.9	9.7	2.7	-72.5	1.0
5	Andor*	0.8	1.0	0.8	-16.6	0.3
6	AT&T	0.2	0.3	0.4	23.3	0.1
7	C. Itoh Techno-Science*	3.5	3.9	3.4	-12.4	1.3
8	CAD-UL	3.3	2.7	3.4	26.1	1.3
9	Cadence	16.7	16.1	16.0	-0.6	6.0
10	CADIX	31.1	18.3	20.3	11.1	7.6
11	Century Research Center	0.8	0.4	0.4	11.0	0.2
12	Computervision	2.1	1.0	-	-100.0	-
13	Cooper & Chyan Technology	5.2	7.4	11.1	49.4	4.2
14	Fujitsu	12.9	14.6	16.9	15.8	6.3
15	GRAPHSOFT	-	0	-	-100.0	-
16	Harris EDA	12.2	11.9	12.0	0.4	4.5
17	Hitachi	3.0	3.1	3.3	6.4	1.2
18	IBM	9.9	9.7	2.7	-72.5	1.0
19	ICL	0.2	0.2	0.2	11.8	0.1
20	Intergraph	9.6	6.9	7.9	14.3	3.0
21	Just In Time Systems	0.5	0.6	0.8	32.3	0.3
22	Mentor Graphics	40.4	41.0	42.0	2.6	15.8
23	NEC	8.6	8.5	4.5	-47.6	1.7
24	Norlinvest Ltd.	1.8	1.9	1.9	1.9	0.7
25	Number One Systems	-	0.4	0.4	4.7	0.1
26	Omron	1.6	0.9	0.6	-31.4	0.2
27	OrCAD EDA	3.3	4.0	5.3	32.7	2.0
28	Pacific Numerics	3.9	3.9	3.1	-21.3	1.2
29	PADS Software	9.1	9.7	12.1	24.9	4.6
30	Protel Technology	-	2.7	3.6	33.3	1.4
31	Royal Digital Centers	1.7	0.9	1.0	15.2	0.4
32	Seiko*	-	-	1.3	NA	0.5
33	Sharp*	2.8	2.5	2.7	8.4	1.0
34	Softdesk	0.1	0.1	0.1	-26.1	0
35	Sophia Systems*	0.8	0.9	0.9	-0.4	0.3
36	Sumisho Electronics*	1.2	1.3	1.3	0.6	0.5
37	TECHSPERT*	0.6	1.5	1.2	-18.9	0.4
38	Toshiba*	10.9	6.1	6.7	11.0	2.5
39	Uchida Yoko	4.6	1.4	1.6	12.5	0.6

(Continued)

Table B-4 (Continued)
All PCB/MCM/Hybrid Software Companies, Worldwide, All Operating Systems
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
40	ULTImate Technology	2.3	1.9	2.7	45.4	1.0
41	UniCAD	-	3.0	3.8	27.0	1.4
42	Wacom	2.6	1.5	1.7	9.9	0.6
43	Yokogawa Digital Computer	35.9	21.0	23.6	12.4	8.9
44	Ziegler Informatics	2.5	0.3	0.4	9.5	0.1
45	Zuken-Redac	52.0	54.7	60.1	9.8	22.6
	All N.A. Companies	111.7	116.6	118.2	1.4	44.5
	All European Companies	12.7	8.1	10.1	24.3	3.8
	All Asian Companies	120.0	129.1	137.5	6.5	51.7
	All Companies	244.4	253.9	265.8	4.7	100.0

NA = Not applicable
Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table C-15
1995 Top 30 PCB/MCM/Hybrid Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Hewlett-Packard	7,001	-	114.0	23.3	137.3	16.6
2	Zuken-Redac	1,171	60.1	19.3	39.7	123.0	14.9
3	Sun Microsystems	5,185	-	93.9	25.0	119.0	14.4
4	Mentor Graphics	124	42.0	3.0	42.6	87.6	10.6
5	Fujitsu	1,150	16.9	29.3	15.7	61.9	7.5
6	Yokogawa Digital Computer	340	23.6	12.8	5.5	41.8	5.0
7	CADIX	81	20.3	4.7	5.5	35.0	4.2
8	Cadence	-	16.0	-	16.6	32.6	3.9
9	Digital Equipment	2,409	-	21.1	2.9	24.0	2.9
10	Harris EDA	51	12.0	1.0	6.5	19.4	2.3
11	NEC	879	4.5	7.3	1.9	17.7	2.1
12	Intergraph	347	7.9	2.1	5.2	15.5	1.9
13	Toshiba*	177	6.7	5.9	1.5	15.4	1.9
14	PADS Software	-	12.1	-	3.2	15.3	1.9
15	Cooper & Chyan Technology	-	11.1	-	2.7	13.8	1.7
16	Sharp*	80	2.7	7.6	2.7	13.1	1.6
17	IBM	900	2.7	7.2	0.6	10.4	1.3
18	Hitachi	213	3.3	3.2	0.8	7.3	0.9
19	Sumisho Electronics*	64	1.3	2.1	-	7.3	0.9
20	Accel Technologies	-	5.0	-	2.2	7.2	0.9
21	OrCAD EDA	-	5.3	-	1.5	6.8	0.8
22	C. Itoh Techno-Science*	-	3.4	1.6	1.2	6.6	0.8
23	Altium*	1,113	2.7	3.4	0.1	6.2	0.8
24	Sony	235	-	2.1	-	4.6	0.6
25	UniCAD	-	3.8	-	0.8	4.6	0.6
26	Uchida Yoko	184	1.6	1.9	0.4	4.5	0.5
27	Protel Technology	-	3.6	-	-	3.6	0.4
28	CAD-UL	-	3.4	-	-	3.3	0.4
29	Pacific Numerics	-	3.1	-	-	3.1	0.4
30	ULTImate Technology	-	2.7	-	-	2.7	0.3
	Other Companies	10,058	-	30.2	0.5	38.0	4.6
	All N.A. Companies	12,467	118.2	194.7	133.4	446.9	54.0
	All European Companies	58	10.1	0.4	0.4	11.1	1.3
	All Asian Companies	4,707	137.5	99.9	76.5	331.0	40.0
	All Companies	27,291	265.8	325.1	210.8	827.0	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table C-16
1995 Top 30 PCB/MCM/Hybrid Software Companies, Worldwide, UNIX
(Revenue in Millions of Dollars, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Hewlett-Packard	5,983	-	111.0	22.7	133.7	19.4
2	Sun Microsystems	5,185	-	93.9	25.0	119.0	17.3
3	Zuken-Redac	1,171	57.1	19.3	36.6	116.9	17.0
4	Mentor Graphics	124	42.0	3.0	42.6	87.6	12.7
5	Fujitsu	1,150	16.0	29.3	15.0	60.3	8.8
6	Yokogawa Digital Computer	340	23.6	12.8	5.5	41.8	6.1
7	CADIX	81	20.3	4.7	5.5	35.0	5.1
8	Cadence	-	16.0	-	16.6	32.6	4.7
9	Harris EDA	49	11.8	0.9	6.5	19.2	2.8
10	Toshiba*	177	6.7	5.9	1.5	15.4	2.2
11	Sharp*	80	2.7	7.6	2.7	13.1	1.9
12	NEC	351	3.5	4.7	1.4	13.0	1.9
13	Cooper & Chyan Technology	-	7.8	-	1.9	9.7	1.4
14	C. Itoh Techno-Science*	-	3.2	1.5	1.1	6.1	0.9
15	Digital Equipment	292	-	4.9	0.8	5.8	0.8
16	Sumisho Electronics*	12	0.9	1.6	-	5.5	0.8
17	Hitachi	111	2.4	2.4	0.6	5.4	0.8
18	IBM	186	-	4.8	0.4	5.2	0.8
19	Sony	235	-	2.1	-	4.6	0.7
20	UniCAD	-	3.8	-	0.8	4.6	0.7
21	Uchida Yoko	149	1.6	1.9	0.4	4.3	0.6
22	Pacific Numerics	-	3.1	-	-	3.1	0.5
23	Intergraph	19	1.2	0.3	0.5	2.1	0.3
24	Silicon Graphics	61	-	1.7	0.3	2.0	0.3
25	Royal Digital Centers	-	1.0	-	0.1	1.1	0.2
26	Century Research Center	8	0.4	0.3	0.1	1.1	0.2
27	Omron	6	0.6	0.3	0.1	1.0	0.1
28	Sophia Systems*	5	0.6	0.1	-	0.8	0.1
29	PADS Software	-	0.6	-	0.2	0.8	0.1
30	Wacom	2	-	-	-	-	-
	All N.A. Companies	9,015	82.9	173.6	118.7	375.3	54.5
	All European Companies	14	0.7	0.3	0	1.0	0.1
	All Asian Companies	3,912	130.4	94.8	70.7	312.0	45.3
	All Companies	12,941	214.0	268.6	189.4	688.3	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table C-17
1995 Top Four PCB/MCM/Hybrid Software Companies, Worldwide, NT/Hybrid (Revenue in Millions of Dollars, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	PADS Software	-	9.7	-	2.5	12.2	41.2
2	Intergraph	178	5.6	1.2	3.8	10.8	36.3
3	Seiko*	-	1.3	0.3	0.8	2.5	8.3
4	Digital Equipment	53	-	0.6	0.1	0.7	2.4
	Other Companies	557	-	5.6	-	5.6	18.9
	All N.A. Companies	231	14.4	1.8	6.4	23	77.3
	All European Companies	-	-	-			-
	All Asian Companies	-	-	0.3	0.8	1.1	3.8
	All Companies	788	14.4	7.7	7.2	29.7	100

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table C-18
1995 Top 28 PCB/MCM/Hybrid Software Companies, Worldwide, Personal Computer (Revenue in Millions of Dollars, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Accel Technologies	-	4.8	-	2.1	6.8	8.0
2	OrCAD EDA	-	5.3	-	1.5	6.8	8.0
3	Altium*	1,113	2.7	3.4	0.1	6.2	7.3
4	Zuken-Redac	-	3.0	-	3.1	6.1	7.2
5	Digital Equipment	1,958	-	5.3	0.2	5.5	6.5
6	IBM	714	2.7	2.4	0.1	5.2	6.1
7	NEC	528	0.9	2.6	0.4	4.7	5.5
8	Cooper & Chyan Technology	-	3.3	-	0.8	4.1	4.9
9	Protel Technology	-	3.6	-	-	3.6	4.2
10	Hewlett-Packard	1,019	-	3.0	0.5	3.6	4.2
11	CAD-UL	-	2.9	-	-	2.8	3.3
12	ULTImate Technology	-	2.7	-	-	2.7	3.2
13	Wacom	51	1.7	0.4	0.3	2.4	2.8
14	Intergraph	151	1.0	0.6	0.6	2.3	2.7
15	PADS Software	-	1.8	-	0.5	2.3	2.7
16	Norlinvest Ltd.	20	1.9	0.1	0.2	2.2	2.6
17	TECHSPERT*	6	1.2	0	0.3	1.8	2.1
18	Sumisho Electronics*	52	0.4	0.5	-	1.8	2.1
19	Hitachi	78	0.7	0.7	0.2	1.5	1.8
20	Andor*	16	0.8	0.2	-	1.2	1.4
21	ALS Design	8	0.8	0	0.1	1.0	1.2
22	Just In Time Systems	-	0.8	-	-	0.8	0.9
23	ABB Industria*	18	0.2	-	0	0.7	0.8
24	Sophia Systems*	4	0.3	0.1	-	0.5	0.6
25	Number One Systems	-	0.4	-	-	0.4	0.5
26	Ziegler Informatics	-	0.4	-	-	0.4	0.4
27	Uchida Yoko	36	-	-	-	0.2	0.2
28	Softdesk	-	0.1	-	0	0.1	0.1
	Other Companies	9,491	-	22.5	-	22.5	26.3
	All N.A. Companies	3,120	20.8	9.6	6.4	36.8	43.1
	All European Companies	45	9.4	0.1	0.3	10.1	11.8
	All Asian Companies	770	6.3	4.5	4.2	16.0	18.7
	All Companies	13,426	36.5	36.7	10.9	85.3	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table C-19
1995 Top Six PCB/MCM/Hybrid Software Companies, Worldwide, Host/Proprietary (Revenue in $M, Actual Units)

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1995 Share of Market (%)
1	Digital Equipment	106	-	10.3	1.7	12.0	50.7
2	Fujitsu	-	0.8	-	0.7	1.5	6.5
3	C. Itoh Techno-Science*	-	0.3	0.1	0.1	0.5	2.2
4	Hitachi	25	0.2	0.2	0	0.4	1.5
5	Intergraph	-	-	-	0.2	0.2	1.0
6	Harris EDA	2	0.2	0	-	0.2	0.8
	Other Companies	10	-	2.1	0.5	9.9	42.0
	All N.A. Companies	101	0.2	9.7	2.0	11.8	49.9
	All European Companies	-	-	-	-	-	-
	All Asian Companies	25	0.8	0.3	0.8	1.9	8.0
	All Companies	135	0.9	12.0	3.3	23.7	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

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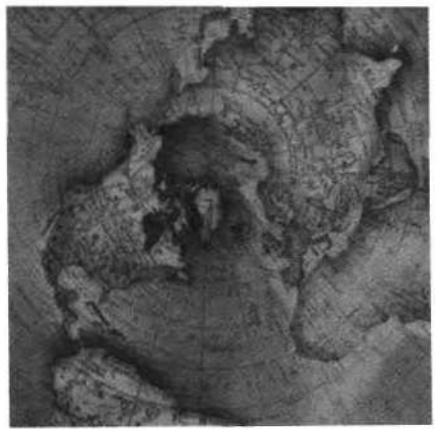

Dataquest

1995 Electronic Design Automation Europe Forecast Update

Market Statistics

Program: Electronic Design Automation Europe
Product Code: CEDA-EU-MS-9602
Publication Date: September 30, 1996
Filing: Market Statistics

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Note: All tables show estimated data.

Chapter 1
1995 Electronic Design Automation Europe Forecast Update

About This Document

This document contains Dataquest's detailed forecast information on the mechanical CAD/CAM/CAE markets at the country level. This report is meant to supplement your worldwide mechanical CAD/CAM/CAE forecast book by providing mechanical CAD/CAM/CAE forecast detail for European countries.

Although Dataquest does not forecast currency exchange rates, we do forecast with the best information available. The exchange rate is calculated as the simple arithmetic mean of the 12 average monthly rates for each country. For the purpose of this forecast, Dataquest assumes the July exchange rate will remain stable in the future (see Tables 1 and 2).

Additional market statistics publications for Dataquest's CAD/CAM/CAE and GIS services for 1996 are as follows:

Dataquest's 1995 Market Share document (published as CAEC-WW-MS-9601, CEDA-WW-MS-9601, and CMEC-WW-MS-9601) was sent to our clients in March.

Dataquest's 1995 forecast documents were released in May (published as CAEC-WW-MS-9602, CEDA-WW-MS-9602, and CMEC-WW-MS-9602).

Dataquest's 1995 market share data was verified, updated, and sent to our clients in August as a Market Share Update report (published as CAEC-WW-MS-9603, CEDA-WW-MS-9603, and CMEC-WW-MS-9603). Country-level data was made available at this time.

This document is an updated forecast that has been expanded to include country-level information and in-depth analysis.

Worldwide Forecast Assumptions

The following paragraphs describe the main forces driving the CAD/CAM/CAE and GIS worldwide software forecast. See Table 3 for worldwide forecast data.

All Applications

As CAD/CAM/CAE/GIS becomes more of a replacement market, market leaders would appear to have the upper hand; the cost of switching is high. However, software that lets users get a better product to market faster, software that helps eliminate business risks will always be in demand—regardless of market share. Thus there is always an opportunity for new vendors in technical markets.

The primary trend in design software function is toward operating at a higher level of abstraction. In all applications, we have seen an evolution of focus from "electronic paper" to component modeling, and now to

Table 1
CAD/CAM/CAE and GIS Revenue Growth Comparison
(U.S. Dollars versus Local Currency for Both Europe and Japan)

	1994	1995	Forecast 2000	Growth (%) 1994-1995	CAGR (%) 1995-2000
Europe (U.S.$ Million)					
Software Revenue	1,820.18	2,161.60	3,374.47	18.8	9.3
Hardware Revenue	2,591.56	2,807.99	5,017.48	8.4	12.3
Service Revenue	1,141.83	1,274.02	1,553.54	11.6	4.0
Total Factory Revenue	5,553.57	6,243.61	9,945.49	12.4	9.8
ECU/U.S.$ Exchange Rate*	0.84	0.77	0.80	-8.6	0.7
Europe (ECU Million)					
Software Revenue	1,535.50	1,666.38	2,691.40	8.5	10.1
Hardware Revenue	2,186.24	2,164.68	4,001.82	-1.0	13.1
Service Revenue	963.25	982.14	1,239.07	2.0	4.8
Total Factory Revenue	4,684.99	4,813.20	7,932.28	2.7	10.5
Japan (U.S.$ Million)					
Software Revenue	1,335.78	1,521.57	2,680.91	13.9	12.0
Hardware Revenue	2,143.29	2,286.92	4,063.64	6.7	12.2
Service Revenue	925.74	1,044.46	1,478.93	12.8	7.2
Total Factory Revenue	4,404.81	4,852.95	8,223.49	10.2	11.1
Japan/U.S.$ Exchange Rate*	110.85	93.90	105.94	-15.3	2.4
Japan (Yen Million)					
Software Revenue	148,071.13	142,875.66	284,015.37	-3.5	14.7
Hardware Revenue	237,583.90	214,741.36	430,502.52	-9.6	14.9
Service Revenue	102,618.14	98,074.81	156,678.33	-4.4	9.8
Total Factory Revenue	488,273.16	455,691.83	871,196.22	-6.7	13.8
North America (U.S.$ Million)					
Software Revenue	1,915.91	2,272.72	4,456.45	18.6	14.4
Hardware Revenue	2,482.33	2,776.43	6,289.30	11.8	17.8
Service Revenue	1,171.94	1,385.61	2,301.71	18.2	10.7
Total Factory Revenue	5,570.18	6,434.76	13,047.45	15.5	15.2
Worldwide (U.S.$ Million)					
Software Revenue	5,415.60	6,420.61	11,855.56	18.6	13.0
Hardware Revenue	7,667.54	8,418.59	17,092.16	9.8	15.2
Service Revenue	3,451.56	3,971.80	5,966.89	15.1	8.5
Total Factory Revenue	16,534.69	18,811.00	34,914.60	13.8	13.2

*Assuming a stable currency, the 2000 exchange rate is March 1996 exchange rate.
Source: Dataquest (March 1996)

Table 2
Foreign Currency per U.S. Dollar

		Actual				Current			Year-to-Year Change (%)					
Country	Currency	1991	1992	1993	1994	1995	1996	1997	1991-1992	1992-1993	1993-1994	1994-1995	1995-1996	1996-1997
Austria	Schilling	11.67	10.95	11.65	11.40	10.06	10.55	10.58	-6.17	6.4	-2.1	-11.8	4.9	0.3
Belgium	Franc	34.13	32.02	34.67	33.66	29.42	30.84	30.95	-6.18	8.3	-2.9	-12.6	4.8	0.4
Denmark	Krone	6.39	6.02	6.49	6.35	5.59	5.80	5.80	-5.79	7.8	-2.2	-12.0	3.8	0
Finland	Markka	4.04	4.45	5.73	5.21	4.37	4.60	4.58	10.15	28.8	-9.1	-16.1	5.3	-0.4
France	Franc	5.64	5.27	5.67	5.54	4.97	5.09	5.09	-6.56	7.6	-2.3	-10.3	2.4	0
Germany	D-Mark	1.66	1.56	1.66	1.62	1.43	1.50	1.50	-6.02	6.4	-2.4	-11.7	4.9	0
Italy	Lira	1,238.93	1,227.75	1,577.85	1,609.34	1,628.21	1,545.31	1,526.82	-0.90	28.5	2.0	1.2	-5.1	-1.2
Netherlands	Guilder	1.87	1.75	1.86	1.82	1.60	1.68	1.69	-6.42	6.3	-2.2	-12.1	5.0	0.6
Norway	Krone	6.49	6.18	7.11	7.04	6.33	6.46	6.45	-4.78	15.0	-1.0	-10.1	2.1	-0.2
Spain	Peseta	103.81	101.90	127.87	133.48	124.40	126.29	126.96	-1.84	25.5	4.4	-6.8	1.5	0.5
Sweden	Krona	6.04	5.81	7.82	7.70	7.14	6.70	6.64	-3.81	34.6	-1.5	-7.3	-6.2	-0.9
Switzerland	Franc	1.43	1.40	1.48	1.37	1.18	1.22	1.23	-2.10	5.7	-7.4	-13.9	3.4	0.8
United Kingdom	Pound	0.57	0.57	0.67	0.65	0.63	0.65	0.64	0	17.5	-3.0	-3.1	3.9	-2.3
Europe Average	ECU	0.81	0.77	0.86	0.84	0.77	0.80	0.80	-4.86	11.4	-1.5	-8.7	3.6	0
China	Renminbi	5.33	5.51	5.76	8.54	8.35	8.34	8.34	3.38	4.5	48.3	-2.2	-0.1	0
Hong Kong	Dollar	7.77	7.74	7.74	7.73	7.74	7.74	7.74	-0.39	0	-0.1	0.1	0	0
Japan	Yen	134.59	126.34	110.85	101.56	93.90	107.93	109.19	-6.13	-12.3	-8.4	-7.5	14.9	1.2
Korea	Won	730.67	782.41	799.42	805.80	770.57	798.87	813.03	7.08	2.2	0.8	-4.4	3.7	1.8
Singapore	Dollar	1.73	1.63	1.62	1.53	1.43	1.41	1.42	-5.78	-0.9	-5.3	-6.5	-1.4	0.7
Taiwan	Dollar	26.49	24.93	26.15	26.45	26.48	27.50	27.57	-5.89	4.9	1.1	0.1	3.9	0.3

Source: Dataquest (March 1996)

system modeling. The eventual goal is the ability to fully simulate, evaluate, redesign, and test the design inside the computer prior to manufacture. At the same time, increased computing power is allowing the nature of design to evolve to include constituencies in manufacturing, product support, and from users themselves. Thus, the engineering process is being expanded to include input from a broader base.

At the same time, the nature of design data itself is expanding from a focus on geometry to include multiple data types—making the challenge of system modeling even more complex. Also, the World Wide Web holds the potential to expand the nature of collaborative design, by harnessing the joint power of anticipated increases in both computing power and communications bandwidth. Thus, there is little limit to the problems that design or GIS software can tackle. The primary challenge will continue to be developing robust, leading-edge software ahead of competitors. During the forecast period we anticipate significant, but not revolutionary, advances in the ability of the existing programmer pool to produce new software.

Mechanical Forecast Assumptions

New Interest in Mechanical CAD Technology

In 1995, we saw a mix of replacement business and new purchases for mechanical CAD technology, particularly in Europe and North America. Growth is picking up in nontraditional industries (those industries outside of aerospace, automotive, and industrial machinery). We expect this trend to continue, as mechanical modeling, analysis, design, and simulation software become more user-friendly. Closely linked to the use of mechanical CAD in new arenas is the availability of software on lower-cost platforms and the potential use of object technology to create customized industry- or application-specific solutions.

The product data management market has clearly found a worldwide interest. Within the past year, we have seen pilot programs move to full-scale production, support for new client platforms (Windows NT, Windows), integration with manufacturing resource planning (MRP) systems, and an emergence of parts/component management software. Product data management will be one of the significant drivers of the mechanical CAD market through 2000.

Growth in Asia/Pacific

The Asia/Pacific region is being fueled by CAD investments from local governments, multinational companies, and local initiatives (such as Indonesia's IPTN). Most of the sales to date are UNIX-based, but some of the future growth is expected to shift to NT.

Ground Shifts in Japan

Mechanical CAD/CAM/CAE growth in Japan is expected to undergo a significant shift in platform usage over our forecast period. The UNIX platform dominates the mechanical sector in Japan, despite the fact that the Japanese mechanical market still places a heavy emphasis on 2-D

drafting instead of 3-D/solid modeling. We expect this drafting orientation to persist, and over next five years we anticipate a significant shift to more Windows NT-based systems at the expense of UNIX. This shift will not begin in earnest until 1997, when more NT-based applications are more widely available in Japan.

Windows NT

As of today, not all of the major mechanical CAD vendors have ported their products to the Windows NT platform. The lack of availability of Windows NT versions of some of the market-share-leading mechanical CAD packages, coupled with the fact that Europe has just completed its five-year investment cycle in mechanical CAD software, will mean that Windows NT will not begin to impact UNIX-based sales for at least a few more years.

AEC Forecast Assumptions

The Impact of Windows NT

Intergraph's shift to Windows NT has initiated the collapse of UNIX sales in North America, a trend expected to increase broadly in this cost-conscious application. At the same time, we expect growth in Windows NT from DOS-based users who find Windows 95 and successors less than reliable. The primary factor holding up growth in the large installed base of DOS users is their reluctance to buy the new hardware required for either Windows 95 or Windows NT.

The factors that should contribute to the long-term expansion of the AEC CAD industry are noted in the following sections.

CAD Is Becoming a Business Requirement

Large design firms are growing at the expense of smaller firms. These large end users increasingly require their employees and suppliers to adopt automation tools in the design and construction process. Smaller design firms must increasingly buy CAD systems or risk being dropped from consideration as a partner.

CAD purchases are increasingly justified as a competitive advantage in both sales and design reviews. Electronic design data is also required downstream by the designer's client—from the federal government down to the small commercial developer. Also, a significant pool of untapped users still exists. The relatively low market penetration of AEC CAD systems should allow steady worldwide growth during the next five years despite constant volatility in demand for the buildings and infrastructure to be designed.

New Features in AEC CAD Products Are Achievable

Better, lower-cost visualization tools will be in increasing demand as sales and communication tools. Data and database functions (versus graphics functions) are increasing in importance in AEC design systems, creating opportunities to sell users significant new functionality. Some vendors will create products that foster communications in the entire

design, construction, and maintenance process—products that will increase the payoff in CAD investments.

The three trends that will inhibit growth in the AEC CAD industry are noted in the following sections.

Design Is Only Part of the Problem

AEC's one-design-one-build structure means CAD provides fewer economic benefits to these users than does the one-design-build-many structure of manufacturing. Construction, which is essentially a prototype build, is fraught with uncertainties and delays that are not well-addressed by AEC systems as they exist today. Design tools can only thrive in the AEC structure when they support more of the entire business problem. Based on Autodesk's increased commitment to progress in this arena, we have increased our forecast modestly; commitment to and cooperation on the problem from multiple vendors will allow us to increase the forecast growth rate further.

Poor Cooperation among Users

Users are poorly organized to take advantage of improved products, partly because of competition between engineering constructors and partly because designs are often split among several different companies representing different and competing aspects of the design process. New approaches to the design and construction process are appearing, allowing users to take full advantage of CAD tools. Still, many users in AEC will need to be shown leadership in working together, both from the very large, most competitive users, and from CAD vendors themselves.

Downturn in Germany

The German construction industry, which has been the driving force behind the high growth of the recent years, has come to an abrupt halt. Although other regions such as Italy are investing, Germany plays such a dominant role that it will drag down the overall European growth for AEC. The applications that are still growing even in Germany are facilities design/management as these are not dependent on the construction industry.

GIS/Mapping Forecast Assumptions

The Impact of Windows NT

Intergraph's move to Windows NT at the expense of UNIX will quickly make PC-based operating systems the dominant revenue stream in North America. In the long term, the GIS UNIX market is highly subject to erosion by Windows NT because of the appeal of better integration of GIS and Windows-based productivity tools, an appealing prospect to many GIS users.

The factors that should contribute to the long-term expansion of the GIS market are noted in the following sections.

"Open GIS"

The thrust of the Open GIS Foundation has been to allow some fresh air into a market that was getting a bit inbred. The nature of GIS data is

under greater scrutiny, and several vendors are embarking on different, creative directions. Ultimately, much of "spatial analysis" will be embedded into other applications, rather than known as a GIS. Nonetheless, a fresh approach to spatial analysis is creating new opportunities for more useful solutions in traditional GIS environments.

Abundant Supply of Prospective Buyers

Penetration is still moderately low among core users. Bread-and-butter prospects in government and utilities are charged with maintaining information on land and assets in perpetuity. Many of these prospective buyers are still using paper maps, which will degrade over time, or have only entry-level systems in terms of value delivered. This creates a certain inevitability to moving from paper maps computer-based models.

New Technologies Will Drive Growth

Faster, cheaper computers will be continually leveraged to support new software products. Widespread computer industry developments in open, distributed systems supporting high-speed networking will make it possible for GIS technology to broadly expand the user base. Lower cost, higher resolution satellite imagery holds the potential to drive another explosion in GIS market growth among users who cannot afford aerial photography. Advances in aerial photography, global positioning systems (GPSs), and laser range finders are making it possible to create GISs that are significantly cheaper, more accurate, and more complete than existing paper maps, giving experienced users some compelling reasons to reinvest. Portable and pen-based computers are bringing GIS to new users in field operations. Finally, database companies themselves are gaining a better understanding of spatial analysis, a key factor in spreading use of GIS systems more broadly.

Data Will Drive Growth

The GIS business market is driving high growth on PCs. However, we see a wide band of uncertainty surrounding the clearly growing revenue opportunity from new applications. Several new applications in GIS are destined to become a relatively low revenue-producing feature in another software program (and market), rather than a standalone product in the GIS market. At the same time, data is increasing in value relative to software in this low-end market.

GIS has attained a certain indispensability, particularly among federal users and in utilities. As a result, users are beginning to expect to share the data that lies in their various GIS systems. Within three years, we expect data to be readily exchangeable across different systems. At that point, shareable data will help drive market growth.

Several factors seriously constraining the long-term expansion of the GIS market are noted in the following sections.

High Cost of Entry Remains a Barrier

There will remain an uncertain, but certainly high, cost of creating a working GIS system in traditional environments. No magic will emerge to create a low-cost, meaningful data set for mainstream customers in

government and utilities. Data conversion will remain costly because the significant cost of correcting prior errors and omissions on paper maps is inevitably bundled into the cost of "conversion."

Price Pressures Inhibit Growth

Price pressure will hold down total revenue. Innovation is the only way to maintain prices in any software industry, and GIS vendors will struggle in their attempt to create compelling new applications and improved investment payoff for customers.

Electronic Design Automation Forecast Assumptions

The EDA software market grew 17.5 percent in 1995. Over the next five years, growth will continue to be fueled by continuing increasing design complexity and ever-higher speeds. The semiconductor downturn is a fact of life. Although many people expect a similar downturn in EDA sales, this is not the case. Semiconductor downturns, an indication of an electronic hardware downturn, actually increase EDA sales as companies design their way out of the recession. The EDA market typically sees its downturn three years later. Dataquest therefore predicts growth to drop off—to about 10 percent in 1999.

Electronic CAE

Design complexity is forcing a large-scale swap: Gate-level users are swapping up to register-transfer level (RTL) while RTL users are swapping up to electronic-system level (ESL) tools. RTL tools are beginning to appear on Windows NT, competing with UNIX-based tools, while the ESL tools will remain UNIX-based. The second wave, those FPGA/CPLD designers moving up to the RTL, are starting to make an impact on the numbers.

IC Layout

Final results show the IC layout market growing at 29.6 percent—a little lower that the preliminary data, but strong nonetheless. Design complexity and high speed are forcing replacement of obsolete tools, driving this high growth. This is primarily a replacement market of very high-cost tools and very few players. The ensuing frenzy for market share is the result. The few PC-based tools in this market are being replaced by UNIX-class tools in North America, and Windows NT will not be a factor in this market. In fact, this is the market that is demanding a "standard" 64-bit operating system. If UNIX repeats its 32-bit performance, these guys could wait for a 64-bit Windows NT.

PCB/MCM/Hybrid

The printed circuit board (PCB) market grew 4.7 percent in 1995. The swap out of old tools continues for the second year. The most significant shift has been the acceptance of Windows NT as the operating system of choice in the PCB design world. It will not happen overnight, as swap out in this segment is slower than in CAE and IC layout, but it will happen.

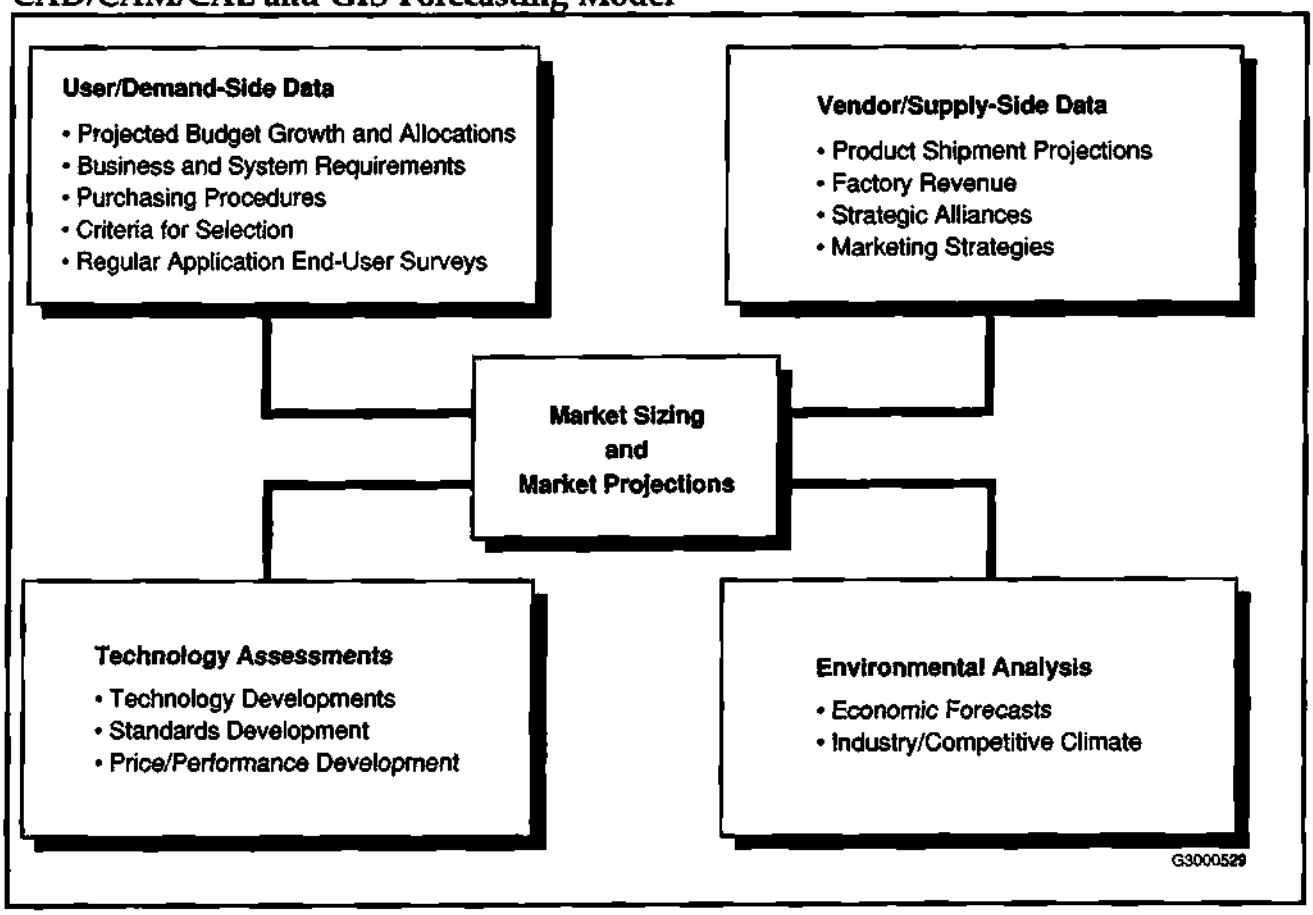
Forecast Methodology

Fundamental to the way Dataquest conducts its research is the underlying philosophy that the best data and analyses come from a well-balanced program. This program includes the following: balance between primary and secondary collection techniques; balance between supply-side and demand-side analysis; balance between focused, industry-specific research and coordinated, "big-picture" analysis aided by integration of data from the more than 25 separate high-technology industries Dataquest covers; and balance between the perspectives of experienced industry professionals and rigorous, disciplined techniques of seasoned market researchers.

Dataquest also analyzes trends in the macro environment, which can have major influences on both supply-side and demand-side forecasting. In addition to demographics, analysts look at gross national product (GNP) growth, interest rate fluctuation, business expectations, and capital spending plans. In the geopolitical arena, the group looks at trade issues, political stability or lack thereof, tariffs, nontariff barriers, and such factors as the effect on Europe of the events of 1995.

Figure 1 shows the CAD/CAM/CAE and GIS forecasting model. The overall forecasting process uses a combination of techniques such as

Figure 1
CAD/CAM/CAE and GIS Forecasting Model



Source: Dataquest (May 1996)

time series and technological modeling. Market estimates and forecasts are derived using the following research techniques:

- Segment forecasting—Individual forecasts are derived for each application segment tracked by the CAD/CAM/CAE and GIS group. Specifically, each application, segmented by region and platform, is forecast and rolled up. In this way, each application segment incorporates its own set of unique assumptions.
- Demand-based analysis—Market growth is tracked and forecast in terms of the present and anticipated demand of current and future users. This requires the development of a total available market model and a satisfied available market figure to assess the levels of penetration accurately. Dataquest analysts also factor in the acceptance or ability for users to consume new technology.
- Capacity-based analysis—This method involves identifying future shipment volume constraints. These constraints, or "ceilings," can be the result of component availability, manufacturing capacity, or distribution capacity. In any case, capacity limitations are capable of keeping shipments below the demand level.

Segmentation Definitions

Operating Systems

The following defines the operating systems:

- UNIX—UNIX includes all UNIX variants and older workstation operating systems.
- Host—Host includes minicomputer and mainframe operating systems in which external workstations' functions are dependent on a host computer.
- Windows NT—Windows NT is the Microsoft operating system.
- PC—PC includes DOS, Windows, Windows 95, OS/2, and Apple operating systems.

Line Items

Line item definitions are as follows:

- Average selling price (ASP) is defined as the average price of a product, inclusive of any discounts.
- CPU revenue is the portion of revenue derived from a system sale that is related to the value of the CPU.
- CPU shipment is defined as the number of CPUs delivered.
- CPU installed base is defined as the total number of CPUs in active, day-to-day use.
- Unit shipment is defined as the number of products delivered (that is, seats).

- Seats are defined as the number of possible simultaneous users.
- Installed seats are defined as the total number of seats in active, day-to-day use.
- Hardware revenue is defined as the sum of the revenue from the hardware system components: CPU revenue, terminal revenue, and peripherals revenue.
- Peripherals revenue is defined as the value of all the peripherals from turnkey sale. (Peripherals in this category typically are input and output devices.)
- Terminal revenue is defined as revenue derived from the sale of terminals used to graphically create, analyze, or manipulate designs. The term is applicable only to the host systems.
- Software revenue is revenue derived from the sale of application software.
- Service revenue is defined as revenue derived from the service and support of CAD/CAM/CAE or GIS systems. Service is followed as software service and hardware service.
- Total factory revenue is defined as the amount of money received for goods measured in U.S. dollars and is the sum of hardware, software, and service revenue.

Table 3
CAD/CAM/CAE/GIS Software History and Forecast
Top-Level Worldwide Forecast, All Applications, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue (U.S.$ Million)									
Worldwide, All Operating Systems	4,881	5,416	6,421	7,446	8,419	9,500	10,664	11,856	13.0
Worldwide									
UNIX	3,371	3,815	4,377	4,901	5,351	5,751	6,181	6,607	8.6
Windows NT	5	115	381	724	1,087	1,595	2,160	2,762	48.6
Personal Computer	1,188	1,307	1,511	1,710	1,908	2,107	2,292	2,464	10.3
Host/Proprietary	317	178	152	111	73	47	32	22	-31.9
All Operating Systems									
North America	1,749	1,916	2,273	2,684	3,096	3,548	4,006	4,456	14.4
Europe	1,598	1,820	2,162	2,385	2,605	2,855	3,105	3,374	9.3
Japan	1,234	1,336	1,522	1,773	1,948	2,164	2,429	2,681	12.0
Asia/Pacific	208	253	362	484	631	770	930	1,095	24.8
Rest of World	93	90	103	120	139	162	195	249	19.3
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		10.9	18.6	16.0	13.1	12.8	12.3	11.2	
Worldwide									
UNIX		13.2	14.7	12.0	9.2	7.5	7.5	6.9	
Windows NT		2116.0	231.4	90.1	50.1	46.7	35.4	27.9	
Personal Computer		10.0	15.6	13.2	11.6	10.4	8.8	7.5	
Host/Proprietary		-43.7	-15.0	-26.8	-34.1	-35.7	-32.6	-29.8	
All Operating Systems									
North America		9.5	18.6	18.1	15.3	14.6	12.9	11.2	
Europe		13.9	18.8	10.3	9.2	9.6	8.7	8.7	
Japan		8.3	13.9	16.5	9.9	11.1	12.2	10.4	
Asia/Pacific		22.1	42.7	33.9	30.4	22.0	20.7	17.8	
Rest of World		-3.0	14.2	16.8	15.4	16.4	20.8	27.5	

Source: Dataquest (April 1996)

Table A-1
CAD/CAM/CAE/GIS Software History and Forecast
Top-Level EDA Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue (U.S.$ Million)									
Worldwide, All Operating Systems	1,187	1,318	1,549	1,850	2,205	2,641	2,933	3,519	17.8
Worldwide									
UNIX	1,016	1,131	1,325	1,541	1,755	1,960	2,104	2,350	12.1
Windows NT	-	13	34	103	221	432	562	878	91.8
Personal Computer	168	171	188	205	228	249	267	291	9.2
Host/Proprietary	3	3	3	1	1	-	-	-	-40.1
All Operating Systems									
North America	553	606	723	881	1,047	1,232	1,371	1,601	17.2
Europe	236	250	277	304	335	366	391	428	9.1
Japan	331	392	447	514	594	735	809	984	17.1
Asia/Pacific	62	65	96	141	207	261	293	363	30.5
Rest of World	5	5	6	9	23	48	69	143	90.5
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		11.0	17.5	19.4	19.2	19.8	11.0	20.0	
Worldwide									
UNIX		11.4	17.2	16.3	13.9	11.7	7.3	11.7	
Windows NT		41919.7	163.9	204.6	115.0	95.0	30.0	56.3	
Personal Computer		1.8	9.7	9.2	11.3	9.0	7.3	9.1	
Host/Proprietary		-10.5	-14.3	-62.6	-28.3	-33.0	-36.4	-32.4	
All Operating Systems									
North America		9.6	19.3	21.9	18.8	17.6	11.3	16.8	
Europe		6.2	10.6	9.9	10.2	9.3	6.8	9.5	
Japan		18.3	14.2	14.9	15.5	23.7	10.1	21.7	
Asia/Pacific		5.6	47.1	46.8	46.7	26.3	12.3	23.8	
Rest of World		-12.9	23.8	58.1	153.4	110.0	43.4	108.0	

Source: Dataquest (September 1996)

Table B-1
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	29,346	29,997	32,900	39,000	46,900	55,200	63,800	75,600	18
Seats	29,381	30,156	33,036	39,100	47,000	55,300	63,900	75,700	18
Year-to-Year Increase (%)	-2	3	10	18	20	18	16	19	
Installed Base									
CPUs	150,819	155,836	164,791	178,600	201,100	226,700	250,600	273,900	11
Seats	153,032	157,487	165,959	179,400	201,900	227,400	251,500	274,900	11
Year-to-Year Increase (%)	6	3	5	8	13	13	11	9	
Revenue Data (U.S.$ Million)									
CPU Revenue	334	336	359	402	465	515	571	642	12
Terminal Revenue	9	8	6	4	3	3	3	3	-12
Peripheral Revenue	1	2	1	1	2	2	2	3	26
Hardware Revenue	344	346	366	406	470	520	576	648	12
Year-to-Year Increase (%)	-14	1	6	11	16	11	11	13	
Software Revenue	236	250	277	304	335	366	391	428	9
Year-to-Year Increase (%)	-9	6	11	10	10	9	7	9	
Software Service	101	123	162	170	179	184	187	193	4
Hardware Service	77	67	75	80	89	94	99	106	7
Service Revenue	178	190	237	250	268	278	286	299	5
Year-to-Year Increase (%)	1	7	25	5	7	4	3	5	
Total Factory Revenue	757	786	880	961	1,074	1,165	1,254	1,376	9
Year-to-Year Increase (%)	-10	4	12	9	12	9	8	10	

Source: Dataquest (September 1996)

Table B-2
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Benelux, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1,787	2,025	2,047	2,400	3,000	3,700	4,400	5,300	21
Seats	1,777	2,021	2,043	2,400	3,000	3,700	4,400	5,300	21
Year-to-Year Increase (%)	-2	14	1	20	24	21	18	22	
Installed Base									
CPUs	9,288	9,854	10,420	11,200	12,600	14,200	15,900	17,800	11
Seats	9,397	9,911	10,437	11,200	12,600	14,200	15,900	17,800	11
Year-to-Year Increase (%)	7	5	5	7	13	12	12	12	
Revenue Data (U.S.$ Million)									
CPU Revenue	17	17	17	18	22	26	30	35	16
Terminal Revenue	1	0	0	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	44
Hardware Revenue	18	17	17	18	22	26	30	35	16
Year-to-Year Increase (%)	-10	-2	-3	7	22	17	16	18	
Software Revenue	11	12	12	14	16	19	21	24	14
Year-to-Year Increase (%)	-3	13	0	13	17	15	11	15	
Software Service	3	5	5	6	6	7	8	9	11
Hardware Service	4	3	3	3	4	4	5	5	12
Service Revenue	7	8	8	9	10	11	12	14	11
Year-to-Year Increase (%)	-1	10	7	7	16	11	9	13	
Total Factory Revenue	36	37	38	41	49	56	63	73	14
Year-to-Year Increase (%)	-6	5	0	9	19	15	13	16	

Source: Dataquest (September 1996)

Table B-3
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, France, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	5,271	6,012	6,840	8,400	10,600	12,800	15,000	18,000	21
Seats	5,261	6,041	6,864	8,400	10,600	12,800	15,000	18,000	21
Year-to-Year Increase (%)	0	15	14	22	26	21	18	20	
Installed Base									
CPUs	23,959	26,430	29,746	34,100	40,600	47,800	54,800	61,700	16
Seats	24,280	26,659	29,906	34,200	40,700	47,900	54,900	61,800	16
Year-to-Year Increase (%)	10	10	12	14	19	18	15	13	
Revenue Data (U.S.$ Million)									
CPU Revenue	61	66	76	88	107	120	135	153	15
Terminal Revenue	1	1	1	0	0	0	0	0	-26
Peripheral Revenue	0	0	0	0	0	0	0	0	28
Hardware Revenue	63	67	77	89	107	121	135	153	15
Year-to-Year Increase (%)	-14	8	15	15	21	13	12	13	
Software Revenue	44	49	59	66	76	84	91	99	11
Year-to-Year Increase (%)	-10	13	20	13	14	11	8	10	
Software Service	18	24	35	38	41	42	43	44	5
Hardware Service	14	13	16	18	20	22	23	25	9
Service Revenue	32	37	51	55	61	64	66	69	6
Year-to-Year Increase (%)	-3	15	36	8	11	5	3	4	
Total Factory Revenue	139	154	187	210	244	269	292	322	11
Year-to-Year Increase (%)	-10	11	22	12	16	10	9	10	

Source: Dataquest (September 1996)

Table B-4
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Germany, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	10,663	9,370	10,482	11,900	13,800	15,900	18,300	21,700	16
Seats	10,700	9,501	10,623	12,100	13,900	16,000	18,400	21,800	15
Year-to-Year Increase (%)	-10	-11	12	13	15	15	15	18	
Installed Base									
CPUs	57,758	57,565	58,723	61,000	65,600	71,100	76,500	82,100	7
Seats	58,566	58,256	59,336	61,600	66,200	71,800	77,300	82,900	7
Year-to-Year Increase (%)	4	-1	2	4	7	9	8	7	
Revenue Data (U.S.$ Million)									
CPU Revenue	113	110	112	121	135	147	163	184	10
Terminal Revenue	3	4	4	3	3	3	3	3	-8
Peripheral Revenue	0	1	0	0	1	1	1	1	22
Hardware Revenue	117	115	117	125	139	151	166	188	10
Year-to-Year Increase (%)	-17	-2	2	7	11	9	10	13	
Software Revenue	81	81	86	91	97	104	111	122	7
Year-to-Year Increase (%)	-14	0	6	6	6	8	7	10	
Software Service	35	40	49	50	51	52	53	55	2
Hardware Service	25	22	23	24	26	27	28	31	6
Service Revenue	60	62	72	74	77	79	81	85	3
Year-to-Year Increase (%)	-3	2	17	2	4	3	3	6	
Total Factory Revenue	258	257	275	289	312	334	358	396	8
Year-to-Year Increase (%)	-13	-1	7	5	8	7	7	11	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-5
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Italy, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1,657	1,811	1,976	2,200	2,500	2,800	3,100	3,500	12
Seats	1,650	1,798	1,960	2,200	2,500	2,800	3,100	3,500	13
Year-to-Year Increase (%)	-2	9	9	13	12	11	12	15	
Installed Base									
CPUs	9,371	9,522	9,958	10,700	11,800	12,800	13,600	14,200	7
Seats	9,565	9,638	10,001	10,700	11,700	12,800	13,500	14,200	7
Year-to-Year Increase (%)	2	1	4	7	10	9	6	5	
Revenue Data (U.S.$ Million)									
CPU Revenue	23	22	23	24	26	28	30	33	7
Terminal Revenue	1	0	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	14
Hardware Revenue	24	22	23	24	27	28	30	33	7
Year-to-Year Increase (%)	-17	-8	6	3	10	6	8	10	
Software Revenue	16	16	18	18	19	20	20	22	4
Year-to-Year Increase (%)	-5	2	10	4	4	4	4	6	
Software Service	7	8	10	10	10	10	10	10	-1
Hardware Service	6	4	5	5	5	5	5	6	2
Service Revenue	13	12	15	15	15	15	15	15	0
Year-to-Year Increase (%)	3	-6	25	0	2	-1	1	1	
Total Factory Revenue	53	50	56	57	61	63	66	70	5
Year-to-Year Increase (%)	-9	-5	12	3	6	3	5	7	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-6
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Scandinavia, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	2,691	2,798	3,259	4,000	4,900	5,900	6,900	8,200	20
Seats	2,681	2,786	3,249	4,000	4,900	5,900	6,900	8,200	20
Year-to-Year Increase (%)	31	4	17	23	23	21	17	18	
Installed Base									
CPUs	11,515	12,300	13,691	15,700	18,700	22,100	25,100	28,100	15
Seats	11,641	12,366	13,706	15,700	18,700	22,000	25,100	28,000	15
Year-to-Year Increase (%)	8	6	11	15	19	18	14	12	
Revenue Data (U.S.$ Million)									
CPU Revenue	31	33	36	41	48	55	61	68	14
Terminal Revenue	1	0	0	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	37
Hardware Revenue	32	33	36	41	48	55	61	68	14
Year-to-Year Increase (%)	8	4	8	15	18	13	11	12	
Software Revenue	22	25	28	31	35	39	42	45	10
Year-to-Year Increase (%)	20	11	13	13	12	11	7	8	
Software Service	11	14	19	20	21	22	22	23	4
Hardware Service	7	7	7	8	9	10	10	11	8
Service Revenue	19	20	26	28	30	32	33	34	5
Year-to-Year Increase (%)	34	10	27	8	8	5	3	3	
Total Factory Revenue	72	78	89	100	114	125	135	147	10
Year-to-Year Increase (%)	17	8	15	12	13	10	8	9	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-7
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Spain, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	652	639	713	800	1,000	1,100	1,200	1,300	13
Seats	662	641	715	800	1,000	1,100	1,200	1,300	13
Year-to-Year Increase (%)	-11	-3	12	15	16	12	9	12	
Installed Base									
CPUs	3,398	3,405	3,479	3,600	4,000	4,300	4,600	4,800	7
Seats	3,513	3,500	3,546	3,700	4,000	4,300	4,600	4,800	6
Year-to-Year Increase (%)	8	0	1	4	9	9	6	4	
Revenue Data (U.S.$ Million)									
CPU Revenue	6	6	6	7	8	8	9	9	8
Terminal Revenue	0	0	0	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	21
Hardware Revenue	7	7	6	7	8	8	9	10	8
Year-to-Year Increase (%)	-47	1	-2	9	12	6	5	7	
Software Revenue	5	5	5	6	6	7	7	7	6
Year-to-Year Increase (%)	-10	7	4	7	9	6	2	6	
Software Service	2	2	3	3	3	3	3	3	2
Hardware Service	1	1	1	2	2	2	2	2	6
Service Revenue	3	3	4	4	4	5	5	5	4
Year-to-Year Increase (%)	-10	10	16	4	7	2	0	4	
Total Factory Revenue	14	15	16	17	19	20	20	21	6
Year-to-Year Increase (%)	-32	5	4	7	10	5	3	6	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-8
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, United Kingdom, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	3,772	4,896	4,969	6,000	7,300	8,600	9,800	11,400	18
Seats	3,767	4,901	4,976	6,100	7,300	8,600	9,800	11,400	18
Year-to-Year Increase (%)	0	30	2	22	21	17	14	17	
Installed Base									
CPUs	21,887	23,011	24,709	27,500	31,700	36,100	40,000	43,500	12
Seats	22,210	23,217	24,828	27,500	31,700	36,200	40,000	43,500	12
Year-to-Year Increase (%)	2	5	7	11	15	14	11	9	
Revenue Data (U.S.$ Million)									
CPU Revenue	53	58	60	69	81	90	98	109	13
Terminal Revenue	1	1	1	0	0	0	0	0	-19
Peripheral Revenue	0	0	0	0	0	0	0	1	26
Hardware Revenue	54	59	61	70	82	90	99	110	12
Year-to-Year Increase (%)	-12	10	3	14	17	10	10	11	
Software Revenue	36	43	46	52	59	64	68	74	10
Year-to-Year Increase (%)	-8	20	7	13	12	9	6	8	
Software Service	16	22	29	31	33	34	35	36	4
Hardware Service	13	12	13	14	16	17	18	19	8
Service Revenue	29	34	42	46	50	52	53	55	5
Year-to-Year Increase (%)	3	18	23	8	9	4	2	4	
Total Factory Revenue	119	137	150	168	190	206	220	239	10
Year-to-Year Increase (%)	-8	15	9	12	13	9	7	9	

Source: Dataquest (September 1996)

Table B-9
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Austria/Switzerland, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	361	552	999	1,200	1,500	1,900	2,300	2,800	23
Seats	352	547	995	1,200	1,500	1,900	2,300	2,800	23
Year-to-Year Increase (%)	22	55	82	24	25	23	19	23	
Installed Base									
CPUs	673	1,218	2,160	3,300	4,600	5,900	6,900	8,100	30
Seats	665	1,205	2,143	3,300	4,600	5,900	6,900	8,100	31
Year-to-Year Increase (%)	110	81	78	52	41	28	17	18	
Revenue Data (U.S.$ Million)									
CPU Revenue	6	5	6	7	9	10	12	14	18
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	41
Hardware Revenue	6	5	6	7	9	10	12	14	18
Year-to-Year Increase (%)	36	-15	27	15	23	17	15	19	
Software Revenue	4	4	5	6	7	8	9	11	17
Year-to-Year Increase (%)	19	-10	42	18	20	17	11	18	
Software Service	2	2	3	3	3	3	4	4	9
Hardware Service	1	1	1	1	1	1	1	2	11
Service Revenue	4	3	4	4	4	5	5	6	10
Year-to-Year Increase (%)	8	-30	33	8	13	9	6	12	
Total Factory Revenue	14	11	15	17	21	24	27	31	16
Year-to-Year Increase (%)	22	-18	33	14	20	15	12	17	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-10
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Russia, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	12	64	167	200	300	400	500	700	31
Seats	12	64	167	200	300	400	500	700	31
Year-to-Year Increase (%)	16	428	159	48	34	26	24	26	
Installed Base									
CPUs	23	87	252	500	800	1,200	1,500	1,900	50
Seats	23	87	252	500	800	1,200	1,500	1,900	50
Year-to-Year Increase (%)	116	283	189	97	66	45	28	25	
Revenue Data (U.S.$ Million)									
CPU Revenue	0	1	2	2	3	3	4	5	24
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	-	-	-	-	-	-	NA
Hardware Revenue	0	1	2	2	3	3	4	5	24
Year-to-Year Increase (%)	16	393	23	41	26	17	18	19	
Software Revenue	0	1	1	2	2	2	3	3	17
Year-to-Year Increase (%)	-109	-6,655	32	31	17	12	11	13	
Software Service	0	1	1	1	2	2	2	2	10
Hardware Service	0	0	0	0	0	1	1	1	15
Service Revenue	0	1	1	2	2	2	2	2	11
Year-to-Year Increase (%)	9	387	35	26	14	6	6	7	
Total Factory Revenue	0	3	4	6	7	8	9	10	18
Year-to-Year Increase (%)	-22	622	29	33	20	12	13	14	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-11
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Central Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	53	157	326	400	600	700	900	1,100	27
Seats	53	157	326	400	600	700	900	1,100	27
Year-to-Year Increase (%)	9	194	107	35	32	27	18	23	
Installed Base									
CPUs	115	268	581	1,000	1,500	2,100	2,600	3,100	40
Seats	115	268	581	1,000	1,500	2,100	2,600	3,100	40
Year-to-Year Increase (%)	83	134	116	71	54	37	24	21	
Revenue Data (U.S.$ Million)									
CPU Revenue	1	1	3	4	5	6	7	9	22
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	48
Hardware Revenue	1	1	3	4	5	6	7	9	22
Year-to-Year Increase (%)	320	76	237	33	27	20	14	17	
Software Revenue	0	1	3	3	4	5	6	7	21
Year-to-Year Increase (%)	201	65	342	30	24	21	12	17	
Software Service	0	0	1	1	1	2	2	2	17
Hardware Service	0	0	1	1	1	1	1	1	15
Service Revenue	0	0	1	2	2	3	3	3	16
Year-to-Year Increase (%)	4,018	18	493	23	21	16	9	13	
Total Factory Revenue	1	2	7	9	12	14	16	18	20
Year-to-Year Increase (%)	339	62	308	30	25	20	12	17	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-12
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Rest of Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	2,426	1,673	1,121	1,200	1,400	1,500	1,500	1,600	8
Seats	2,466	1,698	1,118	1,200	1,400	1,500	1,500	1,600	8
Year-to-Year Increase (%)	0	-31	-34	11	10	6	6	7	
Installed Base									
CPUs	12,831	12,175	11,071	10,000	9,300	9,000	9,100	8,700	-5
Seats	13,059	12,380	11,221	10,100	9,400	9,000	9,100	8,700	-5
Year-to-Year Increase (%)	4	-5	-9	-10	-7	-4	1	-4	
Revenue Data (U.S.$ Million)									
CPU Revenue	22	17	17	19	21	21	22	23	5
Terminal Revenue	1	1	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	32
Hardware Revenue	23	18	17	19	21	21	22	23	5
Year-to-Year Increase (%)	-28	-22	-4	9	8	3	3	4	
Software Revenue	17	14	14	14	14	14	14	14	1
Year-to-Year Increase (%)	-22	-20	0	3	2	1	0	0	
Software Service	5	6	8	8	8	7	7	7	-3
Hardware Service	5	3	4	4	4	4	4	4	1
Service Revenue	10	9	12	12	12	12	11	11	-2
Year-to-Year Increase (%)	-12	-6	27	1	0	-3	-3	-4	
Total Factory Revenue	50	41	43	45	47	47	48	48	2
Year-to-Year Increase (%)	-23	-18	4	5	4	1	1	1	

NA = Not applicable

Source: Dataquest (September 1996)

Table A-2
CAD/CAM/CAE/GIS Software History and Forecast
Top-Level ECAE Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue (U.S.$ Million)									
Worldwide, All Operating Systems	767	861	1,020	1,217	1,455	1,750	1,936	2,319	17.9
Worldwide									
UNIX	642	724	853	986	1,108	1,203	1,271	1,368	9.9
Windows NT	-	5	18	65	158	338	438	701	107.9
Personal Computer	123	131	148	166	189	209	226	250	11.1
Host/Proprietary	2	2	2	-	-	-	-	-	-42.8
All Operating Systems									
North America	406	445	530	623	716	838	922	1,065	15.0
Europe	164	180	197	219	244	270	290	321	10.2
Japan	156	195	228	272	325	412	454	544	19.0
Asia/Pacific	38	38	60	96	149	186	207	253	33.2
Rest of World	4	3	4	7	20	44	64	136	101.5
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		12.2	18.5	19.3	19.6	20.2	10.7	19.8	
Worldwide									
UNIX		12.8	17.8	15.6	12.4	8.5	5.7	7.6	
Windows NT		15329.6	283.6	258.0	144.3	114.2	29.6	59.9	
Personal Computer		5.8	13.0	12.7	13.5	10.4	8.5	10.5	
Host/Proprietary		-0.8	-22.6	-86.9	-25.7	-18.1	-16.3	-8.2	
All Operating Systems									
North America		9.6	19.1	17.7	14.9	17.0	9.9	15.6	
Europe		9.6	9.9	10.7	11.8	10.4	7.5	10.5	
Japan		25.3	17.0	19.3	19.5	26.5	10.3	19.8	
Asia/Pacific		1.3	57.0	59.0	55.6	24.4	11.2	22.4	
Rest of World		-21.6	28.3	63.3	192.4	123.5	45.5	114.0	

Source: Dataquest (September 1996)

Table B-13
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	20,561	22,082	24,458	29,500	36,200	43,400	50,800	61,200	20
Seats	20,524	22,194	24,516	29,500	36,200	43,400	50,800	61,200	20
Year-to-Year Increase (%)	2	8	10	20	23	20	17	21	
Installed Base									
CPUs	95,015	102,555	111,888	124,700	144,600	166,900	188,100	209,800	13
Seats	95,531	102,975	112,204	124,900	144,800	167,000	188,200	210,000	13
Year-to-Year Increase (%)	11	8	9	11	16	15	13	12	
Revenue Data (U.S.$ Million)									
CPU Revenue	233	239	253	292	341	381	425	482	14
Terminal Revenue	4	3	2	-	-	-	-	-	NA
Peripheral Revenue	1	1	0	1	1	1	2	2	40
Hardware Revenue	237	243	256	292	342	383	427	484	14
Year-to-Year Increase (%)	-8	3	5	14	17	12	12	14	
Software Revenue	164	180	197	219	244	270	290	321	10
Year-to-Year Increase (%)	-3	10	10	11	12	10	7	10	
Software Service	65	80	102	108	115	121	124	130	5
Hardware Service	53	47	52	57	65	68	72	78	8
Service Revenue	118	127	154	166	180	189	196	207	6
Year-to-Year Increase (%)	6	7	22	7	9	5	4	6	
Total Factory Revenue	519	550	608	676	767	842	913	1,012	11
Year-to-Year Increase (%)	-4	6	11	11	13	10	8	11	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-14
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Benelux, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1,107	1,275	1,187	1,500	2,000	2,500	3,100	3,900	27
Seats	1,094	1,284	1,194	1,500	2,000	2,500	3,100	3,900	27
Year-to-Year Increase (%)	12	17	-7	25	31	27	24	27	
Installed Base									
CPUs	5,347	5,772	6,098	6,600	7,600	8,900	10,500	12,200	15
Seats	5,356	5,778	6,103	6,600	7,600	8,900	10,500	12,200	15
Year-to-Year Increase (%)	10	8	6	8	16	17	17	17	
Revenue Data (U.S.$ Million)									
CPU Revenue	11	12	12	13	17	20	24	28	20
Terminal Revenue	0	0	0	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	56
Hardware Revenue	12	12	12	14	17	20	24	28	19
Year-to-Year Increase (%)	2	5	-4	16	25	19	18	20	
Software Revenue	7	9	9	10	12	15	17	20	18
Year-to-Year Increase (%)	11	21	-1	16	22	19	14	18	
Software Service	2	3	4	4	5	6	6	7	13
Hardware Service	3	2	2	3	3	4	4	5	15
Service Revenue	5	6	6	7	8	9	10	12	14
Year-to-Year Increase (%)	13	16	12	12	19	14	11	14	
Total Factory Revenue	24	27	27	31	38	44	51	60	18
Year-to-Year Increase (%)	7	12	0	15	23	18	15	18	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-15
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, France, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	4,061	4,767	5,500	6,900	8,900	10,900	13,000	15,800	23
Seats	4,050	4,806	5,531	6,900	8,900	10,900	13,000	15,800	23
Year-to-Year Increase (%)	10	19	15	24	29	23	19	22	
Installed Base									
CPUs	15,947	18,564	21,766	25,800	31,600	38,100	44,500	51,200	19
Seats	16,019	18,638	21,846	25,800	31,700	38,200	44,600	51,200	19
Year-to-Year Increase (%)	17	16	17	18	23	21	17	15	
Revenue Data (U.S.$ Million)									
CPU Revenue	43	46	53	64	79	90	103	117	17
Terminal Revenue	1	1	1	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	53
Hardware Revenue	44	47	54	64	79	91	103	118	17
Year-to-Year Increase (%)	-5	7	15	18	24	15	13	15	
Software Revenue	31	35	42	48	56	63	69	76	13
Year-to-Year Increase (%)	-2	13	20	14	17	13	9	11	
Software Service	12	16	22	24	27	29	30	31	7
Hardware Service	10	9	11	12	14	15	17	18	11
Service Revenue	21	24	33	36	41	44	46	49	8
Year-to-Year Increase (%)	4	13	36	10	14	7	5	5	
Total Factory Revenue	96	106	129	148	176	198	218	243	13
Year-to-Year Increase (%)	-2	10	22	15	19	12	10	11	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-16
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Germany, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	6,911	6,505	7,350	8,400	9,800	11,400	13,200	16,100	17
Seats	6,911	6,528	7,364	8,400	9,800	11,400	13,200	16,100	17
Year-to-Year Increase (%)	-12	-6	13	15	16	16	16	21	
Installed Base									
CPUs	36,335	37,103	38,474	40,700	44,600	49,200	53,400	58,200	9
Seats	36,531	37,251	38,579	40,700	44,700	49,200	53,500	58,200	9
Year-to-Year Increase (%)	7	2	4	6	10	10	9	9	
Revenue Data (U.S.$ Million)									
CPU Revenue	79	78	78	86	95	104	114	131	11
Terminal Revenue	1	1	1	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	1	1	32
Hardware Revenue	80	80	79	86	96	104	115	132	11
Year-to-Year Increase (%)	-13	-1	-1	9	12	9	10	15	
Software Revenue	56	58	60	64	68	73	78	87	8
Year-to-Year Increase (%)	-12	5	3	6	7	8	6	12	
Software Service	23	26	30	30	31	32	32	34	3
Hardware Service	18	16	16	17	18	19	20	22	6
Service Revenue	40	42	46	47	49	51	52	56	4
Year-to-Year Increase (%)	0	3	11	2	4	3	3	7	
Total Factory Revenue	177	180	185	197	213	228	245	274	8
Year-to-Year Increase (%)	-10	2	3	6	8	7	7	12	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-17
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Italy, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1,206	1,327	1,520	1,700	1,900	2,100	2,400	2,800	13
Seats	1,197	1,326	1,515	1,700	1,900	2,100	2,400	2,800	13
Year-to-Year Increase (%)	5	11	14	13	13	12	13	16	
Installed Base									
CPUs	6,158	6,440	6,959	7,600	8,600	9,500	10,200	10,800	9
Seats	6,192	6,458	6,960	7,600	8,600	9,500	10,200	10,800	9
Year-to-Year Increase (%)	6	4	8	10	13	10	7	6	
Revenue Data (U.S.$ Million)									
CPU Revenue	17	15	16	18	19	20	21	23	7
Terminal Revenue	0	0	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	41
Hardware Revenue	17	15	16	18	19	20	21	23	7
Year-to-Year Increase (%)	-8	-11	9	7	8	5	8	9	
Software Revenue	11	11	13	13	13	14	14	15	3
Year-to-Year Increase (%)	1	0	14	2	2	3	4	6	
Software Service	5	5	6	6	6	6	6	6	-2
Hardware Service	4	3	3	3	4	4	4	4	2
Service Revenue	9	8	9	9	9	9	9	9	0
Year-to-Year Increase (%)	7	-12	26	-1	0	-2	0	1	
Total Factory Revenue	37	34	39	40	42	43	45	48	4
Year-to-Year Increase (%)	-2	-8	14	3	4	2	5	6	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-18
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Scandinavia, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1,944	2,201	2,679	3,300	4,200	5,100	6,100	7,300	22
Seats	1,935	2,200	2,678	3,300	4,200	5,100	6,100	7,300	22
Year-to-Year Increase (%)	29	14	22	25	25	23	18	20	
Installed Base									
CPUs	7,525	8,547	10,005	12,000	14,800	17,900	20,800	23,700	19
Seats	7,540	8,551	10,000	12,000	14,800	17,900	20,800	23,700	19
Year-to-Year Increase (%)	14	13	17	20	23	21	16	14	
Revenue Data (U.S.$ Million)									
CPU Revenue	22	24	26	31	37	43	48	54	16
Terminal Revenue	0	0	0	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	42
Hardware Revenue	23	24	26	31	37	43	48	54	16
Year-to-Year Increase (%)	16	5	9	19	20	15	12	13	
Software Revenue	16	18	21	23	27	30	32	35	11
Year-to-Year Increase (%)	23	13	14	14	14	13	8	9	
Software Service	7	9	12	13	14	15	16	16	6
Hardware Service	5	5	5	6	7	7	8	8	10
Service Revenue	13	14	18	19	21	23	24	25	7
Year-to-Year Increase (%)	37	8	28	10	10	7	4	4	
Total Factory Revenue	51	56	64	74	85	96	104	114	12
Year-to-Year Increase (%)	23	8	16	15	15	12	9	9	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-19
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Spain, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	517	531	579	700	800	900	1,000	1,100	14
Seats	521	535	582	700	800	900	1,000	1,100	14
Year-to-Year Increase (%)	-5	3	9	15	17	14	10	13	
Installed Base									
CPUs	2,267	2,455	2,622	2,800	3,200	3,500	3,700	3,900	8
Seats	2,310	2,493	2,652	2,800	3,200	3,500	3,700	3,900	8
Year-to-Year Increase (%)	16	8	6	7	12	10	7	5	
Revenue Data (U.S.$ Million)									
CPU Revenue	5	5	5	5	6	6	6	7	8
Terminal Revenue	0	0	0	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	22
Hardware Revenue	5	5	5	5	6	6	7	7	8
Year-to-Year Increase (%)	-45	4	-5	10	12	6	5	7	
Software Revenue	4	4	4	4	5	5	5	5	6
Year-to-Year Increase (%)	-5	8	1	7	10	7	2	6	
Software Service	1	1	2	2	2	2	2	2	3
Hardware Service	1	1	1	1	1	1	1	1	6
Service Revenue	2	2	3	3	3	3	3	3	4
Year-to-Year Increase (%)	-6	6	12	5	9	3	0	4	
Total Factory Revenue	11	11	11	12	14	14	15	16	7
Year-to-Year Increase (%)	-29	6	0	8	11	6	3	6	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-20
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, United Kingdom, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	2,693	3,596	3,600	4,500	5,600	6,700	7,800	9,200	21
Seats	2,682	3,610	3,611	4,500	5,600	6,700	7,800	9,200	21
Year-to-Year Increase (%)	7	35	0	25	24	20	16	19	
Installed Base									
CPUs	12,934	14,533	16,158	18,500	22,100	25,900	29,300	32,600	15
Seats	13,004	14,581	16,193	18,600	22,100	25,900	29,300	32,600	15
Year-to-Year Increase (%)	9	12	11	15	19	17	13	11	
Revenue Data (U.S.$ Million)									
CPU Revenue	37	41	42	50	60	67	74	83	15
Terminal Revenue	1	0	0	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	0	0	0	0	0	51
Hardware Revenue	37	42	42	50	60	67	74	83	14
Year-to-Year Increase (%)	-4	12	1	19	19	12	11	12	
Software Revenue	25	31	32	37	43	48	51	56	11
Year-to-Year Increase (%)	0	23	5	15	14	11	7	9	
Software Service	10	14	18	19	21	22	23	24	6
Hardware Service	9	8	9	10	12	13	13	14	10
Service Revenue	19	23	27	30	33	35	36	38	8
Year-to-Year Increase (%)	10	19	18	12	11	6	4	5	
Total Factory Revenue	81	95	101	117	136	150	162	177	12
Year-to-Year Increase (%)	0	17	6	16	16	10	8	10	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-21
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Austria/Switzerland, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	196	377	760	1,000	1,200	1,600	1,900	2,300	25
Seats	191	376	759	1,000	1,200	1,600	1,900	2,300	25
Year-to-Year Increase (%)	40	97	102	27	28	26	21	25	
Installed Base									
CPUs	358	728	1,459	2,400	3,500	4,600	5,500	6,700	36
Seats	353	722	1,452	2,400	3,500	4,600	5,500	6,700	36
Year-to-Year Increase (%)	114	105	101	63	48	32	20	21	
Revenue Data (U.S.$ Million)									
CPU Revenue	4	3	4	5	7	8	9	11	21
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	0	0	0	0	0	50
Hardware Revenue	4	3	4	5	7	8	9	12	21
Year-to-Year Increase (%)	41	-15	29	21	26	20	17	21	
Software Revenue	3	3	4	4	5	7	7	9	20
Year-to-Year Increase (%)	27	-6	44	20	25	20	13	20	
Software Service	2	1	2	2	2	2	3	3	12
Hardware Service	1	1	1	1	1	1	1	1	14
Service Revenue	3	2	2	3	3	3	4	4	13
Year-to-Year Increase (%)	7	-32	29	12	17	12	9	14	
Total Factory Revenue	9	8	10	12	15	18	21	25	19
Year-to-Year Increase (%)	26	-17	34	19	24	18	14	20	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-22
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Russia, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	9	46	142	200	300	400	500	600	34
Seats	9	46	142	200	300	400	500	600	34
Year-to-Year Increase (%)	14	434	209	53	36	28	25	28	
Installed Base									
CPUs	16	62	203	400	700	1,000	1,300	1,700	53
Seats	16	62	203	400	700	1,000	1,300	1,700	53
Year-to-Year Increase (%)	114	284	226	106	70	47	29	27	
Revenue Data (U.S.$ Million)									
CPU Revenue	0	1	1	2	2	2	3	4	27
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	-	-	-	-	-	-	NA
Hardware Revenue	0	1	1	2	2	2	3	4	27
Year-to-Year Increase (%)	17	375	23	48	29	19	19	20	
Software Revenue	0	1	1	1	1	2	2	2	19
Year-to-Year Increase (%)	-168	-932	34	38	20	14	12	13	
Software Service	0	0	1	1	1	1	1	1	13
Hardware Service	0	0	0	0	0	0	0	0	17
Service Revenue	0	1	1	1	1	1	2	2	14
Year-to-Year Increase (%)	7	366	29	33	16	8	7	6	
Total Factory Revenue	0	2	3	4	5	6	6	7	21
Year-to-Year Increase (%)	-39	783	28	40	23	15	14	14	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-23
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Central Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	20	101	268	400	500	600	700	900	26
Seats	20	101	268	400	500	600	700	900	26
Year-to-Year Increase (%)	NA	413	166	32	32	28	19	21	
Installed Base									
CPUs	32	129	393	700	1,200	1,700	2,100	2,600	46
Seats	32	129	393	700	1,200	1,700	2,100	2,600	46
Year-to-Year Increase (%)	129	305	204	88	61	42	26	21	
Revenue Data (U.S.$ Million)									
CPU Revenue	0	1	3	4	5	6	6	7	20
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	0	0	0	0	0	56
Hardware Revenue	0	1	3	4	5	6	6	7	21
Year-to-Year Increase (%)	NA	71	300	29	27	20	13	15	
Software Revenue	0	0	2	3	3	4	4	5	17
Year-to-Year Increase (%)	NA	47	518	22	22	19	10	13	
Software Service	0	0	1	1	1	1	1	1	13
Hardware Service	0	0	1	1	1	1	1	1	14
Service Revenue	0	0	1	2	2	2	2	3	13
Year-to-Year Increase (%)	NA	3	607	19	19	14	7	9	
Total Factory Revenue	1	1	7	8	10	12	13	15	18
Year-to-Year Increase (%)	NA	49	409	24	23	18	11	13	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-24
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Rest of Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1,898	1,355	872	1,000	1,100	1,100	1,200	1,300	8
Seats	1,916	1,383	871	1,000	1,100	1,100	1,200	1,300	8
Year-to-Year Increase (%)	11	-28	-37	11	10	6	5	7	
Installed Base									
CPUs	8,097	8,222	7,751	7,100	6,700	6,500	6,600	6,200	-4
Seats	8,177	8,312	7,823	7,200	6,800	6,500	6,600	6,300	-4
Year-to-Year Increase (%)	15	2	-6	-8	-6	-3	1	-5	
Revenue Data (U.S.$ Million)									
CPU Revenue	14	13	13	14	15	15	16	16	4
Terminal Revenue	0	1	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	39
Hardware Revenue	15	13	13	14	15	15	16	16	4
Year-to-Year Increase (%)	-24	-9	-4	9	7	1	2	2	
Software Revenue	11	10	10	10	10	10	10	10	0
Year-to-Year Increase (%)	-16	-11	2	2	1	0	-2	-1	
Software Service	4	4	5	5	5	5	4	4	-5
Hardware Service	3	2	3	3	3	3	3	3	-1
Service Revenue	6	6	8	8	8	8	7	7	-3
Year-to-Year Increase (%)	-10	-1	29	0	-1	-5	-5	-6	
Total Factory Revenue	32	30	31	33	34	33	33	33	1
Year-to-Year Increase (%)	-19	-8	5	5	3	-1	-1	-1	

NA = Not applicable

Source: Dataquest (September 1996)

Table A-3
CAD/CAM/CAE/GIS Software History and Forecast
Top-Level IC Layout Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue (U.S.$ Million)									
Worldwide, All Operating Systems	175	203	263	340	428	537	624	786	24.4
Worldwide									
UNIX	172	200	258	335	423	532	618	780	24.7
Windows NT	-	-	1	1	1	1	1	1	0
Personal Computer	3	3	4	4	4	4	4	4	4.7
Host/Proprietary	-	-	-	-	-	-	-	-	NA
All Operating Systems									
North America	82	95	126	179	237	282	324	387	25.2
Europe	29	30	37	40	43	47	50	54	8.0
Japan	50	62	80	94	111	158	190	265	27.1
Asia/Pacific	14	15	20	26	35	49	58	79	31.1
Rest of World	1	1	1	1	1	1	1	2	25.4
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		15.9	29.7	29.2	25.8	25.6	16.0	26.1	
Worldwide									
UNIX		16.4	29.2	29.6	26.1	25.8	16.2	26.3	
Windows NT		NA	NA	0	0	0	0	0	
Personal Computer		-9.8	17.0	7.2	6.5	5.3	2.1	2.8	
Host/Proprietary		NA	NA	NA	NA	NA	NA	NA	
All Operating Systems									
North America		16.1	32.4	42.3	32.6	18.8	14.9	19.3	
Europe		3.2	22.5	8.9	7.6	7.9	7.4	8.1	
Japan		24.3	28.1	17.7	18.5	42.3	19.8	39.6	
Asia/Pacific		11.4	34.5	29.9	32.9	39.9	19.0	34.9	
Rest of World		-2.5	5.4	42.0	33.0	18.5	17.4	18.0	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-25
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1,294	1,332	1,561	1,700	1,900	2,000	2,200	2,400	9
Seats	1,232	1,245	1,485	1,700	1,900	2,000	2,200	2,400	10
Year-to-Year Increase (%)	-20	1	19	13	12	7	8	9	
Installed Base									
CPUs	7,670	7,968	8,709	9,600	10,700	12,000	12,800	13,200	9
Seats	7,573	7,790	8,473	9,400	10,500	11,800	12,700	13,100	9
Year-to-Year Increase (%)	3	3	9	11	12	12	7	3	
Revenue Data (U.S.$ Million)									
CPU Revenue	46	48	56	56	64	70	79	88	10
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	0	0	0	0	0	-1
Hardware Revenue	47	48	56	56	64	70	79	88	10
Year-to-Year Increase (%)	-25	3	16	0	15	10	11	12	
Software Revenue	29	30	37	40	43	47	50	54	8
Year-to-Year Increase (%)	-21	3	22	9	8	8	7	8	
Software Service	15	23	31	33	34	35	36	36	3
Hardware Service	12	11	13	13	15	15	17	18	6
Service Revenue	28	34	44	46	49	50	52	54	4
Year-to-Year Increase (%)	2	23	31	3	7	4	4	4	
Total Factory Revenue	103	112	137	142	156	168	181	197	7
Year-to-Year Increase (%)	-18	8	22	3	10	7	8	9	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-26
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Benelux, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	66	45	49	0	100	100	100	100	4
Seats	58	36	41	0	100	100	100	100	8
Year-to-Year Increase (%)	-13	-38	15	11	10	5	7	7	
Installed Base									
CPUs	495	468	463	500	500	500	500	500	1
Seats	480	444	434	400	400	500	500	500	2
Year-to-Year Increase (%)	-4	-7	-2	0	3	5	1	1	
Revenue Data (U.S.$ Million)									
CPU Revenue	3	2	2	2	2	2	2	2	1
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	0	0	0	0	0	-3
Hardware Revenue	3	2	2	2	2	2	2	2	1
Year-to-Year Increase (%)	-18	-25	9	-29	13	8	10	10	
Software Revenue	1	1	1	1	1	1	1	1	6
Year-to-Year Increase (%)	-14	-37	18	7	5	6	6	6	
Software Service	0	1	1	1	1	1	1	1	1
Hardware Service	1	0	0	0	0	0	0	0	-1
Service Revenue	1	1	1	1	1	1	1	1	0
Year-to-Year Increase (%)	-9	-7	17	-8	4	2	2	2	
Total Factory Revenue	5	4	4	4	4	4	5	5	2
Year-to-Year Increase (%)	-15	-24	13	-15	8	6	7	6	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-27
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, France, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	284	346	398	400	500	500	600	600	8
Seats	273	331	385	400	500	500	600	600	9
Year-to-Year Increase (%)	-10	21	16	12	12	6	7	8	
Installed Base									
CPUs	1,538	1,699	1,933	2,200	2,500	2,900	3,100	3,200	11
Seats	1,521	1,665	1,890	2,200	2,500	2,900	3,100	3,200	11
Year-to-Year Increase (%)	8	9	13	14	15	15	8	3	
Revenue Data (U.S.$ Million)									
CPU Revenue	10	12	14	15	17	19	21	23	10
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	0	0	0	0	0	-2
Hardware Revenue	10	12	14	15	17	19	21	23	10
Year-to-Year Increase (%)	-17	21	17	5	15	9	10	11	
Software Revenue	7	8	10	11	11	12	13	14	7
Year-to-Year Increase (%)	-14	23	23	8	7	7	6	7	
Software Service	3	5	7	7	8	8	8	8	3
Hardware Service	3	3	3	4	4	4	4	5	6
Service Revenue	6	8	11	11	12	12	12	13	4
Year-to-Year Increase (%)	7	34	31	3	6	3	3	3	
Total Factory Revenue	23	28	35	36	40	43	46	50	8
Year-to-Year Increase (%)	-11	25	23	5	10	7	7	8	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-28
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Germany, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	382	393	464	500	600	600	700	700	9
Seats	363	367	441	500	600	600	700	700	10
Year-to-Year Increase (%)	-17	1	20	13	12	7	9	10	
Installed Base									
CPUs	2,120	2,226	2,473	2,800	3,100	3,500	3,800	3,900	10
Seats	2,090	2,175	2,405	2,700	3,100	3,400	3,700	3,900	10
Year-to-Year Increase (%)	5	4	11	12	13	13	8	4	
Revenue Data (U.S.$ Million)									
CPU Revenue	14	14	17	17	19	21	24	27	10
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	0	0	0	0	0	-1
Hardware Revenue	14	14	17	17	19	21	24	27	10
Year-to-Year Increase (%)	-22	3	17	0	15	10	12	14	
Software Revenue	9	9	11	12	13	14	15	17	9
Year-to-Year Increase (%)	-19	3	24	9	7	8	8	9	
Software Service	5	7	10	10	11	11	11	12	4
Hardware Service	4	3	4	4	4	5	5	6	7
Service Revenue	9	10	14	14	15	15	16	17	5
Year-to-Year Increase (%)	4	21	32	3	6	4	5	5	
Total Factory Revenue	31	33	41	43	47	51	55	61	8
Year-to-Year Increase (%)	-15	8	24	4	10	8	9	10	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-29
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Italy, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	77	90	102	100	100	100	100	200	9
Seats	71	81	95	100	100	100	100	200	10
Year-to-Year Increase (%)	-36	15	16	12	14	7	9	9	
Installed Base									
CPUs	577	576	607	600	700	800	900	900	8
Seats	567	557	582	600	700	800	800	900	8
Year-to-Year Increase (%)	-3	-2	5	8	11	12	8	4	
Revenue Data (U.S.$ Million)									
CPU Revenue	3	3	4	4	4	5	5	6	9
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	0	0	0	0	0	-1
Hardware Revenue	3	3	4	4	4	5	5	6	9
Year-to-Year Increase (%)	-36	15	16	-7	17	10	13	13	
Software Revenue	2	2	2	3	3	3	3	4	9
Year-to-Year Increase (%)	-22	19	23	8	9	8	8	8	
Software Service	1	2	2	2	2	2	3	3	4
Hardware Service	1	1	1	1	1	1	1	1	6
Service Revenue	2	2	3	3	3	4	4	4	4
Year-to-Year Increase (%)	2	26	29	1	8	4	5	4	
Total Factory Revenue	7	8	9	9	11	11	12	13	7
Year-to-Year Increase (%)	-24	19	22	-1	12	8	9	9	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-30
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Scandinavia, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	79	109	128	100	200	200	200	200	10
Seats	73	101	121	100	200	200	200	200	11
Year-to-Year Increase (%)	-20	37	20	14	14	7	9	10	
Installed Base									
CPUs	501	543	615	700	800	900	1,000	1,100	12
Seats	488	522	590	700	800	900	1,000	1,000	12
Year-to-Year Increase (%)	3	7	13	15	16	16	10	4	
Revenue Data (U.S.$ Million)									
CPU Revenue	3	4	5	5	6	6	7	8	10
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	0	0	0	0	0	0
Hardware Revenue	3	4	5	5	6	6	7	8	10
Year-to-Year Increase (%)	-24	33	18	0	17	10	12	14	
Software Revenue	2	2	3	3	4	4	4	5	9
Year-to-Year Increase (%)	-21	43	26	10	9	8	8	9	
Software Service	1	2	3	3	3	4	4	4	4
Hardware Service	1	1	1	1	1	1	1	2	7
Service Revenue	2	3	4	4	5	5	5	5	5
Year-to-Year Increase (%)	14	49	36	4	8	4	4	5	
Total Factory Revenue	7	9	12	12	14	15	16	18	8
Year-to-Year Increase (%)	-15	40	26	4	12	8	9	10	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-31
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Spain, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	24	30	34	0	0	0	0	0	7
Seats	25	29	34	0	0	0	0	0	7
Year-to-Year Increase (%)	-10	16	17	10	10	4	6	6	
Installed Base									
CPUs	96	118	140	200	200	200	200	200	12
Seats	104	123	144	200	200	200	200	200	11
Year-to-Year Increase (%)	24	19	16	16	17	15	7	2	
Revenue Data (U.S.$ Million)									
CPU Revenue	1	1	1	1	1	1	2	2	9
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	0	0	0	0	0	-4
Hardware Revenue	1	1	1	1	1	1	2	2	9
Year-to-Year Increase (%)	-27	17	15	7	13	7	9	9	
Software Revenue	1	1	1	1	1	1	1	1	5
Year-to-Year Increase (%)	-8	23	21	6	5	5	5	5	
Software Service	0	0	1	1	1	1	1	1	1
Hardware Service	0	0	0	0	0	0	0	0	5
Service Revenue	1	1	1	1	1	1	1	1	2
Year-to-Year Increase (%)	10	30	30	2	4	1	2	1	
Total Factory Revenue	2	2	3	3	3	3	4	4	6
Year-to-Year Increase (%)	-14	22	21	5	8	5	6	6	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-32
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, United Kingdom, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	183	202	264	300	300	300	400	400	9
Seats	171	186	250	300	300	300	400	400	10
Year-to-Year Increase (%)	-29	9	34	14	13	8	9	9	
Installed Base									
CPUs	1,379	1,364	1,471	1,600	1,800	2,100	2,200	2,300	9
Seats	1,353	1,326	1,424	1,600	1,800	2,000	2,200	2,200	10
Year-to-Year Increase (%)	-4	-2	7	11	13	13	7	4	
Revenue Data (U.S.$ Million)									
CPU Revenue	7	7	9	9	10	11	12	14	9
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	0	0	0	0	0	-1
Hardware Revenue	7	7	9	9	10	11	12	14	9
Year-to-Year Increase (%)	-30	10	17	-2	17	10	11	11	
Software Revenue	4	5	6	6	7	7	8	8	8
Year-to-Year Increase (%)	-30	12	25	10	9	9	7	7	
Software Service	2	4	5	6	6	6	6	6	4
Hardware Service	2	2	2	2	2	2	3	3	6
Service Revenue	4	6	7	8	8	8	9	9	4
Year-to-Year Increase (%)	-4	34	32	4	7	4	4	3	
Total Factory Revenue	15	18	22	22	25	27	29	31	7
Year-to-Year Increase (%)	-24	17	24	3	11	8	8	8	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-33
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Austria/Switzerland, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	14	12	15	0	0	0	0	0	8
Seats	12	10	13	0	0	0	0	0	11
Year-to-Year Increase (%)	47	-15	29	14	14	7	9	9	
Installed Base									
CPUs	22	34	48	100	100	100	100	100	15
Seats	20	30	42	100	100	100	100	100	17
Year-to-Year Increase (%)	147	51	39	30	26	18	10	5	
Revenue Data (U.S.$ Million)									
CPU Revenue	1	1	1	0	1	1	1	1	5
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	0	0	0	0	0	-1
Hardware Revenue	1	1	1	0	1	1	1	1	5
Year-to-Year Increase (%)	93	-8	15	-20	17	10	12	12	
Software Revenue	0	0	0	0	0	0	0	0	9
Year-to-Year Increase (%)	35	-15	29	10	9	8	8	8	
Software Service	0	0	0	0	0	0	0	0	4
Hardware Service	0	0	0	0	0	0	0	0	3
Service Revenue	0	0	0	0	0	0	1	1	4
Year-to-Year Increase (%)	27	-12	35	-1	8	4	4	4	
Total Factory Revenue	1	1	1	1	1	1	2	2	6
Year-to-Year Increase (%)	53	-11	24	-7	12	7	9	9	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-34
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Russia, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1	5	6	0	0	0	0	0	16
Seats	1	5	6	0	0	0	0	0	16
Year-to-Year Increase (%)	64	532	23	21	15	9	16	21	
Installed Base									
CPUs	1	6	12	0	0	0	0	0	32
Seats	1	6	12	0	0	0	0	0	32
Year-to-Year Increase (%)	164	393	97	59	43	31	21	12	
Revenue Data (U.S.$ Million)									
CPU Revenue	0	0	0	0	0	0	0	0	20
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	-	-	-	-	-	-	NA
Hardware Revenue	0	0	0	0	0	0	0	0	20
Year-to-Year Increase (%)	49	542	26	25	18	12	20	25	
Software Revenue	0	0	0	0	0	0	0	0	15
Year-to-Year Increase (%)	51	535	31	16	10	11	16	21	
Software Service	0	0	0	0	0	0	0	0	9
Hardware Service	0	0	0	0	0	0	0	0	15
Service Revenue	0	0	0	0	0	0	0	0	11
Year-to-Year Increase (%)	28	537	49	14	9	6	11	15	
Total Factory Revenue	0	0	1	1	1	1	1	1	15
Year-to-Year Increase (%)	42	538	35	18	13	10	16	21	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-35
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Central Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	0	0	0	0	0	0	0	0	15
Seats	0	0	0	0	0	0	0	0	15
Year-to-Year Increase (%)	NA	0	80	16	15	13	16	16	
Installed Base									
CPUs	0	0	1	0	0	0	0	0	24
Seats	0	0	1	0	0	0	0	0	24
Year-to-Year Increase (%)	NA	100	90	52	38	19	6	10	
Revenue Data (U.S.$ Million)									
CPU Revenue	0	0	0	0	0	0	0	0	14
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	0	0	0	0	0	4
Hardware Revenue	0	0	0	0	0	0	0	0	13
Year-to-Year Increase (%)	NA	-12	-43	12	13	10	13	16	
Software Revenue	0	0	0	0	0	0	0	0	8
Year-to-Year Increase (%)	NA	-18	9	8	7	6	8	9	
Software Service	0	0	0	0	0	0	0	0	8
Hardware Service	0	0	0	0	0	0	0	0	4
Service Revenue	0	0	0	0	0	0	0	0	6
Year-to-Year Increase (%)	NA	-5	25	-2	8	6	9	10	
Total Factory Revenue	0	0	0	0	0	0	0	0	9
Year-to-Year Increase (%)	NA	-12	-11	6	9	7	10	12	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-36
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Rest of Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	185	101	101	100	100	100	100	100	7
Seats	184	99	99	100	100	100	100	100	7
Year-to-Year Increase (%)	-30	-46	0	10	10	4	6	6	
Installed Base									
CPUs	940	934	947	1,000	1,000	1,000	1,000	1,000	1
Seats	949	941	950	1,000	1,000	1,000	1,000	1,000	1
Year-to-Year Increase (%)	10	-1	1	1	3	2	0	0	
Revenue Data (U.S.$ Million)									
CPU Revenue	6	3	3	4	4	5	5	5	10
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	0	0	0	0	0	-4
Hardware Revenue	6	3	3	4	4	5	5	5	10
Year-to-Year Increase (%)	-34	-44	3	9	13	7	9	9	
Software Revenue	4	2	3	3	3	3	3	3	6
Year-to-Year Increase (%)	-32	-46	6	6	5	6	5	5	
Software Service	1	2	2	2	2	2	2	2	1
Hardware Service	2	1	1	1	1	1	1	1	6
Service Revenue	3	2	3	3	3	3	3	3	2
Year-to-Year Increase (%)	-13	-19	25	3	4	1	2	1	
Total Factory Revenue	13	8	9	10	10	11	11	12	6
Year-to-Year Increase (%)	-30	-39	10	6	8	5	6	6	

NA = Not applicable
Source: Dataquest (September 1996)

Table A-4
CAD/CAM/CAE/GIS Software History and Forecast
Top-Level PCB/MCM/Hybrid Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue (U.S.$ Million)									
Worldwide, All Operating Systems	244	254	266	293	322	355	374	414	9.3
Worldwide									
UNIX	202	207	214	220	224	226	215	202	-1.2
Windows NT	-	8	14	37	62	92	122	176	65.0
Personal Computer	41	37	37	35	35	36	36	37	0.2
Host/Proprietary	1	1	1	1	1	-	-	-	-36.2
All Operating Systems									
North America	66	67	68	79	93	111	126	149	17.1
Europe	42	40	42	45	48	50	51	53	4.7
Japan	125	134	139	148	157	165	165	176	4.8
Asia/Pacific	10	12	15	19	22	26	28	31	15.4
Rest of World	1	1	1	2	2	3	3	5	35.1
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		3.9	4.7	10.1	10.2	10.0	5.4	10.9	
Worldwide									
UNIX		2.8	3.1	2.8	2.0	0.6	-4.8	-6.2	
Windows NT		NA	77.3	157.3	68.0	48.6	32.0	44.2	
Personal Computer		-9.3	-2.4	-4.7	1.4	1.9	1.3	1.1	
Host/Proprietary		-27.3	5.5	-19.9	-29.1	-37.5	-44.3	-46.6	
All Operating Systems									
North America		1.5	1.9	16.7	17.8	19.1	13.1	18.6	
Europe		-4.9	4.9	7.2	4.7	4.5	2.4	5.0	
Japan		7.2	3.7	6.3	6.2	4.8	0.4	6.4	
Asia/Pacific		13.7	30.8	21.0	20.4	17.4	7.7	11.1	
Rest of World		32.9	18.5	46.1	42.4	30.5	22.7	35.0	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-37
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	7,491	6,583	6,881	7,800	8,800	9,800	10,800	12,000	12
Seats	7,624	6,717	7,034	7,900	9,000	9,900	11,000	12,100	12
Year-to-Year Increase (%)	-10	-12	5	13	13	11	10	11	
Installed Base									
CPUs	48,134	45,313	44,194	44,300	45,800	47,800	49,700	50,900	3
Seats	49,928	46,723	45,282	45,100	46,500	48,600	50,600	51,900	3
Year-to-Year Increase (%)	-3	-6	-3	0	3	4	4	3	
Revenue Data (U.S.$ Million)									
CPU Revenue	55	49	50	54	60	63	67	72	7
Terminal Revenue	4	4	4	4	3	3	3	3	-4
Peripheral Revenue	0	1	0	0	1	1	1	1	7
Hardware Revenue	60	54	55	58	64	67	71	76	7
Year-to-Year Increase (%)	-27	-9	1	7	9	6	5	7	
Software Revenue	42	40	42	45	48	50	51	53	5
Year-to-Year Increase (%)	-19	-5	5	7	5	5	2	5	
Software Service	21	21	29	29	29	29	28	27	-1
Hardware Service	11	9	9	10	10	10	10	11	3
Service Revenue	32	30	38	39	39	39	38	38	0
Year-to-Year Increase (%)	-14	-7	29	1	2	-1	-2	-1	
Total Factory Revenue	134	125	135	142	150	156	160	167	4
Year-to-Year Increase (%)	-21	-7	9	5	6	4	3	5	

Source: Dataquest (September 1996)

Table B-38
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Benelux, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	615	705	811	900	1,000	1,100	1,200	1,400	11
Seats	625	701	808	900	1,000	1,100	1,200	1,400	11
Year-to-Year Increase (%)	-19	12	15	13	13	11	8	11	
Installed Base									
CPUs	3,446	3,613	3,859	4,100	4,500	4,800	4,900	5,100	6
Seats	3,560	3,689	3,901	4,100	4,500	4,800	4,900	5,100	5
Year-to-Year Increase (%)	5	4	6	6	9	5	4	3	
Revenue Data (U.S.$ Million)									
CPU Revenue	3	3	3	3	3	4	4	4	7
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	16
Hardware Revenue	4	3	3	3	3	4	4	4	7
Year-to-Year Increase (%)	-31	-10	-4	-1	13	9	6	10	
Software Revenue	2	3	3	3	3	3	3	3	2
Year-to-Year Increase (%)	-29	16	-1	4	3	1	-2	3	
Software Service	1	1	1	1	1	1	1	1	0
Hardware Service	0	0	0	0	0	0	0	0	2
Service Revenue	1	1	1	1	1	1	1	1	1
Year-to-Year Increase (%)	-33	4	-27	-3	4	1	-2	4	
Total Factory Revenue	7	7	7	7	7	7	8	8	5
Year-to-Year Increase (%)	-30	1	-7	1	8	5	2	7	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-39
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, France, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	926	899	942	1,100	1,300	1,400	1,500	1,700	12
Seats	938	904	948	1,100	1,300	1,400	1,500	1,700	12
Year-to-Year Increase (%)	-27	-4	5	16	14	9	9	11	
Installed Base									
CPUs	6,473	6,167	6,048	6,200	6,500	6,800	7,100	7,300	4
Seats	6,740	6,356	6,170	6,200	6,500	6,800	7,200	7,300	4
Year-to-Year Increase (%)	-4	-6	-3	1	4	5	4	3	
Revenue Data (U.S.$ Million)									
CPU Revenue	8	8	9	10	11	11	12	12	8
Terminal Revenue	1	0	0	0	0	0	0	0	-4
Peripheral Revenue	0	0	0	0	0	0	0	0	7
Hardware Revenue	9	8	9	10	11	11	12	13	7
Year-to-Year Increase (%)	-38	-6	7	12	11	4	4	6	
Software Revenue	6	6	7	8	8	8	8	9	4
Year-to-Year Increase (%)	-35	3	12	9	5	3	1	3	
Software Service	3	4	6	6	6	6	6	5	-2
Hardware Service	2	2	2	2	2	2	2	2	4
Service Revenue	5	5	8	8	8	8	8	8	0
Year-to-Year Increase (%)	-31	2	46	4	3	-2	-3	-2	
Total Factory Revenue	20	20	24	26	27	28	28	29	4
Year-to-Year Increase (%)	-35	-1	19	9	7	2	1	3	

Source: Dataquest (September 1996)

Table B-40
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Germany, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	3,370	2,472	2,668	3,000	3,400	3,900	4,400	4,900	13
Seats	3,425	2,606	2,817	3,100	3,500	4,000	4,500	5,000	12
Year-to-Year Increase (%)	-6	-24	8	10	13	14	13	11	
Installed Base									
CPUs	19,304	18,237	17,776	17,500	17,800	18,400	19,300	20,000	2
Seats	19,944	18,830	18,353	18,100	18,400	19,200	20,100	20,900	3
Year-to-Year Increase (%)	0	-6	-3	-1	2	4	5	4	
Revenue Data (U.S.$ Million)									
CPU Revenue	21	17	18	19	21	22	24	26	8
Terminal Revenue	2	4	4	3	3	3	3	3	-4
Peripheral Revenue	0	0	0	0	0	0	0	0	7
Hardware Revenue	23	21	21	22	24	26	28	29	7
Year-to-Year Increase (%)	-24	-8	3	4	7	8	8	6	
Software Revenue	17	14	15	15	16	17	18	19	5
Year-to-Year Increase (%)	-18	-20	7	4	4	7	5	4	
Software Service	8	6	9	9	9	9	9	9	-1
Hardware Service	4	3	3	3	3	3	4	4	3
Service Revenue	11	9	12	12	12	13	13	13	0
Year-to-Year Increase (%)	-16	-18	32	-1	1	2	1	-1	
Total Factory Revenue	51	44	48	50	52	55	58	61	5
Year-to-Year Increase (%)	-21	-14	10	3	5	6	5	4	

Source: Dataquest (September 1996)

Table B-41
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Italy, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	374	394	354	400	400	500	500	600	10
Seats	382	390	351	400	400	500	500	600	10
Year-to-Year Increase (%)	-11	2	-10	13	11	9	7	10	
Installed Base									
CPUs	2,636	2,507	2,392	2,400	2,400	2,500	2,500	2,600	1
Seats	2,805	2,623	2,459	2,400	2,400	2,500	2,500	2,600	1
Year-to-Year Increase (%)	-4	-7	-6	-2	2	3	1	1	
Revenue Data (U.S.$ Million)									
CPU Revenue	4	4	3	3	3	3	4	4	5
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	1
Hardware Revenue	4	4	3	3	3	4	4	4	5
Year-to-Year Increase (%)	-29	-15	-16	0	10	5	4	7	
Software Revenue	3	3	2	3	3	3	3	3	5
Year-to-Year Increase (%)	-14	2	-13	9	4	4	1	6	
Software Service	1	1	2	2	2	2	2	2	-2
Hardware Service	1	1	1	1	1	1	1	1	0
Service Revenue	2	2	2	2	2	2	2	2	-2
Year-to-Year Increase (%)	-10	-11	16	-2	0	-2	-4	-1	
Total Factory Revenue	9	9	8	8	9	9	9	9	3
Year-to-Year Increase (%)	-21	-9	-7	2	5	3	1	5	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-42
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Scandinavia, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	669	488	453	500	600	600	700	700	9
Seats	673	485	450	500	600	600	700	700	10
Year-to-Year Increase (%)	47	-28	-7	13	11	8	7	9	
Installed Base									
CPUs	3,489	3,210	3,072	3,000	3,100	3,200	3,300	3,300	1
Seats	3,613	3,292	3,116	3,100	3,100	3,200	3,300	3,300	1
Year-to-Year Increase (%)	-3	-9	-5	-2	1	4	3	-1	
Revenue Data (U.S.$ Million)									
CPU Revenue	6	5	5	5	6	6	6	6	5
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	21
Hardware Revenue	6	5	5	5	6	6	6	6	5
Year-to-Year Increase (%)	4	-14	-4	4	10	4	3	5	
Software Revenue	4	4	4	4	5	5	5	5	4
Year-to-Year Increase (%)	31	-6	0	8	4	4	1	4	
Software Service	3	3	3	3	3	3	3	3	-3
Hardware Service	1	1	1	1	1	1	1	1	0
Service Revenue	4	4	4	4	4	4	4	4	-2
Year-to-Year Increase (%)	36	-4	17	-1	0	-3	-5	-2	
Total Factory Revenue	14	13	13	14	14	15	15	15	3
Year-to-Year Increase (%)	19	-9	3	4	5	2	0	3	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-43
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Spain, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	111	78	100	100	100	100	100	200	10
Seats	116	77	100	100	100	100	100	200	10
Year-to-Year Increase (%)	-32	-33	29	14	12	8	6	10	
Installed Base									
CPUs	1,036	833	717	600	600	600	600	600	-3
Seats	1,100	884	750	700	600	600	600	600	-4
Year-to-Year Increase (%)	-7	-20	-15	-12	-7	0	1	1	
Revenue Data (U.S.$ Million)									
CPU Revenue	1	0	0	1	1	1	1	1	6
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	19
Hardware Revenue	1	0	1	1	1	1	1	1	6
Year-to-Year Increase (%)	-66	-37	1	6	10	4	3	8	
Software Revenue	1	0	1	1	1	1	1	1	5
Year-to-Year Increase (%)	-33	-17	10	10	5	3	0	6	
Software Service	0	0	0	0	0	0	0	0	0
Hardware Service	0	0	0	0	0	0	0	0	7
Service Revenue	0	0	0	0	0	0	0	1	2
Year-to-Year Increase (%)	-40	2	16	5	4	0	-2	5	
Total Factory Revenue	2	1	1	2	2	2	2	2	5
Year-to-Year Increase (%)	-54	-22	8	7	6	3	0	6	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-44
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, United Kingdom, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	896	1,098	1,105	1,300	1,400	1,500	1,600	1,800	10
Seats	914	1,105	1,114	1,300	1,400	1,500	1,600	1,800	10
Year-to-Year Increase (%)	-10	21	1	14	11	8	7	10	
Installed Base									
CPUs	7,574	7,114	7,079	7,300	7,800	8,200	8,500	8,600	4
Seats	7,853	7,311	7,211	7,400	7,800	8,300	8,500	8,700	4
Year-to-Year Increase (%)	-7	-7	-1	3	6	6	3	2	
Revenue Data (U.S.$ Million)									
CPU Revenue	9	9	10	11	11	12	12	13	6
Terminal Revenue	1	0	0	0	0	0	0	0	-6
Peripheral Revenue	0	0	0	0	0	0	0	0	4
Hardware Revenue	10	10	10	11	12	12	12	13	6
Year-to-Year Increase (%)	-25	3	0	10	8	2	3	6	
Software Revenue	7	8	8	9	9	9	9	9	3
Year-to-Year Increase (%)	-19	15	4	7	3	2	0	4	
Software Service	4	4	6	6	6	6	6	5	-3
Hardware Service	2	2	2	2	2	2	2	2	2
Service Revenue	6	6	8	8	8	8	8	8	-2
Year-to-Year Increase (%)	-10	4	34	2	0	-3	-4	-1	
Total Factory Revenue	22	24	26	28	29	29	29	30	3
Year-to-Year Increase (%)	-20	7	10	6	4	0	0	3	

Source: Dataquest (September 1996)

Table B-45
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Austria/Switzerland, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	151	162	224	300	300	300	400	400	13
Seats	149	161	223	300	300	300	400	400	13
Year-to-Year Increase (%)	4	8	38	16	14	11	10	14	
Installed Base									
CPUs	294	456	653	800	1,000	1,200	1,300	1,300	15
Seats	292	453	650	800	1,000	1,200	1,300	1,300	15
Year-to-Year Increase (%)	104	55	43	29	24	13	7	6	
Revenue Data (U.S.$ Million)									
CPU Revenue	1	1	1	1	2	2	2	2	9
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	21
Hardware Revenue	1	1	1	1	2	2	2	2	9
Year-to-Year Increase (%)	11	-20	26	8	12	8	6	12	
Software Revenue	1	1	1	1	1	2	2	2	8
Year-to-Year Increase (%)	0	-19	39	13	7	7	4	11	
Software Service	1	0	1	1	1	1	1	1	2
Hardware Service	0	0	0	0	0	0	0	0	3
Service Revenue	1	1	1	1	1	1	1	1	2
Year-to-Year Increase (%)	3	-31	44	3	3	1	-1	5	
Total Factory Revenue	3	2	3	4	4	4	4	5	7
Year-to-Year Increase (%)	5	-23	35	9	8	6	4	10	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-46
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Russia, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	3	14	19	0	0	0	0	0	13
Seats	3	14	19	0	0	0	0	0	13
Year-to-Year Increase (%)	13	382	38	23	17	7	8	11	
Installed Base									
CPUs	5	19	38	100	100	100	100	100	30
Seats	5	19	38	100	100	100	100	100	30
Year-to-Year Increase (%)	113	256	97	60	44	30	17	8	
Revenue Data (U.S.$ Million)									
CPU Revenue	0	0	0	0	0	0	1	1	14
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	-	-	-	-	-	-	NA
Hardware Revenue	0	0	0	0	0	0	1	1	14
Year-to-Year Increase (%)	3	390	21	25	19	7	9	12	
Software Revenue	0	0	0	0	0	0	0	0	9
Year-to-Year Increase (%)	4	384	26	16	11	6	5	7	
Software Service	0	0	0	0	0	0	0	0	4
Hardware Service	0	0	0	0	0	0	0	0	9
Service Revenue	0	0	0	0	0	0	0	0	5
Year-to-Year Increase (%)	9	385	42	13	9	1	0	2	
Total Factory Revenue	0	1	1	1	1	1	1	1	9
Year-to-Year Increase (%)	5	387	30	18	13	5	5	7	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-47
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Central Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	34	56	58	100	100	100	200	200	30
Seats	34	56	58	100	100	100	200	200	30
Year-to-Year Increase (%)	-31	67	3	52	32	24	17	27	
Installed Base									
CPUs	82	139	187	300	300	400	500	600	25
Seats	82	139	187	300	300	400	500	600	25
Year-to-Year Increase (%)	69	68	35	36	33	22	16	18	
Revenue Data (U.S.$ Million)									
CPU Revenue	0	0	0	0	1	1	1	1	34
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	31
Hardware Revenue	0	0	0	0	1	1	1	1	34
Year-to-Year Increase (%)	-17	104	34	71	34	25	16	32	
Software Revenue	0	0	0	1	1	1	1	2	38
Year-to-Year Increase (%)	-13	112	55	86	35	28	18	33	
Software Service	0	0	0	0	0	0	0	1	44
Hardware Service	0	0	0	0	0	0	0	0	24
Service Revenue	0	0	0	0	0	0	0	1	42
Year-to-Year Increase (%)	257	182	86	85	39	33	22	38	
Total Factory Revenue	0	0	1	1	2	2	3	4	37
Year-to-Year Increase (%)	-9	114	49	80	35	28	18	33	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-48
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Rest of Europe, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	343	217	148	200	200	200	200	200	10
Seats	366	216	147	200	200	200	200	200	10
Year-to-Year Increase (%)	-23	-41	-32	13	12	9	8	10	
Installed Base									
CPUs	3,794	3,019	2,373	1,900	1,600	1,500	1,500	1,400	-10
Seats	3,933	3,127	2,448	2,000	1,600	1,500	1,500	1,400	-10
Year-to-Year Increase (%)	-14	-20	-22	-19	-18	-9	-1	-3	
Revenue Data (U.S.$ Million)									
CPU Revenue	2	1	1	1	1	1	1	1	6
Terminal Revenue	1	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	22
Hardware Revenue	2	1	1	1	1	1	1	1	6
Year-to-Year Increase (%)	-30	-43	-19	5	10	4	4	6	
Software Revenue	1	1	1	1	1	1	1	1	1
Year-to-Year Increase (%)	-31	-13	-23	3	2	0	-2	0	
Software Service	0	1	1	1	1	1	1	1	-5
Hardware Service	0	0	0	0	0	0	0	0	1
Service Revenue	1	1	1	1	1	1	1	1	-3
Year-to-Year Increase (%)	-20	-1	8	-1	0	-4	-6	-5	
Total Factory Revenue	5	3	3	3	3	3	3	3	2
Year-to-Year Increase (%)	-29	-27	-14	3	5	1	-1	2	

NA = Not applicable

Source: Dataquest (September 1996)

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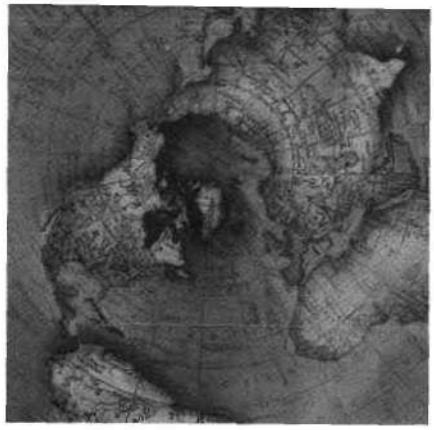

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1995 Electronic Design Automation Market Share Update

Market Statistics

Program: Electronic Design Automation Europe
Product Code: CEDA-EU-MS-9601
Publication Date: August 26, 1996
Filing: Market Statistics

1995 Electronic Design Automation Market Share Update

Market Statistics

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Note: All tables show estimated data.

1995 Electronic Design Automation Market Share Update

About This Document

This document contains Dataquest's detailed market share information on the electronic design automation (EDA) industry at the country level. This report is meant to supplement your worldwide EDA market share book by providing EDA market share detail for European and/or Asia/Pacific countries.

Definitions

This section lists the definitions specific to this document. For other definitions, we ask that you reference your worldwide market statistics book.

Europe

Western Europe

Includes Austria, Benelux, (Belgium, the Netherlands, Luxembourg), France, Germany (including former East Germany), Italy, Scandinavia (Denmark, Finland, Norway, Sweden), Switzerland, the United Kingdom, and the Rest of Western Europe (Andorra, Cyprus, Gibraltar, Iceland, Liechtenstein, Malta, Monaco, San Marino, Spain, Sweden, Turkey, Vatican City, and others)

Eastern Europe

Includes all countries currently categorized as Central Europe in addition to Albania, Bulgaria, the Czech Republic and Slovakia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and the republics of the former Yugoslavia. Also included in this group is Russia and the other republics of the former Soviet Union (Belarus, Ukraine, Georgia, Moldova, Armenia, Azerbaijan, Kazakhstan, Uzbekistan, Tajikistan, Kyrgyzstan, and Turkmenistan)

Asia/Pacific

Includes Hong Kong, Korea, Singapore, Taiwan, and Rest of Asia (Australia, Brunei, Cambodia, China, India, Indonesia, Laos, Malaysia, Maldives, Myanmar, Nepal, New Zealand, Pakistan, the Philippines, Sri Lanka, Thailand, and Vietnam)

Publishing Schedule

We publish market share and forecasting at the country level once each year. Our delivery schedule is as follows:

- Updated market share tables for 1995, based on data collection and analysis beginning in January 1996, are presented in this report. This information is presented at the country level for either Asia/Pacific and/or Europe, according to the services you have purchased from Dataquest. At this point, the market share database is frozen and will not be changed until the end of 1996.

- Forecast tables will be available electronically by September 2, and books will be shipped by September 30. These forecast tables will contain country-level information for Asia/Pacific and/or Europe.

A Final Note

Dataquest's policy is to continually update its market information, for current and past years, with any new data received in order to arrive at the most accurate market representation possible. Our ongoing commitment is to maintain an accurate and complete model of the entire CAD/CAM/CAE/GIS market, worldwide, and we welcome your input. Please feel free to contact any member of the CAD/CAM/CAE team if you have any questions or concerns.

Table A-1
1995 Top 30 Electronic Design Automation Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	189.5	200.8	257.7	28.3	16.6
2	Synopsys	113.7	142.7	193.5	35.6	12.5
3	Mentor Graphics	167.3	175.6	184.0	4.7	11.9
4	Viewlogic Systems	76.9	83.3	77.3	-7.3	5.0
5	Zuken-Redac	72.7	67.0	71.9	7.4	4.6
6	Quickturn Design Systems	51.5	59.0	70.7	19.9	4.6
7	Compass Design Automation	43.6	43.7	51.0	16.7	3.3
8	Hewlett-Packard	33.1	34.4	36.3	5.5	2.3
9	AVANT!	8.4	16.3	32.3	97.7	2.1
10	Marubeni Hytech*	24.7	25.7	29.7	15.4	1.9
11	Zycad	23.2	29.4	28.4	-3.4	1.8
12	Seiko*	32.0	21.9	27.8	26.5	1.8
13	Fujitsu	21.0	23.7	27.4	15.8	1.8
14	Intergraph	25.0	19.9	26.7	34.3	1.7
15	IKOS Systems	18.1	18.6	25.7	38.1	1.7
16	EPIC Design Technology	-	11.9	24.2	103.5	1.6
17	Yokogawa Digital Computer	35.9	21.4	24.0	12.4	1.6
18	Harris EDA	21.0	21.5	21.9	1.6	1.4
19	Autodesk	23.9	22.8	20.6	-9.5	1.3
20	CADIX	31.1	18.3	20.3	11.1	1.3
21	ALTERA	13.1	16.0	19.2	20.0	1.2
22	Xilinx Inc.	14.7	16.9	18.5	9.6	1.2
23	Meta-Software	9.4	14.4	17.5	21.2	1.1
24	Analogy	11.0	11.0	17.1	55.5	1.1
25	Okura*	10.8	14.3	17.0	18.6	1.1
26	Summitt Design	9.1	14.6	16.4	12.7	1.1
27	NEC	22.7	22.4	15.6	-30.1	1.0
28	Wacom	26.3	12.1	15.2	25.8	1.0
29	Cooper & Chyan Technology	5.2	9.3	14.2	53.3	0.9
30	Microsim	5.8	11.9	14.0	17.6	0.9
	All N.A. Companies	965.5	1,111.0	1,327.2	19.5	85.7
	All European Companies	40.4	23.8	26.5	11.3	1.7
	All Asian Companies	181.2	183.5	195.7	6.7	12.6
	All Companies	1,187.1	1,318.3	1,549.4	17.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-2
1995 Top 30 Electronic Design Automation Software Companies, Europe, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	34.8	41.1	49.5	20.5	17.9
2	Cadence	38.8	38.6	45.3	17.2	16.4
3	Synopsys	26.6	30.0	38.1	27.2	13.8
4	Viewlogic Systems	15.4	15.9	15.5	-2.5	5.6
5	Compass Design Automation	11.7	11.4	13.3	16.5	4.8
6	Hewlett-Packard	8.9	9.6	10.2	5.5	3.7
7	Quickturn Design Systems	4.5	11.8	8.3	-29.8	3.0
8	Autodesk	7.9	7.8	8.0	3.0	2.9
9	Zuken-Redac	13.4	9.3	7.1	-23.3	2.6
10	Harris EDA	6.5	6.6	6.4	-3.7	2.3
11	Intergraph	6.7	5.5	5.8	5.7	2.1
12	IKOS Systems	1.8	2.4	5.1	112.5	1.9
13	Analogy	4.2	3.3	5.1	55.5	1.9
14	Zycad	3.0	2.6	3.7	39.6	1.3
15	Cooper & Chyan Technology	0.1	0.9	3.6	283.2	1.3
16	MacNeal-Schwendler	0.8	2.8	3.5	25.4	1.3
17	ALTERA	2.9	3.4	3.3	-2.9	1.2
18	CAD-UL	3.0	2.5	3.2	28.5	1.2
19	Microsim	0.3	2.7	3.2	17.6	1.2
20	ALS Design	2.2	2.3	2.8	18.1	1.0
21	EPIC Design Technology	-	1.9	2.7	39.9	1.0
22	Xilinx Inc.	1.4	2.7	2.5	-7.5	0.9
23	ULTImate Technology	1.8	1.6	2.5	55.1	0.9
24	Ziegler Informatics	5.3	0.7	2.2	228.6	0.8
25	ISDATA	2.3	1.9	2.0	1.9	0.7
26	PADS Software	1.2	1.6	1.9	19.1	0.7
27	i-Logix	1.2	1.6	1.8	16.1	0.7
28	Meta-Software	0.7	1.0	1.7	73.2	0.6
29	OrCAD EDA	1.0	2.1	1.7	-18.3	0.6
30	Norlinvest Ltd.	1.5	1.5	1.5	1.9	0.6
	All N.A. Companies	190.7	220.5	247.3	12.1	89.4
	All European Companies	31.6	20.6	22.4	8.4	8.1
	All Asian Companies	13.4	9.3	7.1	-23.3	2.6
	All Companies	235.7	250.4	276.8	10.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-3
1995 Top 30 Electronic Design Automation Software Companies, France, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	8.9	8.9	10.4	17.2	17.5
2	Mentor Graphics	4.3	7.5	9.0	20.5	15.1
3	Synopsys	2.2	3.6	8.0	122.7	13.4
4	Compass Design Automation	5.9	5.7	6.7	16.5	11.2
5	Viewlogic Systems	4.0	4.7	5.6	19.7	9.4
6	ALS Design	1.8	2.1	2.5	19.5	4.2
7	Zuken-Redac	1.7	1.2	1.5	18.2	2.5
8	Harris EDA	1.3	1.3	1.3	5.2	2.3
9	Hewlett-Packard	1.1	1.2	1.2	5.5	2.0
10	Zycad	1.2	0.9	1.1	28.9	1.9
11	Autodesk	1.2	1.2	1.0	-16.1	1.6
12	Serbi	0.8	0.8	0.9	13.9	1.5
13	Intergraph	1.0	0.8	0.8	5.7	1.4
14	Quickturn Design Systems	-	-	0.7	NA	1.2
15	MacNeal-Schwendler	0.1	0.3	0.4	25.4	0.7
16	VLSI Libraries	-	0.2	0.2	11.8	0.4
17	Sagantec	0.4	0.1	0.2	144.3	0.3
18	Pacific Numerics	-	-	0.2	NA	0.3
19	i-Logix	0.1	0.1	0.1	16.1	0.2
20	PADS Software	0.1	0.1	0.1	27.7	0.2
21	Star Informatic	0.2	0.2	0.1	-49.5	0.2
22	ALDEC	-	-	0.1	NA	0.1
23	Altium*	0.3	0.3	0.1	-72.5	0.1
24	IBM	0.3	0.3	0.1	-72.5	0.1
25	Intusoft	-	0	0.1	96.5	0.1
26	ISDATA	0.2	0.1	0.1	14.5	0.1
27	Accel Technologies	-	-	0.1	NA	0.1
28	ULTImate Technology	0	0	0.1	45.0	0.1
29	Systems Science	-	-	0.1	NA	0.1
30	Ziegler Informatics	0.1	0	0	312.8	0.1
	Other Companies	7.8	9.8	8.0	-18.6	13.4
	All N.A. Companies	30.9	35.7	46.2	29.5	77.6
	All European Companies	3.8	3.3	3.8	17.3	6.5
	All Asian Companies	1.7	1.2	1.5	18.2	2.5
	All Companies	44.1	50.0	59.5	19.0	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-4
1995 Top 30 Electronic Design Automation Software Companies, Germany, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	12.4	12.4	14.5	17.2	16.8
2	Mentor Graphics	12.8	11.9	14.4	20.5	16.7
3	Synopsys	7.8	12.6	9.3	-25.8	10.9
4	Quickturn Design Systems	-	-	5.2	NA	6.1
5	Viewlogic Systems	3.7	3.4	3.7	8.6	4.3
6	Hewlett-Packard	3.2	3.5	3.7	5.5	4.3
7	Zuken-Redac	5.1	3.7	3.1	-16.4	3.6
8	Compass Design Automation	2.7	2.6	3.0	16.5	3.5
9	CAD-UL	1.9	1.9	2.4	28.5	2.8
10	Autodesk	2.2	2.2	2.1	-1.8	2.5
11	Intergraph	2.3	1.9	2.0	5.7	2.3
12	Ziegler Informatics	3.2	0.5	1.7	231.1	2.0
13	ISDATA	1.6	1.5	1.5	-0.6	1.7
14	Zycad	0.7	0.9	1.1	28.9	1.3
15	Harris EDA	1.0	1.0	1.0	6.1	1.2
16	MacNeal-Schwendler	0.2	0.7	0.9	25.4	1.1
17	Kloeckner-Moeller	0.7	0.7	0.8	4.7	0.9
18	Just In Time Systems	0.4	0.5	0.6	32.3	0.7
19	Abstract Hardware	-	0.6	0.6	8.5	0.7
20	Technische Computer Systeme	0.6	0.6	0.6	3.3	0.7
21	i-Logix	0.4	0.5	0.5	16.1	0.6
22	PADS Software	0.4	0.4	0.5	27.7	0.6
23	ULTImate Technology	0.3	0.3	0.5	53.0	0.6
24	ISKA	0.4	0.4	0.4	3.2	0.4
25	Sagantec	1.5	0.2	0.3	57.5	0.3
26	Speed	-	-	0.3	NA	0.3
27	Pacific Numerics	-	-	0.2	NA	0.3
28	ISD Software	0.3	0.2	0.2	36.0	0.3
29	Softronics	0.2	0.2	0.2	2.7	0.3
30	Accel Technologies	-	-	0.2	NA	0.2
	Other Companies	13.5	15.4	11.2	-26.8	13.1
	All N.A. Companies	50.1	53.8	61.9	15.0	72.1
	All European Companies	12.2	7.7	9.7	25.3	11.3
	All Asian Companies	5.1	3.7	3.1	-16.4	3.6
	All Companies	80.9	80.6	86.0	6.6	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-5
1995 Top 29 Electronic Design Automation Software Companies, Benelux, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	1.3	2.1	2.7	27.2	22.1
2	ULTImate Technology	0.7	0.9	1.3	45.0	10.7
3	Mentor Graphics	0.3	1.0	1.2	20.5	9.9
4	Viewlogic Systems	1.1	1.3	0.9	-30.2	7.7
5	Cadence	0.8	0.8	0.9	17.2	7.5
6	Hewlett-Packard	0.6	0.7	0.7	5.5	5.9
7	Compass Design Automation	0.5	0.5	0.6	16.5	5.0
8	Autodesk	0.6	0.6	0.6	-7.5	4.7
9	Intergraph	0.6	0.5	0.5	5.7	4.0
10	CAD-UL	0.2	0.2	0.3	28.5	2.1
11	Harris EDA	0.2	0.2	0.2	6.6	1.6
12	Star Informatic	-	-	0.2	NA	1.4
13	MacNeal-Schwendler	0	0.1	0.2	25.4	1.2
14	Sagantec	0.8	0.1	0.1	-15.7	0.8
15	ISDATA	0.1	0.1	0.1	14.5	0.5
16	Accel Technologies	-	-	0.1	NA	0.5
17	Zuken-Redac	0.5	0.6	0.1	-89.9	0.5
18	ALS Design	0.1	0	0.1	18.1	0.5
19	Intusoft	-	0	0.1	96.5	0.4
20	Optem Engineering	-	0.1	0	-8.0	0.4
21	Technische Computer Systeme	0	0	0	11.2	0.4
22	Altium*	0.1	0.1	0	-72.5	0.3
23	IBM	0.1	0.1	0	-72.5	0.3
24	Ziegler Informatics	0.1	0	0	319.9	0.3
25	Kloeckner-Moeller	0	0	0	13.9	0.1
26	Number One Systems	-	0	0	6.6	0.1
27	ISD Software	0	0	0	36.0	0
28	Computervision	0.1	0	-	-100.0	-
29	Siemens Nixdorf Info systeme	0	0	-	-100.0	-
	Other Companies	1.8	2.3	1.6	-29.2	13.3
	All N.A. Companies	6.4	7.7	8.4	8.4	69.4
	All European Companies	2.2	1.4	2.0	44.5	16.8
	All Asian Companies	0.5	0.6	0.1	-89.9	0.5
	All Companies	10.9	12.0	12.1	0.5	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-6
1995 Top 30 Electronic Design Automation Software Companies, United Kingdom, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	4.1	7.0	8.4	20.5	18.1
2	Cadence	6.8	6.8	7.9	17.2	17.1
3	Synopsys	3.2	5.1	6.7	31.0	14.4
4	Viewlogic Systems	2.6	3.5	2.2	-38.4	4.7
5	Zuken-Redac	2.9	2.5	1.8	-25.7	4.0
6	Harris EDA	1.5	1.6	1.7	10.2	3.7
7	VLSI Libraries	-	1.0	1.2	16.6	2.5
8	Intergraph	1.3	1.1	1.2	5.7	2.5
9	i-Logix	0.8	1.0	1.1	16.1	2.5
10	Zycad	0.5	0.9	1.1	28.9	2.5
11	Autodesk	1.2	1.2	1.1	-3.4	2.4
12	Hewlett-Packard	0.9	1.0	1.1	5.5	2.3
13	Quickturn Design Systems	-	-	0.8	NA	1.8
14	MacNeal-Schwendler	0.1	0.6	0.8	25.4	1.7
15	Compass Design Automation	0.5	0.5	0.6	16.5	1.3
16	Number One Systems	-	0.4	0.4	6.6	0.9
17	Design Acceleration	-	0.1	0.4	380.0	0.8
18	CAD-UL	0.2	0.2	0.3	28.5	0.7
19	Abstract Hardware	1.5	0.3	0.3	8.5	0.6
20	PADS Software	0.2	0.2	0.3	27.7	0.6
21	Quantic Laboratories	-	-	0.2	NA	0.5
22	ULTImate Technology	0.2	0.1	0.2	45.0	0.5
23	Accel Technologies	-	-	0.2	NA	0.4
24	Pacific Numerics	-	-	0.2	NA	0.4
25	ICL	0.2	0.2	0.2	11.8	0.4
26	Tanner Research	-	-	0.1	NA	0.3
27	Intusoft	-	0.1	0.1	96.5	0.3
28	Altium*	0.2	0.3	0.1	-72.5	0.2
29	IBM	0.2	0.3	0.1	-72.5	0.2
30	ISDATA	0.1	0.1	0.1	14.5	0.2
	Other Companies	6.1	8.3	6.2	-25.4	13.4
	All N.A. Companies	23.7	31.0	36.6	18.1	79.1
	All European Companies	3.0	1.5	1.7	11.4	3.6
	All Asian Companies	2.9	2.5	1.8	-25.7	4.0
	All Companies	35.7	43.3	46.3	7.0	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-7
1995 Top 20 Electronic Design Automation Software Companies, Austria/Switzerland, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	2.6	1.7	2.0	20.5	40.4
2	Autodesk	-	-	0.5	NA	11.1
3	CAD Distribution	0.7	0.6	0.5	-21.3	9.6
4	Hewlett-Packard	0.3	0.3	0.3	5.5	6.2
5	Intergraph	0.3	0.2	0.2	5.7	4.9
6	PADS Software	-	-	0.1	NA	2.7
7	ISDATA	0.1	-	0.1	NA	2.7
8	Speed	-	-	0.1	NA	2.6
9	Just In Time Systems	0.1	0.1	0.1	32.3	2.3
10	Ziegler Informatics	0.6	-	0.1	NA	1.5
11	Accel Technologies	-	-	0.1	NA	1.3
12	ULTImate Technology	0	0	0.1	190.0	1.1
13	ALS Design	0	-	0	NA	0.6
14	Altium*	0.1	0.1	0	-72.5	0.5
15	IBM	0.1	0.1	0	-72.5	0.5
16	CAD-UL	0.2	0	0	28.5	0.3
17	ISD Software	0	0	0	36.0	0.2
18	Number One Systems	-	0	0	6.6	0.2
19	Technische Computer Systeme	0.1	0.1	-	-100.0	
20	Viewlogic Systems	0	0	-	-100.0	-
	Other Companies	0.8	0.7	0.6	-10.2	13.1
	All N.A. Companies	3.3	2.3	3.3	43.6	65.9
	All European Companies	0.1	0.7	1.0	41.6	21.0
	All Asian Companies	-	-	-	NA	-
	All Companies	4.1	3.7	4.9	32.8	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-8
1995 Top 23 Electronic Design Automation Software Companies, Spain, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	0.8	0.8	0.9	17.2	17.3
2	ABB Industria*	0.8	0.8	0.9	3.5	16.5
3	Compass Design Automation	0.5	0.5	0.6	16.5	11.6
4	Mentor Graphics	0.5	0.5	0.6	20.5	11.5
5	Synopsys	0.4	0.6	0.6	-4.6	11.0
6	Hewlett-Packard	0.5	0.5	0.6	5.5	10.7
7	Autodesk	0.3	0.3	0.3	8.4	6.4
8	Intergraph	0.3	0.3	0.3	5.7	5.8
9	Softronics	0.2	0.2	0.2	2.7	4.3
10	Viewlogic Systems	0	0.1	0.1	46.6	2.7
11	MacNeal-Schwendler	0	0.1	0.1	25.4	2.7
12	Accel Technologies	-	-	0.1	NA	1.2
13	Ziegler Informatics	0.2	0	0.1	224.5	1.1
14	ALS Design	0	0	0	18.1	0.5
15	ULTImate Technology	-	0	0	190.0	0.5
16	Kloeckner-Moeller	0	0	0	4.0	0.2
17	Harris EDA	0	0	0	1.1	0.2
18	Altium*	0	0	0	-72.5	0.2
19	IBM	0	0	0	-72.5	0.2
20	Intusoft	-	0	0	96.5	0.2
21	Star Informatic	-	-	0	NA	0.1
22	Number One Systems	-	0	0	6.6	0.1
23	PADS Software	0	0	-	-100.0	-
	Other Companies	0.8	1.0	0.7	-30.0	13.8
	All N.A. Companies	3.4	3.8	4.1	9.9	79.4
	All European Companies	0.5	0.3	0.4	25.1	6.8
	All Asian Companies	-	-	-	NA	-
	All Companies	4.8	5.1	5.2	2.7	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-9
1995 Top 29 Electronic Design Automation Software Companies, Italy, All Operating Systems(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	3.1	3.1	3.6	17.2	20.8
2	Synopsys	0.9	1.5	2.9	90.9	16.4
3	Mentor Graphics	2.9	1.8	2.2	20.5	12.6
4	Hewlett-Packard	1.0	1.1	1.1	5.5	6.4
5	Autodesk	0.7	0.7	0.9	29.2	5.2
6	Viewlogic Systems	0.6	0.8	0.8	1.8	4.5
7	Quickturn Design Systems	-	-	0.8	NA	4.3
8	Zuken-Redac	0.5	0.6	0.7	5.9	3.8
9	Compass Design Automation	0.5	0.5	0.6	16.5	3.5
10	MacNeal-Schwendler	0.1	0.3	0.4	25.4	2.4
11	Harris EDA	1.0	1.0	0.3	-71.5	1.6
12	PADS Software	0.1	0.1	0.3	155.3	1.6
13	Intergraph	0.2	0.2	0.2	5.7	1.1
14	ULTImate Technology	0.1	0.1	0.1	93.3	0.6
15	Abstract Hardware	-	0.1	0.1	8.5	0.6
16	Design Acceleration	-	0	0.1	60.0	0.4
17	Accel Technologies	-	-	0.1	NA	0.4
18	Technische Computer Systeme	0.1	0.1	0.1	-33.8	0.3
19	Altium*	0.2	0.2	0.1	-72.5	0.3
20	IBM	0.2	0.2	0.1	-72.5	0.3
21	ALS Design	0	0	0.1	18.1	0.3
22	Silicon Valley Research	-	0	0	20.5	0.2
23	Ziegler Informatics	0.1	0	0	214.0	0.2
24	VLSI Libraries	-	0.1	0	-77.2	0.2
25	ISDATA	0.1	-	0	NA	0.1
26	Number One Systems	-	0	0	6.6	0.1
27	Intusoft	-	0	0	96.5	0
28	Star Informatic	0.6	0.5	0	-98.7	0
29	Siemens Nixdorf Info systeme	0	0	-	-100.0	
	Other Companies	2.8	3.1	2.3	-23.5	13.4
	All N.A. Companies	11.4	11.2	14.0	24.8	80.5
	All European Companies	0.8	0.9	0.4	-53.7	2.3
	All Asian Companies	0.5	0.6	0.7	5.9	3.8
	All Companies	15.5	15.7	17.4	10.4	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-10
1995 Top 24 Electronic Design Automation Software Companies, Scandinavia, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	5.9	7.8	9.4	20.5	34.0
2	Synopsys	1.7	2.7	4.0	48.4	14.5
3	Cadence	2.9	2.9	3.4	17.2	12.3
4	Harris EDA	1.5	1.6	1.7	9.7	6.3
5	Viewlogic Systems	1.8	1.6	1.6	-4.2	5.6
6	Autodesk	0.7	0.7	1.0	41.0	3.6
7	Hewlett-Packard	0.6	0.7	0.7	5.5	2.7
8	Intergraph	0.6	0.5	0.5	5.7	1.7
9	MacNeal-Schwendler	0	0.2	0.3	25.4	1.1
10	Zycad	0.2	-	0.3	NA	1.0
11	PADS Software	0.3	0.3	0.3	-14.9	1.0
12	ULTImate Technology	0.1	0.1	0.2	132.0	0.8
13	LV Software	-	-	0.2	NA	0.7
14	Quantic Laboratories	-	-	0.1	NA	0.5
15	ISDATA	0.1	0.1	0.1	14.5	0.5
16	Ziegler Informatics	0.3	0	0.1	203.5	0.5
17	Design Acceleration	-	0	0.1	60.0	0.2
18	Accel Technologies	-	-	0.1	NA	0.2
19	Altium*	0.2	0.1	0	-72.5	0.1
20	IBM	0.2	0.1	0	-72.5	0.1
21	Number One Systems	-	0	0	6.6	0.1
22	Quickturn Design Systems	-	-	0	NA	0.1
23	Intusoft	-	0	0	96.5	0
24	Zuken-Redac	1.5	0.6	-	-100.0	-
	Other Companies	3.9	4.9	3.9	-21.4	14.0
	All N.A. Companies	16.2	18.8	23.3	23.4	84.2
	All European Companies	0.5	0.3	0.5	93.6	1.8
	All Asian Companies	1.5	0.6	-	-100.0	-
	All Companies	22.1	24.6	27.6	12.1	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-11
1995 Top Four Electronic Design Automation Software Companies, Russia, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	0.2	0.8	1.0	20.5	75.7
2	Autodesk	-	-	0.1	NA	6.8
3	Ziegler Informatics	-	-	0	NA	3.3
4	Viewlogic Systems	-	-	0	NA	1.2
	Other Companies	0	0.2	0.2	-14.1	13.9
	All N.A. Companies	0	0.8	1.1	31.8	82.8
	All European Companies	-	-	0	NA	3.3
	All Asian Companies	-	-	-	NA	
	All Companies	0	1.0	1.3	26.5	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-12
1995 Top 10 Electronic Design Automation Software Companies, Central Europe, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	-	-	1.3	NA	52.7
2	PADS Software	-	0.1	0.3	155.3	10.7
3	Hewlett-Packard	0.2	0.2	0.3	5.5	10.0
4	Autodesk	-	-	0.2	NA	9.4
5	Intergraph	0.1	0.1	0.1	5.7	2.3
6	ALDEC	0.1	-	0	NA	1.1
7	ISD Software	0	0	0	36.0	0.4
8	Altium*	0.1	0	0	-72.5	0.4
9	IBM	0.1	0	0	-72.5	0.4
10	ULTImate Technology	0.1	0	-	-100.0	-
	Other Companies	0.1	0.1	0.4	211.8	14.1
	All N.A. Companies	0.3	0.4	2.2	399.2	85.9
	All European Companies	0	0	0	-98.8	0
	All Asian Companies	-	-	-	NA	
	All Companies	0.4	0.6	2.5	352.5	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-13
1995 Top 30 Electronic Design Automation Software Companies, Rest of Europe, All Operating Systems(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	3.1	3.1	3.6	17.2	26.1
2	Synopsys	1.1	1.8	2.7	48.4	19.3
3	Mentor Graphics	1.2	1.2	1.4	20.5	10.1
4	Compass Design Automation	1.1	1.0	1.2	16.5	8.7
5	Quickturn Design Systems	-	-	0.7	NA	5.2
6	Viewlogic Systems	1.4	0.5	0.6	31.2	4.5
7	Hewlett-Packard	0.5	0.5	0.5	5.5	3.9
8	MacNeal-Schwendler	0.2	0.4	0.5	25.4	3.3
9	Speed	-	-	0.2	NA	1.7
10	CAD-UL	0.2	0.2	0.2	28.5	1.4
11	Nextwave DA	-	-	0.1	NA	0.6
12	Autodesk	0.9	0.9	0.1	-91.2	0.6
13	Harris EDA	0.1	0.1	0.1	-5.9	0.6
14	Number One Systems	-	0.1	0.1	6.6	0.6
15	Intusoft	-	0	0.1	96.5	0.6
16	Intergraph	0.1	0.1	0.1	5.7	0.4
17	Ziegler Informatics	0.6	0	0	-52.8	0.2
18	Altium*	0.1	0	0	-72.5	0.1
19	IBM	0.1	0	0	-72.5	0.1
20	ISD Software	0	0	0	36.0	0
21	Sagantec	2.8	0.4	-	-100.0	-
22	PADS Software	0.1	0.3	-	-100.0	-
23	Technische Computer Systeme	0.2	0.2	-	-100.0	-
24	Kloeckner-Moeller	0.3	0.2	-	-100.0	-
25	ISDATA	0.2	0.2	-	-100.0	-
26	Siemens Nixdorf Info systeme	0.1	0.1	-	-100.0	
27	ALS Design	0	0	-	-100.0	-
28	ULTImate Technology	0	-	-	NA	-
29	Star Informatic	-	-	-	NA	-
30	Zuken-Redac	-	-	-	NA	-
	Other Companies	2.8	2.7	1.9	-29.5	13.9
	All N.A. Companies	9.4	9.6	11.4	18.5	82.2
	All European Companies	5.1	1.3	0.5	-59.4	3.9
	All Asian Companies	-	-	-	NA	-
	All Companies	17.3	13.7	13.9	1.4	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-14
1995 Top 30 Electronic CAE Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	113.7	142.7	193.5	35.6	19.0
2	Cadence	91.4	96.4	123.2	27.7	12.1
3	Mentor Graphics	100.4	100.1	109.0	8.9	10.7
4	Viewlogic Systems	76.9	83.3	77.3	-7.3	7.6
5	Quickturn Design Systems	51.5	59.0	70.7	19.9	6.9
6	Hewlett-Packard	33.1	34.4	36.3	5.5	3.6
7	Zycad	23.2	29.4	28.4	-3.4	2.8
8	Marubeni Hytech*	23.5	24.3	28.0	15.2	2.7
9	IKOS Systems	18.1	18.6	25.7	38.1	2.5
10	EPIC Design Technology	-	11.9	24.2	103.5	2.4
11	Compass Design Automation	24.0	20.1	23.2	15.2	2.3
12	Autodesk	23.9	22.8	20.6	-9.5	2.0
13	ALTERA	13.1	16.0	19.2	20.0	1.9
14	Meta-Software	9.4	14.4	17.5	21.2	1.7
15	Analogy	11.0	11.0	17.1	55.5	1.7
16	Intergraph	13.7	11.5	16.5	42.9	1.6
17	Summitt Design	9.1	14.6	16.4	12.7	1.6
18	Microsim	5.8	11.9	14.0	17.6	1.4
19	Wacom	23.7	10.6	13.6	28.1	1.3
20	Seiko*	12.9	12.0	13.4	11.8	1.3
21	Xilinx Inc.	9.3	11.0	12.6	14.8	1.2
22	Zuken-Redac	20.7	12.3	11.8	-3.7	1.2
23	Minc Software	2.1	6.0	11.7	94.1	1.1
24	LSI Logic	12.3	14.0	11.5	-17.6	1.1
25	NEC	12.9	13.9	11.2	-19.4	1.1
26	Harris EDA	8.7	9.6	9.9	3.1	1.0
27	Ansoft	-	5.6	7.9	41.1	0.8
28	SES Inc.	7.0	8.5	7.7	-8.9	0.8
29	CrossCheck Technology	11.2	6.2	7.0	12.9	0.7
30	C. Itoh Techno-Science*	5.7	6.2	5.7	-8.9	0.6
	All N.A. Companies	698.9	805.8	964.2	19.6	94.5
	All European Companies	21.6	14.9	15.2	2.3	1.5
	All Asian Companies	46.7	40.4	40.7	0.8	4.0
	All Companies	767.3	861.1	1,020.0	18.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-15
1995 Top 30 Electronic CAE Software Companies, Europe, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	26.6	30.0	38.1	27.2	19.3
2	Mentor Graphics	22.3	25.6	29.6	15.6	15.0
3	Cadence	21.5	18.8	21.6	14.8	11.0
4	Viewlogic Systems	15.4	15.9	15.5	-2.5	7.9
5	Hewlett-Packard	8.9	9.6	10.2	5.5	5.1
6	Quickturn Design Systems	4.5	11.8	8.3	-29.8	4.2
7	Autodesk	7.9	7.8	8.0	3.0	4.0
8	Compass Design Automation	7.4	6.2	7.2	15.2	3.6
9	IKOS Systems	1.8	2.4	5.1	112.5	2.6
10	Analogy	4.2	3.3	5.1	55.5	2.6
11	Zycad	3.0	2.6	3.7	39.6	1.9
12	Intergraph	3.7	3.4	3.6	7.5	1.8
13	MacNeal-Schwendler	0.8	2.8	3.5	25.4	1.8
14	ALTERA	2.9	3.4	3.3	-2.9	1.7
15	Microsim	0.3	2.7	3.2	17.6	1.6
16	Harris EDA	2.5	2.9	3.0	4.6	1.5
17	EPIC Design Technology	-	1.9	2.7	39.9	1.3
18	Xilinx Inc.	0.9	2.2	2.5	14.8	1.3
19	ISDATA	2.3	1.9	2.0	1.9	1.0
20	ALS Design	1.4	1.8	1.9	10.4	1.0
21	i-Logix	1.2	1.6	1.8	16.1	0.9
22	Ziegler Informatics	2.9	0.3	1.8	447.7	0.9
23	Meta-Software	0.7	1.0	1.7	73.2	0.9
24	VEDA	1.9	1.9	1.4	-24.1	0.7
25	VLSI Libraries	0.5	1.3	1.4	6.5	0.7
26	Data I/O	0.5	0.6	1.4	139.7	0.7
27	ACTEL	1.0	0.9	1.0	16.2	0.5
28	Abstract Hardware	1.5	0.9	1.0	8.5	0.5
29	Serbi	0.8	0.8	0.9	13.9	0.5
30	OrCAD EDA	0.7	1.0	0.9	-18.3	0.4
	All N.A. Companies	143.4	164.9	184.3	11.7	93.3
	All European Companies	16.6	12.8	12.6	-1.5	6.4
	All Asian Companies	3.9	1.8	0.6	-69.8	0.3
	All Companies	163.9	179.6	197.5	9.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-16
1995 Top 30 Electronic CAE Software Companies, France, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	2.2	3.6	8.0	122.7	19.0
2	Viewlogic Systems	4.0	4.7	5.6	19.7	13.2
3	Mentor Graphics	2.8	4.6	5.4	15.6	12.7
4	Cadence	4.9	4.3	5.0	14.8	11.8
5	Compass Design Automation	3.7	3.1	3.6	15.2	8.5
6	ALS Design	1.4	1.6	1.7	11.7	4.1
7	Hewlett-Packard	1.1	1.2	1.2	5.5	2.9
8	Zycad	1.2	0.9	1.1	28.9	2.7
9	Autodesk	1.2	1.2	1.0	-16.1	2.3
10	Serbi	0.8	0.8	0.9	13.9	2.2
11	Quickturn Design Systems	-	-	0.7	NA	1.7
12	Intergraph	0.5	0.5	0.5	7.5	1.2
13	Harris EDA	0.3	0.4	0.4	6.3	1.0
14	MacNeal-Schwendler	0.1	0.3	0.4	25.4	0.9
15	VLSI Libraries	-	0.2	0.2	11.8	0.5
16	Zuken-Redac	0.4	0.2	0.1	-41.1	0.3
17	i-Logix	0.1	0.1	0.1	16.1	0.3
18	Star Informatic	0.2	0.2	0.1	-49.5	0.2
19	Pacific Numerics	-	-	0.1	NA	0.2
20	ALDEC	-	-	0.1	NA	0.2
21	Intusoft	-	0	0.1	96.5	0.2
22	ISDATA	0.2	0.1	0.1	14.5	0.2
23	Systems Science	-	-	0.1	NA	0.1
24	Sagantec	-	0	0	132.1	0.1
25	Contec Microelectronics	0	0	0	10.8	0.1
26	Ziegler Informatics	0.1	0	0	447.7	0.1
27	Accel Technologies	-	-	0	NA	0
28	Kloeckner-Moeller	0	0	0	13.9	0
29	PADS Software	0	0	0	7.7	0
30	Number One Systems	-	0	0	9.1	0
	Other Companies	6.9	8.1	6.5	-19.9	15.4
	All N.A. Companies	21.5	24.2	32.7	35.0	77.5
	All European Companies	2.5	2.7	2.9	8.6	6.8
	All Asian Companies	0.4	0.2	0.1	-41.1	0.3
	All Companies	31.3	35.2	42.2	19.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-17
1995 Top 30 Electronic CAE Software Companies, Germany, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	7.8	12.6	9.3	-25.8	15.5
2	Mentor Graphics	8.2	7.4	8.6	15.6	14.2
3	Cadence	6.9	6.0	6.9	14.8	11.5
4	Quickturn Design Systems	-	-	5.2	NA	8.7
5	Viewlogic Systems	3.7	3.4	3.7	8.6	6.2
6	Hewlett-Packard	3.2	3.5	3.7	5.5	6.1
7	Autodesk	2.2	2.2	2.1	-1.8	3.5
8	Compass Design Automation	1.7	1.4	1.6	15.2	2.7
9	ISDATA	1.6	1.5	1.5	-0.6	2.4
10	Ziegler Informatics	1.7	0.3	1.5	447.7	2.4
11	Intergraph	1.3	1.2	1.2	7.5	2.1
12	Zycad	0.7	0.9	1.1	28.9	1.9
13	MacNeal-Schwendler	0.2	0.7	0.9	25.4	1.5
14	Kloeckner-Moeller	0.7	0.7	0.8	4.7	1.3
15	Abstract Hardware	-	0.6	0.6	8.5	1.0
16	Technische Computer Systeme	0.6	0.6	0.6	3.3	0.9
17	i-Logix	0.4	0.5	0.5	16.1	0.9
18	Harris EDA	0.5	0.5	0.5	-4.0	0.7
19	Zuken-Redac	1.1	0.7	0.4	-45.5	0.7
20	ISKA	0.4	0.4	0.4	3.2	0.6
21	Speed	-	-	0.3	NA	0.4
22	ISD Software	0.3	0.2	0.2	36.0	0.4
23	Softronics	0.2	0.2	0.2	2.7	0.4
24	Quantic Laboratories	-	-	0.1	NA	0.2
25	Pacific Numerics	-	-	0.1	NA	0.2
26	Systems Science	-	-	0.1	NA	0.1
27	Intusoft	-	0	0.1	96.5	0.1
28	ALDEC	-	-	0.1	NA	0.1
29	Sagantec	-	0	0.1	49.6	0.1
30	ALS Design	-	0.1	0	-26.4	0.1
	Other Companies	12.0	13.3	9.1	-31.4	15.1
	All N.A. Companies	36.0	39.7	45.3	14.1	75.0
	All European Companies	6.5	4.6	5.6	21.2	9.2
	All Asian Companies	1.1	0.7	0.4	-45.5	0.7
	All Companies	55.7	58.3	60.4	3.5	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-18
1995 Top 24 Electronic CAE Software Companies, Benelux, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	1.3	2.1	2.7	27.2	30.8
2	Viewlogic Systems	1.1	1.3	0.9	-30.2	10.7
3	Mentor Graphics	0.2	0.6	0.7	15.6	8.3
4	Hewlett-Packard	0.6	0.7	0.7	5.5	8.2
5	Autodesk	0.6	0.6	0.6	-7.5	6.6
6	Cadence	0.4	0.4	0.4	14.8	5.0
7	Compass Design Automation	0.3	0.3	0.3	15.2	3.8
8	Intergraph	0.3	0.3	0.3	7.5	3.5
9	Harris EDA	0.1	0.2	0.2	7.2	2.1
10	Star Informatic	-	-	0.2	NA	1.9
11	MacNeal-Schwendler	0	0.1	0.2	25.4	1.7
12	ISDATA	0.1	0.1	0.1	14.5	0.8
13	Intusoft	-	0	0.1	96.5	0.6
14	Optem Engineering	-	0.1	0	-8.0	0.5
15	Technische Computer Systeme	0	0	0	11.2	0.5
16	ALS Design	-	0	0	10.4	0.4
17	Ziegler Informatics	0.1	0	0	447.7	0.4
18	Sagantec	-	0	0	-20.0	0.2
19	Accel Technologies	-	-	0	NA	0.1
20	Kloeckner-Moeller	0	0	0	13.9	0.1
21	ISD Software	0	0	0	36.0	0.1
22	Number One Systems	-	0	0	9.1	0
23	Zuken-Redac	0.1	0.1	-	-100.0	-
24	Siemens Nixdorf Info systeme	0	0	-	-100.0	-
	Other Companies	1.6	2.0	1.4	-33.6	15.6
	All N.A. Companies	5.2	6.4	6.9	8.3	80.1
	All European Companies	0.4	0.2	0.4	86.4	4.4
	All Asian Companies	0.1	0.1	-	-100.0	-
	All Companies	7.4	8.8	8.7	-1.1	100.0

NA = Not applicable
Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-19
1995 Top 30 Electronic CAE Software Companies, United Kingdom, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	3.2	5.1	6.7	31.0	20.5
2	Mentor Graphics	2.7	4.3	5.0	15.6	15.4
3	Cadence	3.8	3.3	3.8	14.8	11.6
4	Viewlogic Systems	2.6	3.5	2.2	-38.4	6.7
5	VLSI Libraries	-	1.0	1.2	16.6	3.5
6	i-Logix	0.8	1.0	1.1	16.1	3.5
7	Zycad	0.5	0.9	1.1	28.9	3.5
8	Autodesk	1.2	1.2	1.1	-3.4	3.5
9	Hewlett-Packard	0.9	1.0	1.1	5.5	3.3
10	Quickturn Design Systems	-	-	0.8	NA	2.5
11	MacNeal-Schwendler	0.1	0.6	0.8	25.4	2.4
12	Intergraph	0.7	0.7	0.7	7.5	2.2
13	Harris EDA	0.4	0.5	0.6	10.0	1.8
14	Design Acceleration	-	0.1	0.4	380.0	1.2
15	Compass Design Automation	0.3	0.3	0.3	15.2	1.0
16	Abstract Hardware	1.5	0.3	0.3	8.5	0.9
17	Quantic Laboratories	-	-	0.2	NA	0.8
18	Number One Systems	-	0.2	0.2	9.1	0.5
19	Intusoft	-	0.1	0.1	96.5	0.4
20	Pacific Numerics	-	-	0.1	NA	0.3
21	ISDATA	0.1	0.1	0.1	14.5	0.3
22	ALDEC	-	-	0.1	NA	0.3
23	ALS Design	-	0	0	10.4	0.1
24	Accel Technologies	-	-	0	NA	0.1
25	Star Informatic	0.1	0.1	0	-30.4	0.1
26	Tanner Research	-	-	0	NA	0.1
27	InterHDL	-	0	0	1.5	0.1
28	Kloeckner-Moeller	0	0	0	14.9	0.1
29	PADS Software	0	0	0	7.7	0.1
30	Sagantec	-	0	0	-40.8	0
	Other Companies	5.4	7.2	5.1	-28.6	15.7
	All N.A. Companies	16.7	22.6	26.7	18.1	82.2
	All European Companies	1.6	0.6	0.7	6.3	2.1
	All Asian Companies	1.0	0.5	0	-97.8	0
	All Companies	24.8	31.0	32.5	5.2	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-20
1995 Top 15 Electronic CAE Software Companies, Austria/Switzerland, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	1.7	1.0	1.2	15.6	34.0
2	Autodesk	-	-	0.5	NA	15.7
3	CAD Distribution	0.7	0.6	0.5	-21.3	13.5
4	Hewlett-Packard	0.3	0.3	0.3	5.5	8.7
5	Intergraph	0.2	0.1	0.2	7.5	4.3
6	ISDATA	0.1	-	0.1	NA	3.8
7	Speed	-	-	0.1	NA	3.7
8	Ziegler Informatics	0.3	-	0.1	NA	1.8
9	ALS Design	-	-	0	NA	0.6
10	Accel Technologies	-	-	0	NA	0.3
11	ISD Software	0	0	0	36.0	0.3
12	PADS Software	-	-	0	NA	0.3
13	Number One Systems	-	0	0	9.1	0.1
14	Technische Computer Systeme	0.1	0.1	-	-100.0	-
15	Viewlogic Systems	0	0	-	-100.0	-
	Other Companies	0.6	0.6	0.5	-14.5	14.2
	All N.A. Companies	2.1	1.5	2.2	49.0	62.2
	All European Companies	0	0.6	0.8	35.4	23.6
	All Asian Companies	-	-	-	NA	
	All Companies	2.7	2.7	3.5	31.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-21
1995 Top 19 Electronic CAE Software Companies, Spain, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	ABB Industria*	0.6	0.6	0.6	0.8	16.2
2	Synopsys	0.4	0.6	0.6	-4.6	14.6
3	Hewlett-Packard	0.5	0.5	0.6	5.5	14.3
4	Cadence	0.4	0.4	0.4	14.8	11.0
5	Mentor Graphics	0.3	0.3	0.4	15.6	9.1
6	Autodesk	0.3	0.3	0.3	8.4	8.6
7	Compass Design Automation	0.3	0.3	0.3	15.2	8.3
8	Softronics	0.2	0.2	0.2	2.7	5.8
9	Intergraph	0.2	0.2	0.2	7.5	4.8
10	Viewlogic Systems	0	0.1	0.1	46.6	3.6
11	MacNeal-Schwendler	0	0.1	0.1	25.4	3.5
12	Ziegler Informatics	0.1	0	0	447.7	1.2
13	ALS Design	-	0	0	10.4	0.5
14	Accel Technologies	-	-	0	NA	0.3
15	Kloeckner-Moeller	0	0	0	4.0	0.3
16	Intusoft	-	0	0	96.5	0.2
17	Star Informatic	-	-	0	NA	0.1
18	Number One Systems	-	0	0	9.1	0
19	PADS Software	0	0	-	-100.0	-
	Other Companies	0.8	0.9	0.6	-34.4	15.3
	All N.A. Companies	2.5	2.8	3.0	8.6	76.8
	All European Companies	0.4	0.3	0.3	19.4	7.8
	All Asian Companies	-	-	-	NA	-
	All Companies	3.7	3.9	3.9	-0.7	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-22
1995 Top 25 Electronic CAE Software Companies, Italy, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	0.9	1.5	2.9	90.9	22.8
2	Cadence	1.7	1.5	1.7	14.8	13.8
3	Mentor Graphics	1.9	1.1	1.3	15.6	10.5
4	Hewlett-Packard	1.0	1.1	1.1	5.5	8.9
5	Autodesk	0.7	0.7	0.9	29.2	7.2
6	Viewlogic Systems	0.6	0.8	0.8	1.8	6.2
7	Quickturn Design Systems	-	-	0.8	NA	6.0
8	MacNeal-Schwendler	0.1	0.3	0.4	25.4	3.3
9	Compass Design Automation	0.3	0.3	0.3	15.2	2.6
10	Intergraph	0.1	0.1	0.1	7.5	0.9
11	Abstract Hardware	-	0.1	0.1	8.5	0.8
12	Design Acceleration	-	0	0.1	60.0	0.5
13	Technische Computer Systeme	0.1	0.1	0.1	-33.8	0.5
14	Harris EDA	0.1	0.1	0.1	-40.6	0.5
15	ALS Design	-	0	0	10.4	0.3
16	VLSI Libraries	-	0.1	0	-77.2	0.2
17	Ziegler Informatics	0	0	0	447.7	0.2
18	ISDATA	0.1	-	0	NA	0.2
19	PADS Software	0	0	0	115.4	0.2
20	Accel Technologies	-	-	0	NA	0.1
21	Intusoft	-	0	0	96.5	0.1
22	Star Informatic	0.6	0.5	0	-98.7	0.1
23	Number One Systems	-	0	0	9.1	0.1
24	Zuken-Redac	0.2	0.1	-	-100.0	-
25	Siemens Nixdorf Info systeme	0	0	-	-100.0	
	Other Companies	2.4	2.5	2.0	-20.6	15.8
	All N.A. Companies	7.6	7.5	10.3	38.1	82.2
	All European Companies	0.7	0.8	0.3	-66.8	2.0
	All Asian Companies	0.2	0.1	-	-100.0	-
	All Companies	10.9	10.9	12.6	15.6	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-23
1995 Top 21 Electronic CAE Software Companies, Scandinavia, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	3.8	4.9	5.6	15.6	27.6
2	Synopsys	1.7	2.7	4.0	48.4	19.7
3	Cadence	1.6	1.4	1.6	14.8	8.0
4	Viewlogic Systems	1.8	1.6	1.6	-4.2	7.6
5	Harris EDA	1.1	1.2	1.3	8.7	6.5
6	Autodesk	0.7	0.7	1.0	41.0	4.8
7	Hewlett-Packard	0.6	0.7	0.7	5.5	3.6
8	MacNeal-Schwendler	0	0.2	0.3	25.4	1.5
9	Intergraph	0.3	0.3	0.3	7.5	1.5
10	Zycad	0.2	-	0.3	NA	1.4
11	LV Software	-	-	0.2	NA	0.9
12	Quantic Laboratories	-	-	0.1	NA	0.7
13	ISDATA	0.1	0.1	0.1	14.5	0.7
14	Ziegler Informatics	0.2	0	0.1	447.7	0.5
15	Design Acceleration	-	0	0.1	60.0	0.3
16	Quickturn Design Systems	-	-	0	NA	0.1
17	PADS Software	0	0	0	-28.2	0.1
18	Number One Systems	-	0	0	9.1	0.1
19	Intusoft	-	0	0	96.5	0.1
20	Accel Technologies	-	-	0	NA	0.1
21	Zuken-Redac	0.4	0.1	-	-100.0	-
	Other Companies	3.6	4.2	3.2	-23.9	15.8
	All N.A. Companies	11.7	13.5	16.9	25.2	83.0
	All European Companies	0.3	0.1	0.2	93.4	1.2
	All Asian Companies	0.4	0.1	-	-100.0	-
	All Companies	16.0	17.9	20.3	13.3	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-24
1995 Top Four Electronic CAE Software Companies, Russia, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	0.1	0.5	0.6	15.6	68.9
2	Autodesk	-	-	0.1	NA	10.4
3	Ziegler Informatics	-	-	0	NA	4.2
4	Viewlogic Systems	-	-	0	NA	1.8
	Other Companies	0	0.2	0.1	-15.9	15.6
	All N.A. Companies	0.1	0.5	0.7	34.6	80.2
	All European Companies	-	-	0	NA	4.2
	All Asian Companies	-	-	-	NA	
	All Companies	0.1	0.7	0.9	28.0	100.0

NA = Not applicable
Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-25
1995 Top Seven Electronic CAE Software Companies, Central Europe, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	-	-	1.3	NA	59.2
2	Hewlett-Packard	0.2	0.2	0.3	5.5	11.3
3	Autodesk	-	-	0.2	NA	10.5
4	Intergraph	0	0	0	7.5	1.6
5	ALDEC	0.1	-	0	NA	1.2
6	PADS Software	-	0	0	115.4	0.8
7	ISD Software	0	0	0	36.0	0.5
	Other Companies	0.1	0.1	0.4	307.5	15.9
	All N.A. Companies	0.2	0.3	1.9	571.3	84.1
	All European Companies	0	0	0	36.0	0
	All Asian Companies	-	-	-	NA	
	All Companies	0.3	0.4	2.3	508.5	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-26
1995 Top 25 Electronic CAE Software Companies, Rest of Europe, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	1.1	1.8	2.7	48.4	25.9
2	Cadence	1.7	1.5	1.7	14.8	16.8
3	Mentor Graphics	0.8	0.7	0.8	15.6	8.1
4	Quickturn Design Systems	-	-	0.7	NA	7.0
5	Compass Design Automation	0.7	0.6	0.7	15.2	6.4
6	Viewlogic Systems	1.4	0.5	0.6	31.2	6.0
7	Hewlett-Packard	0.5	0.5	0.5	5.5	5.2
8	MacNeal-Schwendler	0.2	0.4	0.5	25.4	4.4
9	Speed	-	-	0.2	NA	2.3
10	Nextwave DA	-	-	0.1	NA	0.8
11	Autodesk	0.9	0.9	0.1	-91.2	0.8
12	Intusoft	-	0	0.1	96.5	0.8
13	Harris EDA	0	0	0	-6.0	0.4
14	Intergraph	0	0	0	7.5	0.4
15	Number One Systems	-	0	0	9.1	0.3
16	Ziegler Informatics	0.3	0	0	-38.2	0.1
17	ISD Software	0	0	0	36.0	0.1
18	Technische Computer Systeme	0.2	0.2	-	-100.0	
19	Kloeckner-Moeller	0.3	0.2	-	-100.0	-
20	ISDATA	0.2	0.2	-	-100.0	-
21	Sagantec	-	0.1	-	-100.0	-
22	Siemens Nixdorf Info systeme	0.1	0.1	-	-100.0	
23	PADS Software	0	0	-	-100.0	-
24	ALS Design	-	0	-	-100.0	-
25	Star Informatic	-	-	-	NA	-
	Other Companies	2.4	2.3	1.6	-29.6	15.7
	All N.A. Companies	7.1	6.9	8.4	22.5	81.6
	All European Companies	1.8	0.8	0.3	-63.6	2.7
	All Asian Companies	-	-	-	NA	-
	All Companies	11.3	9.9	10.3	3.7	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-27
1995 Top 19 IC Layout Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	81.4	88.3	118.5	34.2	45.0
2	Mentor Graphics	26.5	34.6	32.9	-4.8	12.5
3	AVANT!	8.4	16.3	32.3	97.7	12.3
4	Compass Design Automation	19.6	23.5	27.8	18.0	10.5
5	Okura*	10.8	14.3	17.0	18.6	6.4
6	Seiko*	19.1	9.9	13.0	30.8	4.9
7	High Level Design Systems	3.2	3.3	9.3	178.1	3.5
8	Cascade Design Automation	6.7	8.1	7.9	-2.2	3.0
9	Silicon Valley Research	6.3	5.3	6.4	20.5	2.4
10	Fujitsu	4.8	5.5	6.3	15.8	2.4
11	Xilinx Inc.	5.5	5.9	5.9	-0.2	2.2
12	Cooper & Chyan Technology	-	1.9	3.1	68.6	1.2
13	TSSI Japan*	1.6	2.2	2.5	18.6	1.0
14	Intergraph	1.7	1.4	2.3	61.0	0.9
15	Marubeni Hytech*	1.2	1.5	1.7	18.5	0.7
16	LSI Logic	1.4	1.6	1.3	-14.1	0.5
17	Tanner Research	0.6	0.9	1.2	33.7	0.5
18	Sagantec	6.1	0.8	1.2	47.3	0.4
19	AT&T	-	0.3	0.4	23.3	0.1
	All N.A. Companies	154.8	188.6	244.8	29.8	92.9
	All European Companies	6.1	0.8	1.2	47.3	0.4
	All Asian Companies	14.5	14.0	17.5	25.3	6.7
	All Companies	175.4	203.3	263.5	29.6	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-28
1995 Top 12 IC Layout Software Companies, Europe, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	14.1	16.7	20.8	24.4	56.4
2	Mentor Graphics	3.4	5.2	6.9	33.4	18.8
3	Compass Design Automation	4.3	5.2	6.1	18.0	16.6
4	AVANT!	0.5	0.7	1.3	75.1	3.5
5	Cooper & Chyan Technology	-	0.2	0.8	321.5	2.1
6	Cascade Design Automation	0.6	0.6	0.6	2.3	1.7
7	Sagantec	6.1	0.7	0.5	-26.4	1.4
8	Intergraph	0.5	0.4	0.5	35.9	1.4
9	Tanner Research	0	0.1	0.1	-10.9	0.3
10	Silicon Valley Research	0.4	0.1	0.1	20.5	0.2
11	Xilinx Inc.	0.6	0.5	-	-100.0	-
12	LSI Logic	0.3	0.3	-	-100.0	-
	All N.A. Companies	23.3	29.7	36.4	22.5	98.6
	All European Companies	6.1	0.7	0.5	-26.4	1.4
	All Asian Companies	-	-	-	NA	
	All Companies	29.3	30.4	36.9	21.3	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-29
1995 Top Six IC Layout Software Companies, France, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	3.3	3.9	4.8	24.4	48.6
2	Compass Design Automation	2.2	2.6	3.1	18.0	31.0
3	Mentor Graphics	0.4	0.9	1.3	33.4	12.8
4	Sagantec	0.4	0.1	0.2	147.4	1.6
5	Intergraph	0.1	0.1	0.1	35.9	0.7
6	Silicon Valley Research	0.1	0	0	20.5	0.3
	Other Companies	0.4	0.7	0.6	-6.3	6.3
	All N.A. Companies	5.8	7.4	9.1	23.1	92.2
	All European Companies	0.4	0.1	0.2	147.4	1.6
	All Asian Companies	-	-	-	NA	
	All Companies	6.6	8.1	9.9	21.6	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-30
1995 Top Six IC Layout Software Companies, Germany, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	4.5	5.4	6.7	24.4	60.4
2	Mentor Graphics	1.2	1.5	2.0	33.4	18.3
3	Compass Design Automation	1.0	1.2	1.4	18.0	12.6
4	Sagantec	1.5	0.1	0.2	59.5	2.1
5	Intergraph	0.2	0.1	0.2	35.9	1.6
6	Tanner Research	-	-	0	NA	0.2
	Other Companies	0.4	0.7	0.7	-4.8	6.2
	All N.A. Companies	6.8	8.1	10.1	25.0	91.7
	All European Companies	1.5	0.1	0.2	59.5	2.1
	All Asian Companies	-	-	-	NA	
	All Companies	8.7	9.0	11.0	23.2	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-31
1995 Top Five IC Layout Software Companies, Benelux, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	0.3	0.3	0.4	24.4	40.6
2	Compass Design Automation	0.2	0.2	0.3	18.0	27.1
3	Mentor Graphics	0	0.1	0.2	33.4	16.3
4	Sagantec	0.8	0.1	0.1	-14.7	7.8
5	Intergraph	0	0	0	35.9	4.1
	Other Companies	0	0.1	0.1	-6.1	5.9
	All N.A. Companies	0.6	0.7	0.9	23.3	86.4
	All European Companies	0.8	0.1	0.1	-14.7	7.8
	All Asian Companies	-	-	-	NA	
	All Companies	1.4	0.9	1.0	17.1	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-32
1995 Top Six IC Layout Software Companies, United Kingdom, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	2.5	2.9	3.6	24.4	64.7
2	Mentor Graphics	0.4	0.9	1.2	33.4	20.9
3	Compass Design Automation	0.2	0.2	0.3	18.0	4.9
4	Intergraph	0.1	0.1	0.1	35.9	1.8
5	Tanner Research	-	-	0.1	NA	1.7
6	Sagantec	0.8	0.1	0.1	-36.9	1.1
	Other Companies	0.2	0.4	0.4	-2.6	6.3
	All N.A. Companies	3.1	4.1	5.2	27.9	92.6
	All European Companies	0.8	0.1	0.1	-36.9	1.1
	All Asian Companies	-	-	-	NA	
	All Companies	4.0	4.5	5.6	24.0	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-33
1995 Top Two IC Layout Software Companies, Austria/Switzerland, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	0.3	0.2	0.3	33.4	88.7
2	Intergraph	0	0	0	35.9	6.7
	Other Companies	0	0	0	-0.2	6.4
	All N.A. Companies	0.3	0.2	0.3	31.0	93.6
	All European Companies	-	-	-	NA	
	All Asian Companies	-	-	-	NA	-
	All Companies	0.3	0.2	0.3	28.5	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-34
1995 Top Four IC Layout Software Companies, Spain, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	0.3	0.3	0.4	24.4	49.3
2	Compass Design Automation	0.2	0.2	0.3	18.0	32.9
3	Mentor Graphics	0.1	0.1	0.1	33.4	9.9
4	Intergraph	0	0	0	35.9	3.1
	Other Companies	0	0.1	0.1	-6.6	6.4
	All N.A. Companies	0.5	0.6	0.8	22.6	93.6
	All European Companies	-	-	-	NA	
	All Asian Companies	-	-	-	NA	
	All Companies	0.6	0.7	0.8	20.2	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-35
1995 Top Five IC Layout Software Companies, Italy, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	1.1	1.3	1.7	24.4	68.8
2	Mentor Graphics	0.3	0.2	0.3	33.4	12.7
3	Compass Design Automation	0.2	0.2	0.3	18.0	11.5
4	Silicon Valley Research	-	0	0	20.5	1.3
5	Intergraph	0	0	0	35.9	0.7
	Other Companies	0.1	0.2	0.2	-5.2	6.4
	All N.A. Companies	1.6	1.8	2.3	24.4	93.6
	All European Companies	-	-	-	NA	
	All Asian Companies	-	-	-	NA	
	All Companies	1.7	2.0	2.4	22.0	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-36
1995 Top Three IC Layout Software Companies, Scandinavia, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	1.1	1.3	1.6	24.4	50.8
2	Mentor Graphics	0.6	1.0	1.3	33.4	42.8
3	Intergraph	0	0	0	35.9	1.4
	Other Companies	0.1	0.2	0.2	-2.8	6.4
	All N.A. Companies	1.6	2.3	2.9	27.6	93.6
	All European Companies	-	-	-	NA	
	All Asian Companies	-	-	-	NA	
	All Companies	1.7	2.5	3.1	25.1	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-37
1995 Top IC Layout Software Company, Russia, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	0	0.1	0.1	33.4	94.6
	Other Companies	0	0	0	0.6	6.4
	All N.A. Companies	0	0.1	0.1	32.1	93.6
	All European Companies	-	-	-	NA	
	All Asian Companies	-	-	-	NA	
	All Companies	0	0.1	0.1	29.5	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-38
1995 Top IC Layout Software Company, Central Europe, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Intergraph	0	0	0	35.9	109.0
	Other Companies	0	0	0	-11.1	6.4
	All N.A. Companies	0	0	0	16.7	93.6
	All European Companies	-	-	-	NA	
	All Asian Companies	-	-	-	NA	
	All Companies	0	0	0	14.4	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-39
1995 Top Five IC Layout Software Companies, Rest of Europe, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	1.1	1.3	1.7	24.4	65.3
2	Compass Design Automation	0.4	0.5	0.6	18.0	21.8
3	Mentor Graphics	0.1	0.1	0.2	33.4	7.7
4	Intergraph	0	0	0	35.9	0.2
5	Sagantec	2.8	0.3	-	-100.0	-
	Other Companies	0.1	0.2	0.2	-6.0	6.4
	All N.A. Companies	1.6	1.9	2.4	23.4	93.6
	All European Companies	2.8	0.3	-	-100.0	-
	All Asian Companies	-	-	-	NA	
	All Companies	4.4	2.4	2.6	5.1	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-40
1995 Top 30 PCB/MCM/Hybrid Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Zuken-Redac	52.0	54.7	60.1	9.8	22.6
2	Mentor Graphics	40.4	41.0	42.0	2.6	15.8
3	Yokogawa Digital Computer	35.9	21.0	23.6	12.4	8.9
4	CADIX	31.1	18.3	20.3	11.1	7.6
5	Fujitsu	12.9	14.6	16.9	15.8	6.3
6	Cadence	16.7	16.1	16.0	-0.6	6.0
7	PADS Software	9.1	9.7	12.1	24.9	4.6
8	Harris EDA	12.2	11.9	12.0	0.4	4.5
9	Cooper & Chyan Technology	5.2	7.4	11.1	49.4	4.2
10	Intergraph	9.6	6.9	7.9	14.3	3.0
11	Toshiba*	10.9	6.1	6.7	11.0	2.5
12	OrCAD EDA	3.3	4.0	5.3	32.7	2.0
13	Accel Technologies	2.6	3.3	5.0	53.7	1.9
14	NEC	8.6	8.5	4.5	-47.6	1.7
15	UniCAD	-	3.0	3.8	27.0	1.4
16	Protel Technology	-	2.7	3.6	33.3	1.4
17	C. Itoh Techno-Science*	3.5	3.9	3.4	-12.4	1.3
18	CAD-UL	3.3	2.7	3.4	26.1	1.3
19	Hitachi	3.0	3.1	3.3	6.4	1.2
20	Pacific Numerics	3.9	3.9	3.1	-21.3	1.2
21	Sharp*	2.8	2.5	2.7	8.4	1.0
22	ULTImate Technology	2.3	1.9	2.7	45.4	1.0
23	Altium*	9.9	9.7	2.7	-72.5	1.0
24	IBM	9.9	9.7	2.7	-72.5	1.0
25	Norlinvest Ltd.	1.8	1.9	1.9	1.9	0.7
26	Wacom	2.6	1.5	1.7	9.9	0.6
27	Uchida Yoko	4.6	1.4	1.6	12.5	0.6
28	Seiko*	-	-	1.3	NA	0.5
29	Sumisho Electronics*	1.2	1.3	1.3	0.6	0.5
30	TECHSPERT*	0.6	1.5	1.2	-18.9	0.4
	All N.A. Companies	111.7	116.6	118.2	1.4	44.5
	All European Companies	12.7	8.1	10.1	24.3	3.8
	All Asian Companies	120.0	129.1	137.5	6.5	51.7
	All Companies	244.4	253.9	265.8	4.7	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-41
1995 Top 26 PCB/MCM/Hybrid Software Companies, Europe, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	9.1	10.3	13.0	25.9	30.6
2	Zuken-Redac	9.5	7.4	6.5	-11.6	15.4
3	Harris EDA	4.0	3.7	3.3	-10.1	7.9
4	CAD-UL	3.0	2.5	3.2	28.5	7.6
5	Cadence	3.2	3.0	2.8	-7.2	6.6
6	Cooper & Chyan Technology	0.1	0.7	2.8	273.6	6.5
7	ULTImate Technology	1.8	1.6	2.5	55.1	5.9
8	PADS Software	1.1	1.5	1.8	20.8	4.2
9	Intergraph	2.5	1.8	1.7	-4.1	4.0
10	Norlinvest Ltd.	1.3	1.3	1.3	1.9	3.1
11	OrCAD EDA	0.3	1.0	0.9	-18.3	2.0
12	ALS Design	0.8	0.6	0.8	41.6	1.9
13	Protel Technology	-	0.6	0.8	33.3	1.9
14	Just In Time Systems	0.5	0.6	0.8	32.3	1.8
15	Accel Technologies	0.4	0.5	0.6	22.9	1.4
16	Altium*	2.0	1.7	0.5	-72.5	1.1
17	IBM	2.0	1.7	0.5	-72.5	1.1
18	Ziegler Informatics	2.4	0.3	0.4	9.5	0.9
19	Number One Systems	-	0.3	0.3	4.7	0.8
20	Pacific Numerics	0.5	0.5	0.3	-41.5	0.7
21	ABB Industria*	0.2	0.2	0.2	12.1	0.5
22	UniCAD	-	0.7	0.2	-74.6	0.4
23	ICL	0.2	0.2	0.2	11.8	0.4
24	Computervision	0.9	0.3	-	-100.0	-
25	Softdesk	0	0	-	-100.0	-
26	GRAPHSOFT	-	0	-	-100.0	-
	All N.A. Companies	24.1	25.9	26.7	2.9	62.9
	All European Companies	8.9	7.1	9.2	29.9	21.7
	All Asian Companies	9.5	7.4	6.5	-11.6	15.4
	All Companies	42.5	40.4	42.4	4.9	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-42
1995 Top 14 PCB/MCM/Hybrid Software Companies, France, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	1.1	1.9	2.4	25.9	32.3
2	Zuken-Redac	1.3	1.0	1.3	33.0	18.0
3	Harris EDA	1.0	0.9	0.9	4.7	12.9
4	ALS Design	0.5	0.5	0.7	43.2	10.1
5	Cadence	0.7	0.7	0.6	-7.2	8.8
6	Intergraph	0.4	0.3	0.2	-4.1	3.4
7	PADS Software	0.1	0.1	0.1	29.5	1.7
8	Pacific Numerics	-	-	0.1	NA	1.3
9	Altium*	0.3	0.3	0.1	-72.5	1.1
10	IBM	0.3	0.3	0.1	-72.5	1.1
11	ULTImate Technology	0	0	0.1	45.0	0.7
12	Accel Technologies	-	-	0.1	NA	0.7
13	Number One Systems	-	0	0	4.7	0.1
14	Ziegler Informatics	0.1	0	0	9.5	0
	Other Companies	0.4	0.8	0.7	-7.8	9.8
	All N.A. Companies	3.6	4.1	4.5	8.7	61.2
	All European Companies	0.9	0.6	0.8	44.5	11.1
	All Asian Companies	1.3	1.0	1.3	33.0	18.0
	All Companies	6.2	6.4	7.3	13.6	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-43
1995 Top 17 PCB/MCM/Hybrid Software Companies, Germany, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	3.3	3.0	3.8	25.9	25.9
2	Zuken-Redac	4.0	3.0	2.7	-9.1	18.5
3	CAD-UL	1.9	1.9	2.4	28.5	16.7
4	Cadence	1.0	1.0	0.9	-7.2	6.1
5	Just In Time Systems	0.4	0.5	0.6	32.3	4.4
6	Intergraph	0.9	0.6	0.6	-4.1	4.0
7	Harris EDA	0.5	0.5	0.6	15.8	3.9
8	ULTImate Technology	0.3	0.3	0.5	53.0	3.5
9	PADS Software	0.4	0.4	0.5	29.5	3.5
10	Ziegler Informatics	1.5	0.3	0.3	9.5	2.0
11	Accel Technologies	-	-	0.2	NA	1.0
12	Altium*	0.7	0.5	0.1	-72.5	0.9
13	IBM	0.7	0.5	0.1	-72.5	0.9
14	Pacific Numerics	-	-	0.1	NA	0.9
15	ALS Design	0.1	0	0	-5.6	0.1
16	Number One Systems	-	0	0	4.7	0.1
17	Computervision	0.5	0.2	-	-100.0	-
	Other Companies	1.3	1.5	1.4	-7.6	9.6
	All N.A. Companies	7.3	6.1	6.6	8.2	45.1
	All European Companies	4.2	3.0	3.9	29.9	26.8
	All Asian Companies	4.0	3.0	2.7	-9.1	18.5
	All Companies	16.8	13.6	14.6	7.5	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-44
1995 Top 14 PCB/MCM/Hybrid Software Companies, Benelux, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	ULTImate Technology	0.7	0.9	1.3	45.0	52.3
2	Mentor Graphics	0.1	0.2	0.3	25.9	12.6
3	CAD-UL	0.2	0.2	0.3	28.5	10.1
4	Intergraph	0.2	0.1	0.1	-4.1	5.7
5	Zuken-Redac	0.4	0.5	0.1	-87.4	2.5
6	Cadence	0.1	0.1	0.1	-7.2	2.3
7	Accel Technologies	-	-	0.1	NA	2.0
8	Altium*	0.1	0.1	0	-72.5	1.4
9	IBM	0.1	0.1	0	-72.5	1.4
10	ALS Design	0.1	0	0	41.6	0.7
11	Harris EDA	0	0	0	-4.1	0.4
12	Number One Systems	-	0	0	4.7	0.2
13	Ziegler Informatics	0	0	0	9.5	0.1
14	Computervision	0.1	0	-	-100.0	-
	Other Companies	0.2	0.3	0.3	-4.0	11.2
	All N.A. Companies	0.6	0.6	0.6	-8.6	22.9
	All European Companies	1.0	1.1	1.6	41.8	63.4
	All Asian Companies	0.4	0.5	0.1	-87.4	2.5
	All Companies	2.2	2.5	2.5	-1.3	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-45
1995 Top 16 PCB/MCM/Hybrid Software Companies, United Kingdom, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	1.1	1.7	2.2	25.9	26.8
2	Zuken-Redac	1.9	2.0	1.8	-7.7	22.3
3	Harris EDA	1.2	1.0	1.1	10.4	13.9
4	Cadence	0.6	0.5	0.5	-7.2	6.0
5	Intergraph	0.5	0.4	0.3	-4.1	4.1
6	CAD-UL	0.2	0.2	0.3	28.5	3.8
7	PADS Software	0.2	0.2	0.3	29.5	3.1
8	Number One Systems	-	0.2	0.2	4.7	2.8
9	ULTImate Technology	0.2	0.1	0.2	45.0	2.6
10	ICL	0.2	0.2	0.2	11.8	2.0
11	Accel Technologies	-	-	0.2	NA	1.8
12	Pacific Numerics	-	-	0.1	NA	1.1
13	Altium*	0.2	0.3	0.1	-72.5	1.1
14	IBM	0.2	0.3	0.1	-72.5	1.1
15	ALS Design	0	0	0	41.6	0.2
16	Computervision	0.3	0.1	-	-100.0	-
	Other Companies	0.5	0.8	0.8	-9.8	9.2
	All N.A. Companies	3.9	4.3	4.7	8.8	57.0
	All European Companies	0.6	0.8	0.9	21.9	11.5
	All Asian Companies	1.9	2.0	1.8	-7.7	22.3
	All Companies	6.9	7.9	8.2	3.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-46
1995 Top 12 PCB/MCM/Hybrid Software Companies, Austria/Switzerland, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	0.7	0.4	0.5	25.9	46.7
2	PADS Software	-	-	0.1	NA	11.2
3	Just In Time Systems	0.1	0.1	0.1	32.3	10.1
4	Intergraph	0.1	0.1	0.1	-4.1	6.4
5	ULTImate Technology	0	0	0.1	190.0	4.8
6	Accel Technologies	-	-	0.1	NA	4.5
7	Altium*	0.1	0.1	0	-72.5	2.1
8	IBM	0.1	0.1	0	-72.5	2.1
9	CAD-UL	0.2	0	0	28.5	1.4
10	Ziegler Informatics	0.3	-	0	NA	1.1
11	ALS Design	0	-	0	NA	0.7
12	Number One Systems	-	0	0	4.7	0.4
	Other Companies	0.1	0.1	0.1	14.7	11.9
	All N.A. Companies	0.9	0.6	0.8	34.8	69.5
	All European Companies	0.1	0.1	0.2	72.6	18.6
	All Asian Companies	-	-	-	NA	
	All Companies	1.0	0.8	1.1	37.6	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-47
1995 Top 13 PCB/MCM/Hybrid Software Companies, Spain, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	ABB Industria*	0.2	0.2	0.2	12.1	50.4
2	Mentor Graphics	0.1	0.1	0.2	25.9	35.3
3	Intergraph	0.1	0.1	0.1	-4.1	19.9
4	Cadence	0.1	0.1	0.1	-7.2	12.6
5	Accel Technologies	-	-	0.1	NA	11.3
6	ULTImate Technology	-	0	0	190.0	6.1
7	Harris EDA	0	0	0	1.1	2.3
8	Ziegler Informatics	0.1	0	0	9.5	2.2
9	Altium*	0	0	0	-72.5	2.2
10	IBM	0	0	0	-72.5	2.2
11	ALS Design	0	0	0	41.6	1.8
12	Number One Systems	-	0	0	4.7	0.4
13	PADS Software	0	0	-	-100.0	-
	Other Companies	0	0.1	0.1	-15.8	11.9
	All N.A. Companies	0.4	0.4	0.3	-2.9	77.5
	All European Companies	0.1	0	0	81.9	10.6
	All Asian Companies	-	-	-	NA	
	All Companies	0.5	0.4	0.4	0.2	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-48
1995 Top 13 PCB/MCM/Hybrid Software Companies, Italy, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Zuken-Redac	0.3	0.5	0.7	32.3	27.1
2	Mentor Graphics	0.8	0.5	0.6	25.9	23.9
3	PADS Software	0.1	0.1	0.3	158.9	10.4
4	Cadence	0.3	0.2	0.2	-7.2	9.3
5	Harris EDA	0.9	0.9	0.2	-75.1	8.9
6	ULTImate Technology	0.1	0.1	0.1	93.3	4.5
7	Altium*	0.2	0.2	0.1	-72.5	2.4
8	IBM	0.2	0.2	0.1	-72.5	2.4
9	Intergraph	0.1	0.1	0.1	-4.1	2.3
10	Accel Technologies	-	-	0.1	NA	2.1
11	ALS Design	0	0	0	41.6	0.7
12	Number One Systems	-	0	0	4.7	0.4
13	Ziegler Informatics	0	0	0	9.5	0.2
	Other Companies	0.2	0.3	0.2	-36.4	8.7
	All N.A. Companies	2.2	1.9	1.4	-26.5	58.4
	All European Companies	0.1	0.1	0.1	71.8	5.8
	All Asian Companies	0.3	0.5	0.7	32.3	27.1
	All Companies	2.8	2.8	2.4	-14.6	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-49
1995 Top 12 PCB/MCM/Hybrid Software Companies, Scandinavia, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	1.5	2.0	2.5	25.9	57.5
2	Harris EDA	0.4	0.4	0.4	13.1	9.5
3	PADS Software	0.3	0.3	0.3	-13.7	5.9
4	ULTImate Technology	0.1	0.1	0.2	132.0	5.1
5	Cadence	0.2	0.2	0.2	-7.2	4.9
6	Intergraph	0.2	0.1	0.1	-4.1	3.3
7	Accel Technologies	-	-	0.1	NA	1.2
8	Altium*	0.2	0.1	0	-72.5	0.9
9	IBM	0.2	0.1	0	-72.5	0.9
10	Ziegler Informatics	0.2	0	0	9.5	0.6
11	Number One Systems	-	0	0	4.7	0.4
12	Zuken-Redac	1.1	0.5	-	-100.0	-
	Other Companies	0.3	0.5	0.5	-4.7	12.0
	All N.A. Companies	2.8	3.1	3.5	12.6	81.9
	All European Companies	0.3	0.1	0.3	93.8	6.1
	All Asian Companies	1.1	0.5	-	-100.0	-
	All Companies	4.5	4.3	4.3	0	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-50
1995 Top Two PCB/MCM/Hybrid Software Companies, Russia, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	0	0.2	0.3	25.9	86.5
2	Ziegler Informatics	-	-	0	NA	2.4
	Other Companies	0	0	0	5.6	12.0
	All N.A. Companies	0	0.2	0.3	24.6	85.6
	All European Companies	-	-	0	NA	2.4
	All Asian Companies	-	-	-	NA	
	All Companies	0	0.2	0.3	24.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-51
1995 Top Five PCB/MCM/Hybrid Software Companies, Central Europe, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	PADS Software	-	0.1	0.3	158.9	80.4
2	Intergraph	0	0	0	-4.1	5.4
3	Altium*	0.1	0	0	-72.5	3.1
4	IBM	0.1	0	0	-72.5	3.1
5	ULTImate Technology	0.1	0	-	-100.0	-
	Other Companies	0	0	0	42.9	12.0
	All N.A. Companies	0.1	0.1	0.3	83.9	88.0
	All European Companies	-	0	-	-100.0	-
	All Asian Companies	-	-	-	NA	
	All Companies	0.1	0.2	0.3	68.8	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-52
1995 Top 13 PCB/MCM/Hybrid Software Companies, Rest of Europe, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	0.3	0.3	0.4	25.9	37.5
2	Cadence	0.3	0.2	0.2	-7.2	22.9
3	CAD-UL	0.2	0.2	0.2	28.5	20.5
4	Number One Systems	-	0	0	4.7	4.7
5	Harris EDA	0.1	0	0	-5.8	4.3
6	Intergraph	0	0	0	-4.1	1.7
7	Ziegler Informatics	0.3	0	0	-63.9	1.0
8	Altium*	0.1	0	0	-72.5	0.8
9	IBM	0.1	0	0	-72.5	0.8
10	PADS Software	0.1	0.2	-	-100.0	-
11	ALS Design	0	0	-	-100.0	-
12	ULTImate Technology	0	-	-	NA	
13	Zuken-Redac	-	-	-	NA	-
	Other Companies	0.1	0.2	0.1	-34.2	11.8
	All N.A. Companies	0.7	0.8	0.6	-26.5	62.0
	All European Companies	0.6	0.2	0.3	10.1	26.2
	All Asian Companies	-	-	-	NA	-
	All Companies	1.4	1.2	1.0	-20.7	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

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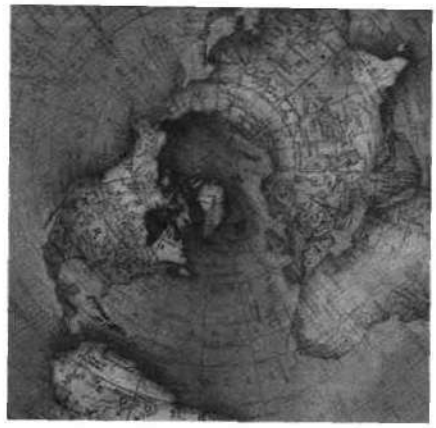

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1995 Electronic Design Automation Market Share Update

Market Statistics

Program: Electronic Design Automation Asia/Pacific
Product Code: CEDA-AP-MS-9601
Publication Date: August 26, 1996
Filing: Market Statistics

1995 Electronic Design Automation Market Share Update

Market Statistics

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Note: All tables show estimated data.

1995 Electronic Design Automation Market Share Update

About This Document

This document contains Dataquest's detailed market share information on the electronic design automation (EDA) industry at the country level. This report is meant to supplement your worldwide EDA market share book by providing EDA market share detail for European and/or Asia/Pacific countries.

Definitions

This section lists the definitions specific to this document. For other definitions, we ask that you reference your worldwide market statistics book.

Europe

Western Europe

Includes Austria, Benelux, (Belgium, the Netherlands, Luxembourg), France, Germany (including former East Germany), Italy, Scandinavia (Denmark, Finland, Norway, Sweden), Switzerland, the United Kingdom, and the Rest of Western Europe (Andorra, Cyprus, Gibraltar, Iceland, Liechtenstein, Malta, Monaco, San Marino, Spain, Sweden, Turkey, Vatican City, and others)

Eastern Europe

Includes all countries currently categorized as Central Europe in addition to Albania, Bulgaria, the Czech Republic and Slovakia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and the republics of the former Yugoslavia. Also included in this group is Russia and the other republics of the former Soviet Union (Belarus, Ukraine, Georgia, Moldova, Armenia, Azerbaijan, Kazakhstan, Uzbekistan, Tajikistan, Kyrgyzstan, and Turkmenistan)

Asia/Pacific

Includes Hong Kong, Korea, Singapore, Taiwan, and Rest of Asia (Australia, Brunei, Cambodia, China, India, Indonesia, Laos, Malaysia, Maldives, Myanmar, Nepal, New Zealand, Pakistan, the Philippines, Sri Lanka, Thailand, and Vietnam)

Publishing Schedule

We publish market share and forecasting at the country level once each year. Our delivery schedule is as follows:

- Updated market share tables for 1995, based on data collection and analysis beginning in January 1996, are presented in this report. This information is presented at the country level for either Asia/Pacific and/or Europe, according to the services you have purchased from Dataquest. At this point, the market share database is frozen and will not be changed until the end of 1996.

- Forecast tables will be available electronically by September 2, and books will be shipped by September 30. These forecast tables will contain country-level information for Asia/Pacific and/or Europe.

A Final Note

Dataquest's policy is to continually update its market information, for current and past years, with any new data received in order to arrive at the most accurate market representation possible. Our ongoing commitment is to maintain an accurate and complete model of the entire CAD/CAM/CAE/GIS market, worldwide, and we welcome your input. Please feel free to contact any member of the CAD/CAM/CAE team if you have any questions or concerns.

Table A-1
1995 Top 30 Electronic Design Automation Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	189.5	200.8	257.7	28.3	16.6
2	Synopsys	113.7	142.7	193.5	35.6	12.5
3	Mentor Graphics	167.3	175.6	184.0	4.7	11.9
4	Viewlogic Systems	76.9	83.3	77.3	-7.3	5.0
5	Zuken-Redac	72.7	67.0	71.9	7.4	4.6
6	Quickturn Design Systems	51.5	59.0	70.7	19.9	4.6
7	Compass Design Automation	43.6	43.7	51.0	16.7	3.3
8	Hewlett-Packard	33.1	34.4	36.3	5.5	2.3
9	AVANT!	8.4	16.3	32.3	97.7	2.1
10	Marubeni Hytech*	24.7	25.7	29.7	15.4	1.9
11	Zycad	23.2	29.4	28.4	-3.4	1.8
12	Seiko*	32.0	21.9	27.8	26.5	1.8
13	Fujitsu	21.0	23.7	27.4	15.8	1.8
14	Intergraph	25.0	19.9	26.7	34.3	1.7
15	IKOS Systems	18.1	18.6	25.7	38.1	1.7
16	EPIC Design Technology	-	11.9	24.2	103.5	1.6
17	Yokogawa Digital Computer	35.9	21.4	24.0	12.4	1.6
18	Harris EDA	21.0	21.5	21.9	1.6	1.4
19	Autodesk	23.9	22.8	20.6	-9.5	1.3
20	CADIX	31.1	18.3	20.3	11.1	1.3
21	ALTERA	13.1	16.0	19.2	20.0	1.2
22	Xilinx Inc.	14.7	16.9	18.5	9.6	1.2
23	Meta-Software	9.4	14.4	17.5	21.2	1.1
24	Analogy	11.0	11.0	17.1	55.5	1.1
25	Okura*	10.8	14.3	17.0	18.6	1.1
26	Summitt Design	9.1	14.6	16.4	12.7	1.1
27	NEC	22.7	22.4	15.6	-30.1	1.0
28	Wacom	26.3	12.1	15.2	25.8	1.0
29	Cooper & Chyan Technology	5.2	9.3	14.2	53.3	0.9
30	Microsim	5.8	11.9	14.0	17.6	0.9
	All N.A. Companies	965.5	1,111.0	1,327.2	19.5	85.7
	All European Companies	40.4	23.8	26.5	11.3	1.7
	All Asian Companies	181.2	183.5	195.7	6.7	12.6
	All Companies	1,187.1	1,318.3	1,549.4	17.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-2
1995 Top 30 Electronic Design Automation Software Companies, Asia/Pacific, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	16.9	14.1	20.3	43.6	21.1
2	Synopsys	2.5	4.3	14.5	239.1	15.1
3	Mentor Graphics	13.2	12.7	11.6	-8.5	12.0
4	Compass Design Automation	5.7	6.0	7.0	17.1	7.3
5	Quickturn Design Systems	4.0	1.8	6.6	274.4	6.9
6	Zuken-Redac	6.5	3.7	4.5	22.1	4.7
7	AVANT!	0.9	1.7	3.9	131.3	4.0
8	EPIC Design Technology	-	0.4	3.9	985.5	4.0
9	Viewlogic Systems	2.5	1.7	2.3	32.3	2.4
10	Autodesk	1.7	2.1	2.3	8.6	2.3
11	Meta-Software	0.3	0.6	1.7	203.1	1.8
12	Hewlett-Packard	1.3	1.4	1.5	5.5	1.5
13	Zycad	2.3	2.4	1.4	-39.6	1.5
14	CrossCheck Technology	1.3	1.2	1.4	12.9	1.5
15	Pacific Numerics	-	-	1.2	NA	1.3
16	PADS Software	0.4	0.8	1.2	42.7	1.2
17	Protel Technology	-	0.8	1.0	33.3	1.1
18	CADIX	-	-	1.0	NA	1.1
19	ALTERA	0.6	1.0	1.0	-	1.0
20	Silicon Valley Research	0.8	0.7	0.8	20.5	0.9
21	Yokogawa Digital Computer	0.7	0.6	0.8	27.4	0.8
22	Ansoft	-	0.6	0.8	41.1	0.8
23	Intergraph	0.6	0.5	0.7	34.5	0.7
24	Accel Technologies	0.1	0.2	0.6	128.2	0.6
25	Sharp*	0.6	0.5	0.5	8.4	0.6
26	IKOS Systems	0.2	0.7	0.5	-30.9	0.5
27	ACTEL	0.4	0.4	0.4	3.8	0.5
28	SIMUCAD	0.2	0.3	0.4	51.6	0.4
29	VLSI Libraries	0.1	0.4	0.4	5.7	0.4
30	Quantic Laboratories	0.1	0.1	0.4	182.1	0.4
	All N.A. Companies	55.5	60.1	88.5	47.4	92.0
	All European Companies	0.6	0.5	0.6	20.9	0.6
	All Asian Companies	5.7	4.8	7.1	47.5	7.4
	All Companies	61.8	65.4	96.2	47.2	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-3
1995 Top 11 Electronic Design Automation Software Companies, China, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	1.9	1.6	2.3	43.6	57.1
2	Viewlogic Systems	0.5	0.4	0.5	32.3	13.1
3	Pacific Numerics	-	-	0.4	NA	9.3
4	Zuken-Redac	0.7	0.2	0.2	22.1	6.2
5	Accel Technologies	-	0	0.1	128.2	2.3
6	Intergraph	0.1	0.1	0.1	36.4	1.9
7	Autodesk	0	0.1	0.1	8.6	1.6
8	Altium*	0.1	0.1	0	-66.0	0.9
9	IBM	0.1	0.1	0	-66.0	0.9
10	ACTEL	0	0	0	3.8	0.8
11	PADS Software	-	0	-	-100.0	-
	Other Companies	0.5	0.4	0.4	1.2	9.7
	All N.A. Companies	2.5	2.2	3.4	52.5	84.1
	All European Companies	-	-	-	NA	-
	All Asian Companies	0.7	0.2	0.2	22.1	6.2
	All Companies	3.7	2.8	4.0	43.2	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-4
1995 Top 14 Electronic Design Automation Software Companies, Hong Kong, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	1.1	0.9	1.3	43.6	36.0
2	PADS Software	0.1	0.1	0.8	1096.3	21.5
3	Mentor Graphics	0.2	0.5	0.5	-3.7	13.5
4	Intergraph	0.2	0.1	0.2	36.4	5.2
5	Autodesk	0.1	0.1	0.1	8.6	2.7
6	Accel Technologies	-	0	0.1	128.2	2.6
7	Zuken-Redac	1.9	0.1	0.1	22.1	2.3
8	Quickturn Design Systems	0.8	-	0.1	NA	1.8
9	CAD-UL	0.1	0	0.1	22.2	1.6
10	ACTEL	0.1	0.1	0.1	3.8	1.5
11	Altium*	0.1	0.1	0	-66.0	0.9
12	IBM	0.1	0.1	0	-66.0	0.9
13	ALDEC	-	-	0	NA	0.8
14	Intusoft	-	0	0	87.4	0.2
	Other Companies	0.4	0.4	0.4	-2.3	11.2
	All N.A. Companies	2.2	1.9	3.1	63.1	85.6
	All European Companies	0.1	0.1	0	-34.2	0.9
	All Asian Companies	0.2	0.1	0.1	22.1	2.3
	All Companies	2.9	2.4	3.6	48.7	100.0

NA = Not applicable
Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-5
1995 Top 30 Electronic Design Automation Software Companies, Korea, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	9.0	7.5	10.8	43.6	25.7
2	Compass Design Automation	4.7	4.9	5.8	17.1	13.7
3	Mentor Graphics	3.5	4.9	4.4	-10.9	10.5
4	AVANT!	0.5	1.6	3.9	147.1	9.2
5	Zuken-Redac	3.1	2.6	3.2	22.1	7.7
6	EPIC Design Technology	-	-	2.7	NA	6.3
7	CrossCheck Technology	0.5	0.9	1.1	12.9	2.5
8	Yokogawa Digital Computer	0.4	0.6	0.8	27.4	1.9
9	Quickturn Design Systems	0.8	0.4	0.7	59.2	1.7
10	Silicon Valley Research	0.4	0.6	0.7	20.5	1.7
11	Viewlogic Systems	0.6	0.5	0.6	32.3	1.5
12	Autodesk	0.5	0.5	0.6	8.6	1.4
13	Zycad	0.5	1.5	0.6	-61.3	1.4
14	Pacific Numerics	-	-	0.5	NA	1.2
15	VLSI Libraries	-	0.4	0.4	5.7	0.9
16	Seiko*	-	-	0.4	NA	0.8
17	PADS Software	0.2	0.4	0.3	-28.5	0.6
18	Accel Technologies	0.1	0.1	0.2	128.2	0.4
19	SIMUCAD	0.1	0.1	0.2	29.7	0.4
20	Intergraph	0.1	0.1	0.1	36.4	0.4
21	APTIX	0.1	0.1	0.1	70.1	0.3
22	Systems Science	-	-	0.1	NA	0.2
23	Royal Digital Centers	0.1	0.1	0.1	68.7	0.2
24	ALDEC	0	-	0.1	NA	0.1
25	i-Logix	0	0	0	16.1	0.1
26	Altium*	0.1	0.1	0	-66.0	0.1
27	IBM	0.1	0.1	0	-66.0	0.1
28	ACTEL	0.1	0	0	3.8	0.1
29	ULTImate Technology	0	0	0	45.0	0.1
30	Intusoft	-	0	0	87.4	0
	Other Companies	3.7	4.4	4.4	0.7	10.6
	All N.A. Companies	21.1	24.4	33.3	36.5	79.2
	All European Companies	0	0	0	45.0	0.1
	All Asian Companies	3.5	3.3	4.3	30.9	10.2
	All Companies	28.3	32.1	42.0	31.0	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-6
1995 Top 16 Electronic Design Automation Software Companies, Singapore, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	2.2	1.1	1.1	-6.3	28.3
2	Zuken-Redac	0.5	0.6	0.7	22.1	19.9
3	Viewlogic Systems	0.5	0.4	0.5	32.3	14.1
4	Quickturn Design Systems	1.1	-	0.3	NA	7.9
5	Zycad	0.5	-	0.3	NA	7.6
6	Accel Technologies	-	0	0.1	128.2	2.5
7	Autodesk	0.1	0.1	0.1	8.6	1.8
8	CAD-UL	0.1	0	0.1	25.6	1.6
9	Altium*	0.1	0.1	0	-66.0	0.9
10	IBM	0.1	0.1	0	-66.0	0.9
11	ACTEL	0	0	0	3.8	0.9
12	ALDEC	-	-	0	NA	0.7
13	ULTImate Technology	0	0	0	45.0	0.7
14	Systems Science	-	-	0	NA	0.7
15	Intusoft	-	0	0	87.4	0.1
16	PADS Software	-	0	-	-100.0	-
	Other Companies	0.6	0.5	0.6	22.5	15.9
	All N.A. Companies	3.3	1.7	2.3	36.7	62.6
	All European Companies	0.1	0.1	0.1	-11.3	1.6
	All Asian Companies	0.5	0.6	0.7	22.1	19.9
	All Companies	4.6	2.9	3.7	30.0	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-7
1995 Top 26 Electronic Design Automation Software Companies, Taiwan, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	0.8	4.3	14.5	239.1	42.7
2	Quickturn Design Systems	1.1	1.3	5.5	317.1	16.3
3	Cadence	4.2	3.5	5.0	43.6	14.8
4	Mentor Graphics	2.6	2.0	1.8	-12.5	5.2
5	Compass Design Automation	1.0	1.1	1.3	17.1	3.8
6	Zycad	0.9	0.9	0.6	-35.6	1.7
7	Autodesk	0.4	0.5	0.5	8.6	1.4
8	Pacific Numerics	-	-	0.4	NA	1.1
9	CrossCheck Technology	0.2	0.3	0.4	12.9	1.0
10	Zuken-Redac	0.3	0.2	0.2	22.1	0.7
11	SIMUCAD	0.1	0.1	0.2	73.5	0.7
12	Intergraph	0.1	0.1	0.1	36.4	0.4
13	Silicon Valley Research	0.1	0.1	0.1	20.5	0.4
14	PADS Software	0.1	0.4	0.1	-64.3	0.4
15	APTIX	0.1	0.1	0.1	70.1	0.3
16	Accel Technologies	-	0	0.1	128.2	0.3
17	i-Logix	0	0	0	16.1	0.1
18	Altium*	0.1	0.1	0	-66.0	0.1
19	IBM	0.1	0.1	0	-66.0	0.1
20	Contec Microelectronics	0	0	0	9.3	0.1
21	ACTEL	0	0	0	3.8	0.1
22	ALDEC	-	-	0	NA	0.1
23	Systems Science	-	-	0	NA	0.1
24	Intusoft	-	0	0	87.4	0
25	InterHDL	-	0	0	15.4	0
26	AVANT!	0.1	0.1	-	-100.0	-
	Other Companies	1.8	2.5	3.0	21.6	8.8
	All N.A. Companies	11.8	14.9	30.7	106.2	90.4
	All European Companies	-	-	-	NA	
	All Asian Companies	0.3	0.2	0.2	22.1	0.7
	All Companies	13.8	17.6	34.0	93.3	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-8
1995 Top 17 Electronic Design Automation Software Companies, Rest of Asia, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	4.8	4.1	3.9	-4.9	43.4
2	EPIC Design Technology	-	-	1.2	NA	13.5
3	Autodesk	0.7	0.9	1.0	8.6	10.7
4	Cadence	0.7	0.6	0.8	43.8	9.2
5	Viewlogic Systems	0.6	0.5	0.6	32.3	7.1
6	ACTEL	0.2	0.2	0.3	3.8	2.9
7	LV Software	-	-	0.2	NA	2.1
8	Intergraph	0.1	0.1	0.1	25.8	1.3
9	CAD-UL	0	0	0.1	166.0	0.7
10	Intusoft	-	0	0.1	87.4	0.7
11	Quickturn Design Systems	-	-	0	NA	0.3
12	i-Logix	0.1	0	0	16.1	0.3
13	Altium*	0.1	0.2	0	-91.9	0.2
14	IBM	0.1	0.2	0	-91.9	0.2
15	InterHDL	-	0	0	15.4	0
16	Viagrafix	0	0	0	-62.9	0
17	PADS Software	-	0	-	-100.0	-
	Other Companies	1.3	1.1	0.9	-22.7	9.7
	All N.A. Companies	7.1	6.5	8.0	23.3	89.9
	All European Companies	0.2	0	0	43.9	0.4
	All Asian Companies	-	-	-	NA	-
	All Companies	8.6	7.7	8.9	16.6	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-9
1995 Top 30 Electronic CAE Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	113.7	142.7	193.5	35.6	19.0
2	Cadence	91.4	96.4	123.2	27.7	12.1
3	Mentor Graphics	100.4	100.1	109.0	8.9	10.7
4	Viewlogic Systems	76.9	83.3	77.3	-7.3	7.6
5	Quickturn Design Systems	51.5	59.0	70.7	19.9	6.9
6	Hewlett-Packard	33.1	34.4	36.3	5.5	3.6
7	Zycad	23.2	29.4	28.4	-3.4	2.8
8	Marubeni Hytech*	23.5	24.3	28.0	15.2	2.7
9	IKOS Systems	18.1	18.6	25.7	38.1	2.5
10	EPIC Design Technology	-	11.9	24.2	103.5	2.4
11	Compass Design Automation	24.0	20.1	23.2	15.2	2.3
12	Autodesk	23.9	22.8	20.6	-9.5	2.0
13	ALTERA	13.1	16.0	19.2	20.0	1.9
14	Meta-Software	9.4	14.4	17.5	21.2	1.7
15	Analogy	11.0	11.0	17.1	55.5	1.7
16	Intergraph	13.7	11.5	16.5	42.9	1.6
17	Summitt Design	9.1	14.6	16.4	12.7	1.6
18	Microsim	5.8	11.9	14.0	17.6	1.4
19	Wacom	23.7	10.6	13.6	28.1	1.3
20	Seiko*	12.9	12.0	13.4	11.8	1.3
21	Xilinx Inc.	9.3	11.0	12.6	14.8	1.2
22	Zuken-Redac	20.7	12.3	11.8	-3.7	1.2
23	Minc Software	2.1	6.0	11.7	94.1	1.1
24	LSI Logic	12.3	14.0	11.5	-17.6	1.1
25	NEC	12.9	13.9	11.2	-19.4	1.1
26	Harris EDA	8.7	9.6	9.9	3.1	1.0
27	Ansoft	-	5.6	7.9	41.1	0.8
28	SES Inc.	7.0	8.5	7.7	-8.9	0.8
29	CrossCheck Technology	11.2	6.2	7.0	12.9	0.7
30	C. Itoh Techno-Science*	5.7	6.2	5.7	-8.9	0.6
	All N.A. Companies	698.9	805.8	964.2	19.6	94.5
	All European Companies	21.6	14.9	15.2	2.3	1.5
	All Asian Companies	46.7	40.4	40.7	0.8	4.0
	All Companies	767.3	861.1	1,020.0	18.5	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-10
1995 Top 30 Electronic CAE Software Companies, Asia/Pacific, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	2.5	4.3	14.5	239.1	24.0
2	Cadence	7.6	6.8	9.7	43.2	16.0
3	Mentor Graphics	8.9	7.8	6.9	-11.6	11.3
4	Quickturn Design Systems	4.0	1.8	6.6	274.4	11.0
5	EPIC Design Technology	-	0.4	3.9	985.5	6.4
6	Compass Design Automation	2.4	2.0	2.3	15.2	3.8
7	Viewlogic Systems	2.5	1.7	2.3	32.3	3.8
8	Autodesk	1.7	2.1	2.3	8.6	3.7
9	Meta-Software	0.3	0.6	1.7	203.1	2.9
10	Hewlett-Packard	1.3	1.4	1.5	5.5	2.4
11	Zycad	2.3	2.4	1.4	-39.6	2.3
12	CrossCheck Technology	1.3	1.2	1.4	12.9	2.3
13	ALTERA	0.6	1.0	1.0	-	1.6
14	Ansoft	-	0.6	0.8	41.1	1.3
15	Pacific Numerics	-	-	0.6	NA	1.0
16	IKOS Systems	0.2	0.7	0.5	-30.9	0.9
17	ACTEL	0.4	0.4	0.4	3.8	0.7
18	Protel Technology	-	0.3	0.4	33.3	0.7
19	SIMUCAD	0.2	0.3	0.4	51.6	0.7
20	Intergraph	0.3	0.3	0.4	38.5	0.6
21	VLSI Libraries	0.1	0.4	0.4	5.7	0.6
22	Quantic Laboratories	0.1	0.1	0.4	182.1	0.6
23	Xilinx Inc.	0.1	0.2	0.3	14.8	0.4
24	APTIX	0.3	0.1	0.2	70.1	0.4
25	Data I/O	0.1	0.1	0.2	91.8	0.4
26	LV Software	-	-	0.2	NA	0.3
27	Zuken-Redac	4.0	0.6	0.2	-68.4	0.3
28	Systems Science	0	0	0.2	239.2	0.3
29	ALDEC	0	0.1	0.1	-6.0	0.2
30	Minc Software	-	0.1	0.1	94.1	0.2
	All N.A. Companies	35.5	37.9	60.2	59.1	99.6
	All European Companies	0.2	0.1	0.1	-18.9	0.1
	All Asian Companies	2.3	0.6	0.2	-68.4	0.3
	All Companies	38.0	38.5	60.5	56.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-11
1995 Top Nine Electronic CAE Software Companies, China, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	0.9	0.8	1.1	43.2	51.9
2	Viewlogic Systems	0.5	0.4	0.5	32.3	25.0
3	Pacific Numerics	-	-	0.2	NA	8.8
4	Autodesk	0	0.1	0.1	8.6	3.1
5	Intergraph	0	0	0	38.5	2.0
6	ACTEL	0	0	0	3.8	1.5
7	Accel Technologies	-	0	0	119.0	0.9
8	Zuken-Redac	0.5	0	0	-68.4	0.5
9	PADS Software	-	0	-	-100.0	-
	Other Companies	0.3	0.3	0.2	-11.6	10.9
	All N.A. Companies	1.4	1.2	1.9	52.8	88.6
	All European Companies	-	-	-	NA	-
	All Asian Companies	0.5	0	0	-68.4	0.5
	All Companies	2.1	1.5	2.1	39.1	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-12
1995 Top 11 Electronic CAE Software Companies, Hong Kong, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	0.5	0.4	0.6	43.2	41.9
2	Mentor Graphics	0.1	0.3	0.3	-11.6	18.4
3	Intergraph	0.1	0.1	0.1	38.5	7.0
4	Autodesk	0.1	0.1	0.1	8.6	6.6
5	PADS Software	0	0	0.1	762.8	4.7
6	Quickturn Design Systems	0.8	-	0.1	NA	4.3
7	ACTEL	0.1	0.1	0.1	3.8	3.6
8	ALDEC	-	-	0	NA	1.8
9	Accel Technologies	-	0	0	119.0	1.2
10	Intusoft	-	0	0	87.4	0.6
11	Zuken-Redac	1.7	0	0	-68.4	0.2
	Other Companies	0.3	0.2	0.2	-21.9	10.9
	All N.A. Companies	1.3	1.0	1.3	35.0	88.8
	All European Companies	-	-	-	NA	-
	All Asian Companies	0.1	0	0	-68.4	0.2
	All Companies	1.6	1.2	1.5	24.2	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-13
1995 Top 23 Electronic CAE Software Companies, Korea, All Operating Systems
(Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	4.0	3.6	5.1	43.2	26.8
2	Mentor Graphics	2.3	3.3	2.9	-11.6	15.1
3	EPIC Design Technology	-	-	2.7	NA	13.8
4	Compass Design Automation	2.0	1.6	1.9	15.2	9.9
5	CrossCheck Technology	0.5	0.9	1.1	12.9	5.5
6	Quickturn Design Systems	0.8	0.4	0.7	59.2	3.7
7	Viewlogic Systems	0.6	0.5	0.6	32.3	3.3
8	Autodesk	0.5	0.5	0.6	8.6	3.0
9	Zycad	0.5	1.5	0.6	-61.3	3.0
10	VLSI Libraries	-	0.4	0.4	5.7	1.9
11	Pacific Numerics	-	-	0.2	NA	1.3
12	SIMUCAD	0.1	0.1	0.2	29.7	0.9
13	Zuken-Redac	1.7	0.4	0.1	-68.4	0.7
14	APTIX	0.1	0.1	0.1	70.1	0.6
15	Systems Science	-	-	0.1	NA	0.5
16	Intergraph	0.1	0.1	0.1	38.5	0.4
17	ALDEC	0	-	0.1	NA	0.3
18	i-Logix	0	0	0	16.1	0.2
19	Accel Technologies	0	0	0	119.0	0.2
20	ACTEL	0.1	0	0	3.8	0.2
21	PADS Software	0	0	0	-48.4	0.1
22	Intusoft	-	0	0	87.4	0.1
23	InterHDL	-	0	0	15.4	0
	Other Companies	2.4	2.7	2.1	-23.6	10.9
	All N.A. Companies	11.2	12.9	17.0	32.1	88.4
	All European Companies	-	-	-	NA	-
	All Asian Companies	1.7	0.4	0.1	-68.4	0.7
	All Companies	15.4	16.0	19.2	19.9	100.0

NA = Not applicable
Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-14
1995 Top 12 Electronic CAE Software Companies, Singapore, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	1.7	0.8	0.7	-11.6	33.8
2	Viewlogic Systems	0.5	0.4	0.5	32.3	24.2
3	Quickturn Design Systems	1.1	-	0.3	NA	13.6
4	Zycad	0.5	-	0.3	NA	13.1
5	Autodesk	0.1	0.1	0.1	8.6	3.0
6	ACTEL	0	0	0	3.8	1.5
7	Zuken-Redac	0.1	0.1	0	-68.4	1.4
8	ALDEC	-	-	0	NA	1.3
9	Systems Science	-	-	0	NA	1.2
10	Accel Technologies	-	0	0	119.0	0.8
11	Intusoft	-	0	0	87.4	0.2
12	PADS Software	-	0	-	-100.0	-
	Other Companies	0.6	0.3	0.2	-13.1	10.8
	All N.A. Companies	2.7	1.3	1.9	50.2	87.8
	All European Companies	-	-	-	NA	
	All Asian Companies	0.1	0.1	0	-68.4	1.4
	All Companies	3.3	1.6	2.2	32.7	100.0

NA = Not applicable
Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-15
1995 Top 22 Electronic CAE Software Companies, Taiwan, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Synopsys	0.8	4.3	14.5	239.1	50.7
2	Quickturn Design Systems	1.1	1.3	5.5	317.1	19.3
3	Cadence	1.9	1.7	2.4	43.2	8.4
4	Zycad	0.9	0.9	0.6	-35.6	2.0
5	Mentor Graphics	1.3	0.6	0.5	-11.6	1.9
6	Autodesk	0.4	0.5	0.5	8.6	1.7
7	Compass Design Automation	0.4	0.4	0.4	15.2	1.5
8	CrossCheck Technology	0.2	0.3	0.4	12.9	1.2
9	SIMUCAD	0.1	0.1	0.2	73.5	0.8
10	Pacific Numerics	-	-	0.2	NA	0.7
11	APTIX	0.1	0.1	0.1	70.1	0.4
12	Intergraph	0.1	0.1	0.1	38.5	0.3
13	i-Logix	0	0	0	16.1	0.2
14	Contec Microelectronics	0	0	0	9.3	0.1
15	ACTEL	0	0	0	3.8	0.1
16	ALDEC	-	-	0	NA	0.1
17	Systems Science	-	-	0	NA	0.1
18	Accel Technologies	-	0	0	119.0	0.1
19	Intusoft	-	0	0	87.4	0.1
20	PADS Software	0	0	0	-74.2	0
21	Zuken-Redac	0.1	0	0	-68.4	0
22	InterHDL	-	0	0	15.4	0
	Other Companies	1.5	2.2	3.1	43.6	11.0
	All N.A. Companies	7.3	10.3	25.5	148.3	89.0
	All European Companies	-	-	-	NA	
	All Asian Companies	0.1	0	0	-68.4	0
	All Companies	8.8	12.5	28.6	129.4	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-16
1995 Top 14 Electronic CAE Software Companies, Rest of Asia, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	3.5	2.7	2.4	-11.6	35.1
2	EPIC Design Technology	-	-	1.2	NA	17.7
3	Autodesk	0.7	0.9	1.0	8.6	13.9
4	Viewlogic Systems	0.6	0.5	0.6	32.3	9.2
5	Cadence	0.3	0.3	0.4	43.2	5.9
6	ACTEL	0.2	0.2	0.3	3.8	3.7
7	LV Software	-	-	0.2	NA	2.8
8	Intusoft	-	0	0.1	87.4	0.9
9	Intergraph	0.1	0	0.1	38.5	0.9
10	Quickturn Design Systems	-	-	0	NA	0.4
11	i-Logix	0.1	0	0	16.1	0.3
12	InterHDL	-	0	0	15.4	0
13	Viagrafix	0	0	0	-62.9	0
14	PADS Software	-	0	-	-100.0	-
	Other Companies	1.3	1.0	0.8	-24.0	11.0
	All N.A. Companies	5.4	4.6	6.1	31.4	89.0
	All European Companies	-	-	-	NA	
	All Asian Companies	-	-	-	NA	-
	All Companies	6.8	5.6	6.8	21.6	100.0

NA = Not applicable
Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
Source: Dataquest (June 1996)

Table A-17
1995 Top 19 IC Layout Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	81.4	88.3	118.5	34.2	45.0
2	Mentor Graphics	26.5	34.6	32.9	-4.8	12.5
3	AVANT!	8.4	16.3	32.3	97.7	12.3
4	Compass Design Automation	19.6	23.5	27.8	18.0	10.5
5	Okura*	10.8	14.3	17.0	18.6	6.4
6	Seiko*	19.1	9.9	13.0	30.8	4.9
7	High Level Design Systems	3.2	3.3	9.3	178.1	3.5
8	Cascade Design Automation	6.7	8.1	7.9	-2.2	3.0
9	Silicon Valley Research	6.3	5.3	6.4	20.5	2.4
10	Fujitsu	4.8	5.5	6.3	15.8	2.4
11	Xilinx Inc.	5.5	5.9	5.9	-0.2	2.2
12	Cooper & Chyan Technology	-	1.9	3.1	68.6	1.2
13	TSSI Japan*	1.6	2.2	2.5	18.6	1.0
14	Intergraph	1.7	1.4	2.3	61.0	0.9
15	Marubeni Hytech*	1.2	1.5	1.7	18.5	0.7
16	LSI Logic	1.4	1.6	1.3	-14.1	0.5
17	Tanner Research	0.6	0.9	1.2	33.7	0.5
18	Sagantec	6.1	0.8	1.2	47.3	0.4
19	AT&T	-	0.3	0.4	23.3	0.1
	All N.A. Companies	154.8	188.6	244.8	29.8	92.9
	All European Companies	6.1	0.8	1.2	47.3	0.4
	All Asian Companies	14.5	14.0	17.5	25.3	6.7
	All Companies	175.4	203.3	263.5	29.6	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-18
1995 Top 12 IC Layout Software Companies, Asia/Pacific, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	7.6	6.2	9.3	50.4	45.5
2	Compass Design Automation	3.3	4.0	4.7	18.0	23.1
3	AVANT!	0.9	1.7	3.9	131.3	18.9
4	Mentor Graphics	1.2	1.6	1.1	-28.9	5.5
5	Silicon Valley Research	0.8	0.7	0.8	20.5	4.1
6	Seiko*	-	-	0.4	NA	1.7
7	Cascade Design Automation	0.7	0.9	0.2	-82.3	0.8
8	Intergraph	0.1	0.1	0.1	53.0	0.7
9	Sagantec	-	-	0.1	NA	0.6
10	Cooper & Chyan Technology	-	0	0.1	68.6	0.3
11	LSI Logic	0	0.1	-	-100.0	-
12	Tanner Research	-	0	-	-100.0	-
	All N.A. Companies	13.6	15.1	20.0	32.1	97.7
	All European Companies	-	-	0.1	NA	0.6
	All Asian Companies	-	-	0.4	NA	1.7
	All Companies	13.6	15.1	20.5	35.2	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-19
1995 Top Two IC Layout Software Companies, China, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	0.9	0.7	1.1	50.4	98.8
2	Intergraph	0	0	0	53.0	1.8
	Other Companies	0	0.1	0	-79.9	0.9
	All N.A. Companies	0.8	0.7	1.1	49.9	99.1
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	0.9	0.8	1.1	41.2	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-20
1995 Top Two IC Layout Software Companies, Hong Kong, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	0.5	0.4	0.6	50.4	93.7
2	Intergraph	0	0	0	53.0	7.4
	Other Companies	0	0	0	-80.1	0.9
	All N.A. Companies	0.5	0.4	0.6	48.8	99.1
	All European Companies	-	-	-	NA	
	All Asian Companies	-	-	-	NA	
	All Companies	0.5	0.5	0.6	40.2	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-21
1995 Top Seven IC Layout Software Companies, Korea, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	4.1	3.3	5.0	50.4	34.6
2	AVANT!	0.5	1.6	3.9	147.1	27.0
3	Compass Design Automation	2.7	3.3	3.9	18.0	26.9
4	Silicon Valley Research	0.4	0.6	0.7	20.5	4.9
5	Mentor Graphics	0.6	0.8	0.6	-28.9	3.9
6	Seiko*	-	-	0.4	NA	2.4
7	Intergraph	0	0	0	53.0	0.3
	Other Companies	0.5	0.7	0.1	-80.4	0.9
	All N.A. Companies	8.0	9.5	13.9	46.7	96.6
	All European Companies	-	-	-	NA	
	All Asian Companies	-	-	0.4	NA	2.4
	All Companies	8.5	10.1	14.4	41.7	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-22
1995 Top Six IC Layout Software Companies, Taiwan, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	1.9	1.5	2.3	50.4	59.5
2	Compass Design Automation	0.6	0.7	0.9	18.0	22.0
3	Mentor Graphics	0.6	0.8	0.6	-28.9	14.6
4	Silicon Valley Research	0.1	0.1	0.1	20.5	3.4
5	Intergraph	0	0	0	53.0	1.0
6	AVANT!	0.1	0.1	-	-100.0	-
	Other Companies	0.2	0.2	0	-84.2	0.9
	All N.A. Companies	3.1	3.3	3.9	17.7	99.1
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	3.3	3.5	3.9	10.9	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-23
1995 Top IC Layout Software Company, Rest of Asia, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Cadence	0.3	0.2	0.4	50.4	100.5
	Other Companies	0	0	0	-79.9	0.9
	All N.A. Companies	0.3	0.2	0.4	50.2	99.1
	All European Companies	-	-	-	NA	
	All Asian Companies	-	-	-	NA	-
	All Companies	0.3	0.3	0.4	41.6	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

Source: Dataquest (June 1996)

Table A-24
1995 Top 30 PCB/MCM/Hybrid Software Companies, Worldwide, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Zuken-Redac	52.0	54.7	60.1	9.8	22.6
2	Mentor Graphics	40.4	41.0	42.0	2.6	15.8
3	Yokogawa Digital Computer	35.9	21.0	23.6	12.4	8.9
4	CADIX	31.1	18.3	20.3	11.1	7.6
5	Fujitsu	12.9	14.6	16.9	15.8	6.3
6	Cadence	16.7	16.1	16.0	-0.6	6.0
7	PADS Software	9.1	9.7	12.1	24.9	4.6
8	Harris EDA	12.2	11.9	12.0	0.4	4.5
9	Cooper & Chyan Technology	5.2	7.4	11.1	49.4	4.2
10	Intergraph	9.6	6.9	7.9	14.3	3.0
11	Toshiba*	10.9	6.1	6.7	11.0	2.5
12	OrCAD EDA	3.3	4.0	5.3	32.7	2.0
13	Accel Technologies	2.6	3.3	5.0	53.7	1.9
14	NEC	8.6	8.5	4.5	-47.6	1.7
15	UniCAD	-	3.0	3.8	27.0	1.4
16	Protel Technology	-	2.7	3.6	33.3	1.4
17	C. Itoh Techno-Science*	3.5	3.9	3.4	-12.4	1.3
18	CAD-UL	3.3	2.7	3.4	26.1	1.3
19	Hitachi	3.0	3.1	3.3	6.4	1.2
20	Pacific Numerics	3.9	3.9	3.1	-21.3	1.2
21	Sharp*	2.8	2.5	2.7	8.4	1.0
22	ULTImate Technology	2.3	1.9	2.7	45.4	1.0
23	Altium*	9.9	9.7	2.7	-72.5	1.0
24	IBM	9.9	9.7	2.7	-72.5	1.0
25	Norlinvest Ltd.	1.8	1.9	1.9	1.9	0.7
26	Wacom	2.6	1.5	1.7	9.9	0.6
27	Uchida Yoko	4.6	1.4	1.6	12.5	0.6
28	Seiko*	-	-	1.3	NA	0.5
29	Sumisho Electronics*	1.2	1.3	1.3	0.6	0.5
30	TECHSPERT*	0.6	1.5	1.2	-18.9	0.4
	All N.A. Companies	111.7	116.6	118.2	1.4	44.5
	All European Companies	12.7	8.1	10.1	24.3	3.8
	All Asian Companies	120.0	129.1	137.5	6.5	51.7
	All Companies	244.4	253.9	265.8	4.7	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-25
1995 Top 21 PCB/MCM/Hybrid Software Companies, Asia/Pacific, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Zuken-Redac	2.5	3.1	4.3	39.5	28.4
2	Mentor Graphics	3.1	3.3	3.6	8.6	23.5
3	Cadence	1.7	1.2	1.3	10.2	8.4
4	PADS Software	0.3	0.7	1.1	48.3	7.0
5	CADIX	-	-	1.0	NA	6.6
6	Yokogawa Digital Computer	0.7	0.6	0.8	27.4	5.2
7	Pacific Numerics	-	-	0.6	NA	4.1
8	Protel Technology	-	0.5	0.6	33.3	4.0
9	Sharp*	0.6	0.5	0.5	8.4	3.6
10	Accel Technologies	0.1	0.2	0.5	130.5	3.0
11	Norlinvest Ltd.	0.3	0.3	0.3	1.9	1.9
12	Cooper & Chyan Technology	0.1	0.1	0.2	49.4	1.5
13	UniCAD	-	-	0.2	NA	1.2
14	Altium*	0.6	0.7	0.2	-72.5	1.2
15	IBM	0.6	0.7	0.2	-72.5	1.2
16	CAD-UL	0.2	0.1	0.2	52.3	1.2
17	Intergraph	0.2	0.1	0.2	14.6	1.1
18	Royal Digital Centers	0.2	0.1	0.1	68.7	0.6
19	ULTImate Technology	0.1	0	0.1	45.0	0.4
20	Harris EDA	0.3	0.3	-	-100.0	-
21	Softdesk	0	0	-	-100.0	-
	All N.A. Companies	6.5	7.1	8.3	17.3	54.2
	All European Companies	0.4	0.4	0.4	-0.3	2.6
	All Asian Companies	3.4	4.2	6.6	55.7	43.2
	All Companies	10.3	11.7	15.3	30.6	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-26
1995 Top Eight PCB/MCM/Hybrid Software Companies, China, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Zuken-Redac	0.2	0.2	0.2	39.5	28.9
2	Pacific Numerics	-	-	0.2	NA	22.7
3	Cadence	0.2	0.1	0.1	10.2	17.8
4	Accel Technologies	-	0	0.1	130.5	9.2
5	Altium*	0.1	0.1	0	-66.0	4.2
6	IBM	0.1	0.1	0	-66.0	4.2
7	Intergraph	0	0	0	14.6	1.7
8	PADS Software	-	0	-	-100.0	-
	Other Companies	0.1	0.1	0.1	116.9	15.8
	All N.A. Companies	0.3	0.3	0.5	57.4	55.3
	All European Companies	-	-	-	NA	
	All Asian Companies	0.2	0.2	0.2	39.5	28.9
	All Companies	0.6	0.5	0.8	58.4	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-27
1995 Top Nine PCB/MCM/Hybrid Software Companies, Hong Kong, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	PADS Software	0.1	0.1	0.7	1143.6	48.3
2	Mentor Graphics	0.1	0.2	0.2	8.6	14.6
3	Cadence	0.1	0.1	0.1	10.2	5.6
4	Zuken-Redac	0.2	0.1	0.1	39.5	5.3
5	Accel Technologies	-	0	0.1	130.5	5.1
6	CAD-UL	0.1	0	0.1	22.2	4.0
7	Intergraph	0	0	0	14.6	2.4
8	Altium*	0.1	0.1	0	-66.0	2.3
9	IBM	0.1	0.1	0	-66.0	2.3
	Other Companies	0.1	0.1	0.2	51.4	14.6
	All N.A. Companies	0.4	0.5	1.1	130.4	77.8
	All European Companies	0.1	0.1	0	-34.2	2.2
	All Asian Companies	0.2	0.1	0.1	39.5	5.3
	All Companies	0.8	0.7	1.5	97.4	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-28
1995 Top 12 PCB/MCM/Hybrid Software Companies, Korea, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Zuken-Redac	1.4	2.2	3.1	39.5	40.0
2	Mentor Graphics	0.6	0.9	0.9	8.6	12.1
3	Yokogawa Digital Computer	0.4	0.6	0.8	27.4	10.4
4	Cadence	0.9	0.6	0.7	10.2	8.9
5	Pacific Numerics	-	-	0.2	NA	3.2
6	PADS Software	0.2	0.3	0.2	-25.7	3.1
7	Accel Technologies	0.1	0.1	0.2	130.5	2.0
8	Royal Digital Centers	0.1	0.1	0.1	68.7	1.2
9	Altium*	0.1	0.1	0	-66.0	0.4
10	IBM	0.1	0.1	0	-66.0	0.4
11	Intergraph	0	0	0	14.6	0.4
12	ULTImate Technology	0	0	0	45.0	0.4
	Other Companies	0.5	0.7	1.5	125.0	19.5
	All N.A. Companies	1.9	2.0	2.4	16.8	31.0
	All European Companies	0	0	0	45.0	0.4
	All Asian Companies	1.7	2.8	3.8	33.4	49.1
	All Companies	4.1	5.6	7.7	38.3	100.0

NA = Not applicable
Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-29
1995 Top Eight PCB/MCM/Hybrid Software Companies, Singapore, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Zuken-Redac	0.5	0.5	0.7	39.5	45.4
2	Mentor Graphics	0.5	0.3	0.3	8.6	20.6
3	Accel Technologies	-	0	0.1	130.5	4.8
4	CAD-UL	0.1	0	0.1	25.6	3.9
5	Altium*	0.1	0.1	0	-66.0	2.2
6	IBM	0.1	0.1	0	-66.0	2.2
7	ULTImate Technology	0	0	0	45.0	1.7
8	PADS Software	-	0	-	-100.0	-
	Other Companies	0.2	0.2	0.4	63.7	23.3
	All N.A. Companies	0.6	0.4	0.4	-2.4	27.5
	All European Companies	0.1	0.1	0.1	-11.3	3.9
	All Asian Companies	0.5	0.5	0.7	39.5	45.4
	All Companies	1.4	1.2	1.6	26.2	100.0

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.
*Company statistics contain VAR/distributor revenue not counted in total.
Source: Dataquest (June 1996)

Table A-30
1995 Top Nine PCB/MCM/Hybrid Software Companies, Taiwan, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	0.7	0.6	0.6	8.6	34.4
2	Cadence	0.4	0.3	0.3	10.2	17.0
3	Zuken-Redac	0.2	0.2	0.2	39.5	12.6
4	Pacific Numerics	-	-	0.2	NA	9.9
5	PADS Software	0.1	0.3	0.1	-62.8	6.3
6	Accel Technologies	-	0	0.1	130.5	4.0
7	Altium*	0.1	0.1	0	-66.0	1.8
8	IBM	0.1	0.1	0	-66.0	1.8
9	Intergraph	0	0	0	14.6	1.5
	Other Companies	0.2	0.2	0.2	24.4	13.1
	All N.A. Companies	1.4	1.4	1.4	2.1	74.3
	All European Companies	-	-	-	NA	
	All Asian Companies	0.2	0.2	0.2	39.5	12.6
	All Companies	1.7	1.7	1.9	8.3	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

Table A-31
1995 Top Seven PCB/MCM/Hybrid Software Companies, Rest of Asia, All Operating Systems (Revenue in Millions of Dollars)

Rank	Company Name	1993	1994	1995	1994-95 Growth (%)	1995 Share of Market (%)
1	Mentor Graphics	1.2	1.4	1.5	8.6	79.5
2	CAD-UL	0	0	0.1	166.0	3.5
3	Intergraph	0.1	0	0.1	14.6	3.0
4	Cadence	0.1	0	0	10.2	2.5
5	Altium*	0.1	0.2	0	-91.9	0.8
6	IBM	0.1	0.2	0	-91.9	0.8
7	PADS Software	-	0	-	-100.0	-
	Other Companies	0.2	0.2	0.2	1.6	13.4
	All N.A. Companies	1.5	1.6	1.6	-3.8	84.7
	All European Companies	0	0	0	43.9	1.9
	All Asian Companies	-	-	-	NA	
	All Companies	1.7	1.9	1.9	-2.5	100.0

NA = Not applicable

Note: Vendor data includes OEM revenue, so sum of vendors is greater than total.

*Company statistics contain VAR/distributor revenue not counted in total.

Source: Dataquest (June 1996)

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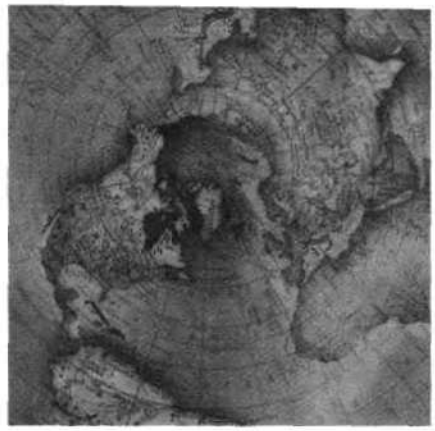

Dataquest

1995 Electronic Design Automation Asia/Pacific Forecast Update

Market Statistics

Program: Electronic Design Automation Asia/Pacific
Product Code: CEDA-AP-MS-9602
Publication Date: September 30, 1996
Filing: Market Statistics

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Note: All tables show estimated data.

Chapter 1
1995 Electronic Design Automation Asia/Pacific Forecast Update

About This Document

This document contains Dataquest's detailed forecast information on the mechanical CAD/CAM/CAE markets at the country level. This report is meant to supplement your worldwide mechanical CAD/CAM/CAE forecast book by providing mechanical CAD/CAM/CAE forecast detail for Asia/Pacific countries.

Although Dataquest does not forecast currency exchange rates, we do forecast with the best information available. The exchange rate is calculated as the simple arithmetic mean of the 12 average monthly rates for each country. For the purpose of this forecast, Dataquest assumes the July exchange rate will remain stable in the future (see Tables 1 and 2).

Additional market statistics publications for Dataquest's CAD/CAM/CAE and GIS services for 1996 are as follows:

Dataquest's 1995 Market Share document (published as CAEC-WW-MS-9601, CEDA-WW-MS-9601, and CMEC-WW-MS-9601) was sent to our clients in March.

Dataquest's 1995 forecast documents were released in May (published as CAEC-WW-MS-9602, CEDA-WW-MS-9602, and CMEC-WW-MS-9602).

Dataquest's 1995 market share data was verified, updated, and sent to our clients in August as a Market Share Update report (published as CAEC-WW-MS-9603, CEDA-WW-MS-9603, and CMEC-WW-MS-9603). Country-level data was made available at this time.

This document is an updated forecast that has been expanded to include country-level information and in-depth analysis.

Worldwide Forecast Assumptions

The following paragraphs describe the main forces driving the CAD/CAM/CAE and GIS worldwide software forecast. See Table 3 for worldwide forecast data.

All Applications

As CAD/CAM/CAE/GIS becomes more of a replacement market, market leaders would appear to have the upper hand; the cost of switching is high. However, software that lets users get a better product to market faster, software that helps eliminate business risks will always be in demand—regardless of market share. Thus there is always an opportunity for new vendors in technical markets.

The primary trend in design software function is toward operating at a higher level of abstraction. In all applications, we have seen an evolution of focus from "electronic paper" to component modeling, and now to

Table 1
CAD/CAM/CAE and GIS Revenue Growth Comparison
(U.S. Dollars versus Local Currency for Both Europe and Japan)

	1994	1995	Forecast 2000	Growth (%) 1994-1995	CAGR (%) 1995-2000
Europe (U.S.$ Million)					
Software Revenue	1,820.18	2,161.60	3,374.47	18.8	9.3
Hardware Revenue	2,591.56	2,807.99	5,017.48	8.4	12.3
Service Revenue	1,141.83	1,274.02	1,553.54	11.6	4.0
Total Factory Revenue	5,553.57	6,243.61	9,945.49	12.4	9.8
ECU/U.S.$ Exchange Rate*	0.84	0.77	0.80	-8.6	0.7
Europe (ECU Million)					
Software Revenue	1,535.50	1,666.38	2,691.40	8.5	10.1
Hardware Revenue	2,186.24	2,164.68	4,001.82	-1.0	13.1
Service Revenue	963.25	982.14	1,239.07	2.0	4.8
Total Factory Revenue	4,684.99	4,813.20	7,932.28	2.7	10.5
Japan (U.S.$ Million)					
Software Revenue	1,335.78	1,521.57	2,680.91	13.9	12.0
Hardware Revenue	2,143.29	2,286.92	4,063.64	6.7	12.2
Service Revenue	925.74	1,044.46	1,478.93	12.8	7.2
Total Factory Revenue	4,404.81	4,852.95	8,223.49	10.2	11.1
Japan/U.S.$ Exchange Rate*	110.85	93.90	105.94	-15.3	2.4
Japan (Yen Million)					
Software Revenue	148,071.13	142,875.66	284,015.37	-3.5	14.7
Hardware Revenue	237,583.90	214,741.36	430,502.52	-9.6	14.9
Service Revenue	102,618.14	98,074.81	156,678.33	-4.4	9.8
Total Factory Revenue	488,273.16	455,691.83	871,196.22	-6.7	13.8
North America (U.S.$ Million)					
Software Revenue	1,915.91	2,272.72	4,456.45	18.6	14.4
Hardware Revenue	2,482.33	2,776.43	6,289.30	11.8	17.8
Service Revenue	1,171.94	1,385.61	2,301.71	18.2	10.7
Total Factory Revenue	5,570.18	6,434.76	13,047.45	15.5	15.2
Worldwide (U.S.$ Million)					
Software Revenue	5,415.60	6,420.61	11,855.56	18.6	13.0
Hardware Revenue	7,667.54	8,418.59	17,092.16	9.8	15.2
Service Revenue	3,451.56	3,971.80	5,966.89	15.1	8.5
Total Factory Revenue	16,534.69	18,811.00	34,914.60	13.8	13.2

*Assuming a stable currency, the 2000 exchange rate is March 1996 exchange rate.
Source: Dataquest (March 1996)

Table 2
Foreign Currency per U.S. Dollar

		Actual			Current				Year-to-Year Change (%)					
Country	Currency	1991	1992	1993	1994	1995	1996	1997	1991-1992	1992-1993	1993-1994	1994-1995	1995-1996	1996-1997
Austria	Schilling	11.67	10.95	11.65	11.40	10.06	10.55	10.58	-6.17	6.4	-2.1	-11.8	4.9	0.3
Belgium	Franc	34.13	32.02	34.67	33.66	29.42	30.84	30.95	-6.18	8.3	-2.9	-12.6	4.8	0.4
Denmark	Krone	6.39	6.02	6.49	6.35	5.59	5.80	5.80	-5.79	7.8	-2.2	-12.0	3.8	0
Finland	Markka	4.04	4.45	5.73	5.21	4.37	4.60	4.58	10.15	28.8	-9.1	-16.1	5.3	-0.4
France	Franc	5.64	5.27	5.67	5.54	4.97	5.09	5.09	-6.56	7.6	-2.3	-10.3	2.4	0
Germany	D-Mark	1.66	1.56	1.66	1.62	1.43	1.50	1.50	-6.02	6.4	-2.4	-11.7	4.9	0
Italy	Lira	1,238.93	1,227.75	1,577.85	1,609.34	1,628.21	1,545.31	1,526.82	-0.90	28.5	2.0	1.2	-5.1	-1.2
Netherlands	Guilder	1.87	1.75	1.86	1.82	1.60	1.68	1.69	-6.42	6.3	-2.2	-12.1	5.0	0.6
Norway	Krone	6.49	6.18	7.11	7.04	6.33	6.46	6.45	-4.78	15.0	-1.0	-10.1	2.1	-0.2
Spain	Peseta	103.81	101.90	127.87	133.48	124.40	126.29	126.96	-1.84	25.5	4.4	-6.8	1.5	0.5
Sweden	Krona	6.04	5.81	7.82	7.70	7.14	6.70	6.64	-3.81	34.6	-1.5	-7.3	-6.2	-0.9
Switzerland	Franc	1.43	1.40	1.48	1.37	1.18	1.22	1.23	-2.10	5.7	-7.4	-13.9	3.4	0.8
United Kingdom	Pound	0.57	0.57	0.67	0.65	0.63	0.65	0.64	0	17.5	-3.0	-3.1	3.9	-2.3
Europe Average	ECU	0.81	0.77	0.86	0.84	0.77	0.80	0.80	-4.86	11.4	-1.5	-8.7	3.6	0
China	Renminbi	5.33	5.51	5.76	8.54	8.35	8.34	8.34	3.38	4.5	48.3	-2.2	-0.1	0
Hong Kong	Dollar	7.77	7.74	7.74	7.73	7.74	7.74	7.74	-0.39	0	-0.1	0.1	0	0
Japan	Yen	134.59	126.34	110.85	101.56	93.90	107.93	109.19	-6.13	-12.3	-8.4	-7.5	14.9	1.2
Korea	Won	730.67	782.41	799.42	805.80	770.57	798.87	813.03	7.08	2.2	0.8	-4.4	3.7	1.8
Singapore	Dollar	1.73	1.63	1.62	1.53	1.43	1.41	1.42	-5.78	-0.9	-5.3	-6.5	-1.4	0.7
Taiwan	Dollar	26.49	24.93	26.15	26.45	26.48	27.50	27.57	-5.89	4.9	1.1	0.1	3.9	0.3

Source: Dataquest (March 1996)

system modeling. The eventual goal is the ability to fully simulate, evaluate, redesign, and test the design inside the computer prior to manufacture. At the same time, increased computing power is allowing the nature of design to evolve to include constituencies in manufacturing, product support, and from users themselves. Thus, the engineering process is being expanded to include input from a broader base.

At the same time, the nature of design data itself is expanding from a focus on geometry to include multiple data types—making the challenge of system modeling even more complex. Also, the World Wide Web holds the potential to expand the nature of collaborative design, by harnessing the joint power of anticipated increases in both computing power and communications bandwidth. Thus, there is little limit to the problems that design or GIS software can tackle. The primary challenge will continue to be developing robust, leading-edge software ahead of competitors. During the forecast period we anticipate significant, but not revolutionary, advances in the ability of the existing programmer pool to produce new software.

Mechanical Forecast Assumptions

New Interest in Mechanical CAD Technology

In 1995, we saw a mix of replacement business and new purchases for mechanical CAD technology, particularly in Europe and North America. Growth is picking up in nontraditional industries (those industries outside of aerospace, automotive, and industrial machinery). We expect this trend to continue, as mechanical modeling, analysis, design, and simulation software become more user-friendly. Closely linked to the use of mechanical CAD in new arenas is the availability of software on lower-cost platforms and the potential use of object technology to create customized industry- or application-specific solutions.

The product data management market has clearly found a worldwide interest. Within the past year, we have seen pilot programs move to full-scale production, support for new client platforms (Windows NT, Windows), integration with manufacturing resource planning (MRP) systems, and an emergence of parts/component management software. Product data management will be one of the significant drivers of the mechanical CAD market through 2000.

Growth in Asia/Pacific

The Asia/Pacific region is being fueled by CAD investments from local governments, multinational companies, and local initiatives (such as Indonesia's IPTN). Most of the sales to date are UNIX-based, but some of the future growth is expected to shift to NT.

Ground Shifts in Japan

Mechanical CAD/CAM/CAE growth in Japan is expected to undergo a significant shift in platform usage over our forecast period. The UNIX platform dominates the mechanical sector in Japan, despite the fact that the Japanese mechanical market still places a heavy emphasis on 2-D

drafting instead of 3-D/solid modeling. We expect this drafting orientation to persist, and over next five years we anticipate a significant shift to more Windows NT-based systems at the expense of UNIX. This shift will not begin in earnest until 1997, when more NT-based applications are more widely available in Japan.

Windows NT

As of today, not all of the major mechanical CAD vendors have ported their products to the Windows NT platform. The lack of availability of Windows NT versions of some of the market-share-leading mechanical CAD packages, coupled with the fact that Europe has just completed its five-year investment cycle in mechanical CAD software, will mean that Windows NT will not begin to impact UNIX-based sales for at least a few more years.

AEC Forecast Assumptions

The Impact of Windows NT

Intergraph's shift to Windows NT has initiated the collapse of UNIX sales in North America, a trend expected to increase broadly in this cost-conscious application. At the same time, we expect growth in Windows NT from DOS-based users who find Windows 95 and successors less than reliable. The primary factor holding up growth in the large installed base of DOS users is their reluctance to buy the new hardware required for either Windows 95 or Windows NT.

The factors that should contribute to the long-term expansion of the AEC CAD industry are noted in the following sections.

CAD Is Becoming a Business Requirement

Large design firms are growing at the expense of smaller firms. These large end users increasingly require their employees and suppliers to adopt automation tools in the design and construction process. Smaller design firms must increasingly buy CAD systems or risk being dropped from consideration as a partner.

CAD purchases are increasingly justified as a competitive advantage in both sales and design reviews. Electronic design data is also required downstream by the designer's client—from the federal government down to the small commercial developer. Also, a significant pool of untapped users still exists. The relatively low market penetration of AEC CAD systems should allow steady worldwide growth during the next five years despite constant volatility in demand for the buildings and infrastructure to be designed.

New Features in AEC CAD Products Are Achievable

Better, lower-cost visualization tools will be in increasing demand as sales and communication tools. Data and database functions (versus graphics functions) are increasing in importance in AEC design systems, creating opportunities to sell users significant new functionality. Some vendors will create products that foster communications in the entire

design, construction, and maintenance process—products that will increase the payoff in CAD investments.

The three trends that will inhibit growth in the AEC CAD industry are noted in the following sections.

Design Is Only Part of the Problem

AEC's one-design-one-build structure means CAD provides fewer economic benefits to these users than does the one-design-build-many structure of manufacturing. Construction, which is essentially a prototype build, is fraught with uncertainties and delays that are not well-addressed by AEC systems as they exist today. Design tools can only thrive in the AEC structure when they support more of the entire business problem. Based on Autodesk's increased commitment to progress in this arena, we have increased our forecast modestly; commitment to and cooperation on the problem from multiple vendors will allow us to increase the forecast growth rate further.

Poor Cooperation among Users

Users are poorly organized to take advantage of improved products, partly because of competition between engineering constructors and partly because designs are often split among several different companies representing different and competing aspects of the design process. New approaches to the design and construction process are appearing, allowing users to take full advantage of CAD tools. Still, many users in AEC will need to be shown leadership in working together, both from the very large, most competitive users, and from CAD vendors themselves.

Downturn in Germany

The German construction industry, which has been the driving force behind the high growth of the recent years, has come to an abrupt halt. Although other regions such as Italy are investing, Germany plays such a dominant role that it will drag down the overall European growth for AEC. The applications that are still growing even in Germany are facilities design/management as these are not dependent on the construction industry.

GIS/Mapping Forecast Assumptions

The Impact of Windows NT

Intergraph's move to Windows NT at the expense of UNIX will quickly make PC-based operating systems the dominant revenue stream in North America. In the long term, the GIS UNIX market is highly subject to erosion by Windows NT because of the appeal of better integration of GIS and Windows-based productivity tools, an appealing prospect to many GIS users.

The factors that should contribute to the long-term expansion of the GIS market are noted in the following sections.

"Open GIS"

The thrust of the Open GIS Foundation has been to allow some fresh air into a market that was getting a bit inbred. The nature of GIS data is

under greater scrutiny, and several vendors are embarking on different, creative directions. Ultimately, much of "spatial analysis" will be embedded into other applications, rather than known as a GIS. Nonetheless, a fresh approach to spatial analysis is creating new opportunities for more useful solutions in traditional GIS environments.

Abundant Supply of Prospective Buyers

Penetration is still moderately low among core users. Bread-and-butter prospects in government and utilities are charged with maintaining information on land and assets in perpetuity. Many of these prospective buyers are still using paper maps, which will degrade over time, or have only entry-level systems in terms of value delivered. This creates a certain inevitability to moving from paper maps computer-based models.

New Technologies Will Drive Growth

Faster, cheaper computers will be continually leveraged to support new software products. Widespread computer industry developments in open, distributed systems supporting high-speed networking will make it possible for GIS technology to broadly expand the user base. Lower cost, higher resolution satellite imagery holds the potential to drive another explosion in GIS market growth among users who cannot afford aerial photography. Advances in aerial photography, global positioning systems (GPSs), and laser range finders are making it possible to create GISs that are significantly cheaper, more accurate, and more complete than existing paper maps, giving experienced users some compelling reasons to reinvest. Portable and pen-based computers are bringing GIS to new users in field operations. Finally, database companies themselves are gaining a better understanding of spatial analysis, a key factor in spreading use of GIS systems more broadly.

Data Will Drive Growth

The GIS business market is driving high growth on PCs. However, we see a wide band of uncertainty surrounding the clearly growing revenue opportunity from new applications. Several new applications in GIS are destined to become a relatively low revenue-producing feature in another software program (and market), rather than a standalone product in the GIS market. At the same time, data is increasing in value relative to software in this low-end market.

GIS has attained a certain indispensability, particularly among federal users and in utilities. As a result, users are beginning to expect to share the data that lies in their various GIS systems. Within three years, we expect data to be readily exchangeable across different systems. At that point, shareable data will help drive market growth.

Several factors seriously constraining the long-term expansion of the GIS market are noted in the following sections.

High Cost of Entry Remains a Barrier

There will remain an uncertain, but certainly high, cost of creating a working GIS system in traditional environments. No magic will emerge to create a low-cost, meaningful data set for mainstream customers in

government and utilities. Data conversion will remain costly because the significant cost of correcting prior errors and omissions on paper maps is inevitably bundled into the cost of "conversion."

Price Pressures Inhibit Growth

Price pressure will hold down total revenue. Innovation is the only way to maintain prices in any software industry, and GIS vendors will struggle in their attempt to create compelling new applications and improved investment payoff for customers.

Electronic Design Automation Forecast Assumptions

The EDA software market grew 17.5 percent in 1995. Over the next five years, growth will continue to be fueled by continuing increasing design complexity and ever-higher speeds. The semiconductor downturn is a fact of life. Although many people expect a similar downturn in EDA sales, this is not the case. Semiconductor downturns, an indication of an electronic hardware downturn, actually increase EDA sales as companies design their way out of the recession. The EDA market typically sees its downturn three years later. Dataquest therefore predicts growth to drop off—to about 10 percent in 1999.

Electronic CAE

Design complexity is forcing a large-scale swap: Gate-level users are swapping up to register-transfer level (RTL) while RTL users are swapping up to electronic-system level (ESL) tools. RTL tools are beginning to appear on Windows NT, competing with UNIX-based tools, while the ESL tools will remain UNIX-based. The second wave, those FPGA/CPLD designers moving up to the RTL, are starting to make an impact on the numbers.

IC Layout

Final results show the IC layout market growing at 29.6 percent—a little lower that the preliminary data, but strong nonetheless. Design complexity and high speed are forcing replacement of obsolete tools, driving this high growth. This is primarily a replacement market of very high-cost tools and very few players. The ensuing frenzy for market share is the result. The few PC-based tools in this market are being replaced by UNIX-class tools in North America, and Windows NT will not be a factor in this market. In fact, this is the market that is demanding a "standard" 64-bit operating system. If UNIX repeats its 32-bit performance, these guys could wait for a 64-bit Windows NT.

PCB/MCM/Hybrid

The printed circuit board (PCB) market grew 4.7 percent in 1995. The swap out of old tools continues for the second year. The most significant shift has been the acceptance of Windows NT as the operating system of choice in the PCB design world. It will not happen overnight, as swap out in this segment is slower than in CAE and IC layout, but it will happen.

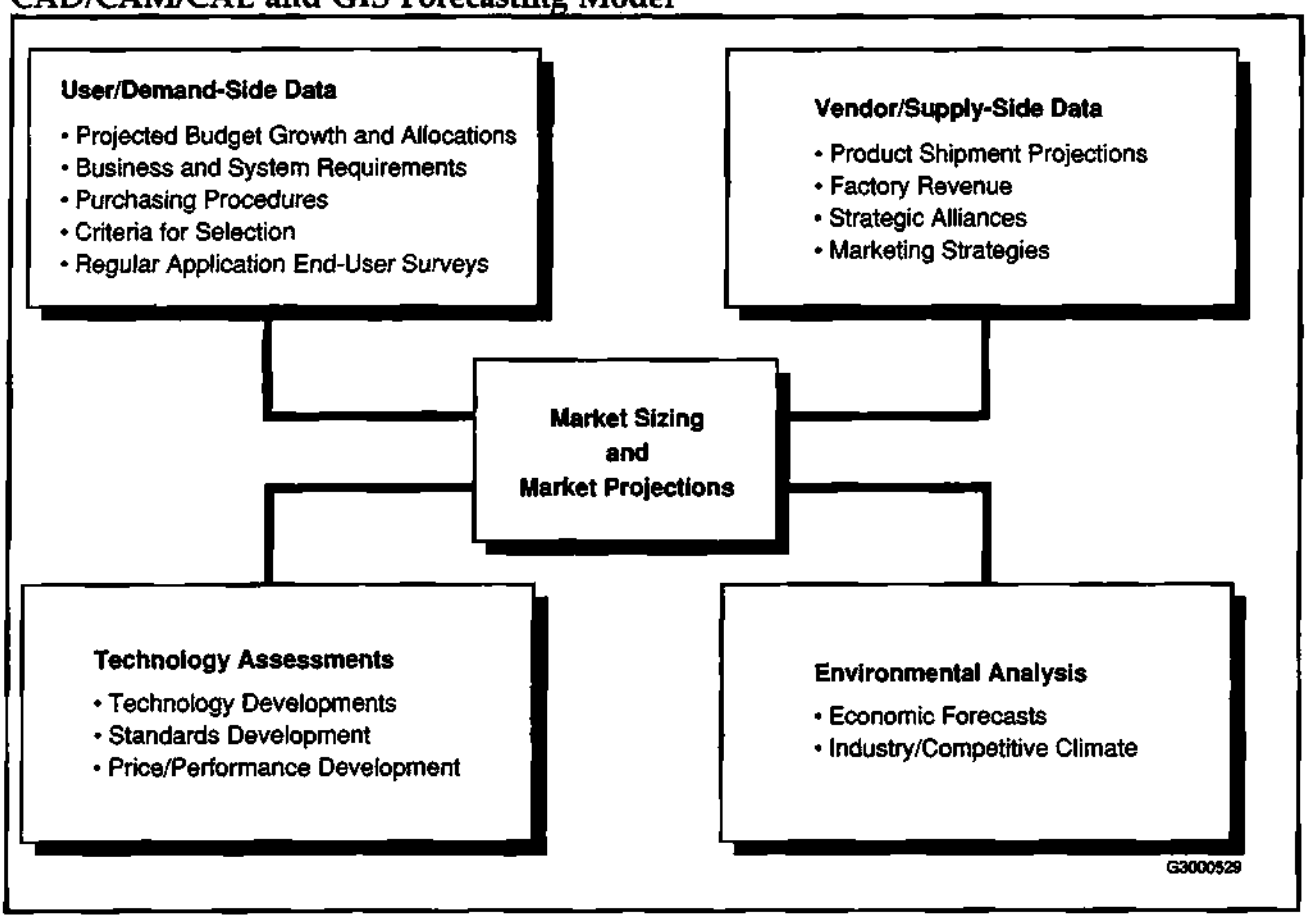
Forecast Methodology

Fundamental to the way Dataquest conducts its research is the underlying philosophy that the best data and analyses come from a well-balanced program. This program includes the following: balance between primary and secondary collection techniques; balance between supply-side and demand-side analysis; balance between focused, industry-specific research and coordinated, "big-picture" analysis aided by integration of data from the more than 25 separate high-technology industries Dataquest covers; and balance between the perspectives of experienced industry professionals and rigorous, disciplined techniques of seasoned market researchers.

Dataquest also analyzes trends in the macro environment, which can have major influences on both supply-side and demand-side forecasting. In addition to demographics, analysts look at gross national product (GNP) growth, interest rate fluctuation, business expectations, and capital spending plans. In the geopolitical arena, the group looks at trade issues, political stability or lack thereof, tariffs, nontariff barriers, and such factors as the effect on Europe of the events of 1995.

Figure 1 shows the CAD/CAM/CAE and GIS forecasting model. The overall forecasting process uses a combination of techniques such as

Figure 1
CAD/CAM/CAE and GIS Forecasting Model



Source: Dataquest (May 1996)

time series and technological modeling. Market estimates and forecasts are derived using the following research techniques:

- Segment forecasting—Individual forecasts are derived for each application segment tracked by the CAD/CAM/CAE and GIS group. Specifically, each application, segmented by region and platform, is forecast and rolled up. In this way, each application segment incorporates its own set of unique assumptions.
- Demand-based analysis—Market growth is tracked and forecast in terms of the present and anticipated demand of current and future users. This requires the development of a total available market model and a satisfied available market figure to assess the levels of penetration accurately. Dataquest analysts also factor in the acceptance or ability for users to consume new technology.
- Capacity-based analysis—This method involves identifying future shipment volume constraints. These constraints, or "ceilings," can be the result of component availability, manufacturing capacity, or distribution capacity. In any case, capacity limitations are capable of keeping shipments below the demand level.

Segmentation Definitions

Operating Systems

The following defines the operating systems:

- UNIX—UNIX includes all UNIX variants and older workstation operating systems.
- Host—Host includes minicomputer and mainframe operating systems in which external workstations' functions are dependent on a host computer.
- Windows NT—Windows NT is the Microsoft operating system.
- PC—PC includes DOS, Windows, Windows 95, OS/2, and Apple operating systems.

Line Items

Line item definitions are as follows:

- Average selling price (ASP) is defined as the average price of a product, inclusive of any discounts.
- CPU revenue is the portion of revenue derived from a system sale that is related to the value of the CPU.
- CPU shipment is defined as the number of CPUs delivered.
- CPU installed base is defined as the total number of CPUs in active, day-to-day use.
- Unit shipment is defined as the number of products delivered (that is, seats).

- Seats are defined as the number of possible simultaneous users.
- Installed seats are defined as the total number of seats in active, day-to-day use.
- Hardware revenue is defined as the sum of the revenue from the hardware system components: CPU revenue, terminal revenue, and peripherals revenue.
- Peripherals revenue is defined as the value of all the peripherals from turnkey sale. (Peripherals in this category typically are input and output devices.)
- Terminal revenue is defined as revenue derived from the sale of terminals used to graphically create, analyze, or manipulate designs. The term is applicable only to the host systems.
- Software revenue is revenue derived from the sale of application software.
- Service revenue is defined as revenue derived from the service and support of CAD/CAM/CAE or GIS systems. Service is followed as software service and hardware service.
- Total factory revenue is defined as the amount of money received for goods measured in U.S. dollars and is the sum of hardware, software, and service revenue.

Table 3
CAD/CAM/CAE/GIS Software History and Forecast
Top-Level Worldwide Forecast, All Applications, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue (U.S.$ Million)									
Worldwide, All Operating Systems	4,881	5,416	6,421	7,446	8,419	9,500	10,664	11,856	13.0
Worldwide									
UNIX	3,371	3,815	4,377	4,901	5,351	5,751	6,181	6,607	8.6
Windows NT	5	115	381	724	1,087	1,595	2,160	2,762	48.6
Personal Computer	1,188	1,307	1,511	1,710	1,908	2,107	2,292	2,464	10.3
Host/Proprietary	317	178	152	111	73	47	32	22	-31.9
All Operating Systems									
North America	1,749	1,916	2,273	2,684	3,096	3,548	4,006	4,456	14.4
Europe	1,598	1,820	2,162	2,385	2,605	2,855	3,105	3,374	9.3
Japan	1,234	1,336	1,522	1,773	1,948	2,164	2,429	2,681	12.0
Asia/Pacific	208	253	362	484	631	770	930	1,095	24.8
Rest of World	93	90	103	120	139	162	195	249	19.3
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		10.9	18.6	16.0	13.1	12.8	12.3	11.2	
Worldwide									
UNIX		13.2	14.7	12.0	9.2	7.5	7.5	6.9	
Windows NT		2116.0	231.4	90.1	50.1	46.7	35.4	27.9	
Personal Computer		10.0	15.6	13.2	11.6	10.4	8.8	7.5	
Host/Proprietary		-43.7	-15.0	-26.8	-34.1	-35.7	-32.6	-29.8	
All Operating Systems									
North America		9.5	18.6	18.1	15.3	14.6	12.9	11.2	
Europe		13.9	18.8	10.3	9.2	9.6	8.7	8.7	
Japan		8.3	13.9	16.5	9.9	11.1	12.2	10.4	
Asia/Pacific		22.1	42.7	33.9	30.4	22.0	20.7	17.8	
Rest of World		-3.0	14.2	16.8	15.4	16.4	20.8	27.5	

Source: Dataquest (April 1996)

Table A-1
CAD/CAM/CAE/GIS Software History and Forecast
Top-Level EDA Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue (U.S.$ Million)									
Worldwide, All Operating Systems	1,187	1,318	1,549	1,850	2,205	2,641	2,933	3,519	17.8
Worldwide									
UNIX	1,016	1,131	1,325	1,541	1,755	1,960	2,104	2,350	12.1
Windows NT	-	13	34	103	221	432	562	878	91.8
Personal Computer	168	171	188	205	228	249	267	291	9.2
Host/Proprietary	3	3	3	1	1	-	-	-	-40.1
All Operating Systems									
North America	553	606	723	881	1,047	1,232	1,371	1,601	17.2
Europe	236	250	277	304	335	366	391	428	9.1
Japan	331	392	447	514	594	735	809	984	17.1
Asia/Pacific	62	65	96	141	207	261	293	363	30.5
Rest of World	5	5	6	9	23	48	69	143	90.5
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		11.0	17.5	19.4	19.2	19.8	11.0	20.0	
Worldwide									
UNIX		11.4	17.2	16.3	13.9	11.7	7.3	11.7	
Windows NT		41,919.7	163.9	204.6	115.0	95.0	30.0	56.3	
Personal Computer		1.8	9.7	9.2	11.3	9.0	7.3	9.1	
Host/Proprietary		-10.5	-14.3	-62.6	-28.3	-33.0	-36.4	-32.4	
All Operating Systems									
North America		9.6	19.3	21.9	18.8	17.6	11.3	16.8	
Europe		6.2	10.6	9.9	10.2	9.3	6.8	9.5	
Japan		18.3	14.2	14.9	15.5	23.7	10.1	21.7	
Asia/Pacific		5.6	47.1	46.8	46.7	26.3	12.3	23.8	
Rest of World		-12.9	23.8	58.1	153.4	110.0	43.4	108.0	

Source: Dataquest (September 1996)

Table B-1
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Asia/Pacific, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	7,000	7,453	9,725	14,600	22,100	28,200	33,800	44,200	35
Seats	6,954	7,407	9,681	14,600	22,100	28,200	33,800	44,200	36
Year-to-Year Increase (%)	54	7	31	51	51	28	20	31	
Installed Base									
CPUs	19,449	24,840	32,259	43,500	61,900	84,400	107,700	133,200	33
Seats	19,727	24,960	32,236	43,400	61,800	84,300	107,600	133,100	33
Year-to-Year Increase (%)	39	27	29	35	42	36	28	24	
Revenue Data (U.S.$ Million)									
CPU Revenue	93	94	134	205	321	405	469	592	35
Terminal Revenue	1	0	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	1	1	1	1	1	28
Hardware Revenue	94	94	134	205	322	406	470	593	35
Year-to-Year Increase (%)	14	1	42	53	57	26	16	26	
Software Revenue	62	65	96	141	207	261	293	363	30
Year-to-Year Increase (%)	17	6	47	47	47	26	12	24	
Software Service	30	34	51	71	102	121	130	152	24
Hardware Service	23	20	31	45	69	83	92	111	29
Service Revenue	53	54	82	117	170	204	222	262	26
Year-to-Year Increase (%)	36	3	50	43	46	20	9	18	
Total Factory Revenue	208	214	312	463	699	871	986	1,219	31
Year-to-Year Increase (%)	20	3	46	48	51	25	13	24	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-2
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, China, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	474	415	495	800	1,100	1,400	1,700	2,300	36
Seats	451	409	490	800	1,100	1,400	1,700	2,300	36
Year-to-Year Increase (%)	23	-9	20	54	47	31	20	33	
Installed Base									
CPUs	1,195	1,502	1,857	2,400	3,200	4,300	5,400	6,700	29
Seats	1,224	1,506	1,841	2,400	3,200	4,300	5,400	6,700	29
Year-to-Year Increase (%)	41	23	22	29	36	33	26	24	
Revenue Data (U.S.$ Million)									
CPU Revenue	7	4	6	9	13	17	20	26	34
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	39
Hardware Revenue	7	4	6	9	13	17	20	26	34
Year-to-Year Increase (%)	7	-39	36	46	55	30	17	28	
Software Revenue	4	3	4	6	9	12	13	17	32
Year-to-Year Increase (%)	-11	-22	43	47	45	32	13	27	
Software Service	2	2	3	4	6	7	8	9	26
Hardware Service	2	1	1	2	3	3	4	5	30
Service Revenue	3	3	4	6	9	11	12	14	27
Year-to-Year Increase (%)	37	-15	52	41	45	24	10	21	
Total Factory Revenue	14	10	14	21	31	39	45	57	32
Year-to-Year Increase (%)	7	-29	43	45	49	29	14	26	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-3
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Hong Kong, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	419	405	588	800	1,200	1,700	2,200	3,200	40
Seats	414	397	581	800	1,200	1,700	2,200	3,200	40
Year-to-Year Increase (%)	39	-4	46	38	50	45	26	44	
Installed Base									
CPUs	1,565	1,780	2,168	2,700	3,600	4,900	6,200	8,100	30
Seats	1,596	1,790	2,160	2,700	3,600	4,900	6,200	8,100	30
Year-to-Year Increase (%)	21	12	21	24	34	36	27	30	
Revenue Data (U.S.$ Million)									
CPU Revenue	5	4	5	6	10	15	18	25	38
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	61
Hardware Revenue	5	4	5	6	10	15	18	25	38
Year-to-Year Increase (%)	-22	-22	30	30	60	43	20	40	
Software Revenue	3	2	4	5	9	14	17	25	46
Year-to-Year Increase (%)	-22	-15	54	46	59	59	22	49	
Software Service	1	1	2	3	5	7	8	11	37
Hardware Service	1	1	1	1	2	2	3	4	31
Service Revenue	3	2	3	4	6	9	11	15	35
Year-to-Year Increase (%)	16	-12	44	33	52	41	16	38	
Total Factory Revenue	10	8	12	16	25	38	45	65	40
Year-to-Year Increase (%)	-15	-17	41	36	58	48	20	43	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-4
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Korea, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	2,564	2,886	3,570	5,300	7,800	9,800	11,500	14,900	33
Seats	2,550	2,872	3,558	5,300	7,800	9,800	11,500	14,900	33
Year-to-Year Increase (%)	67	13	24	48	47	26	18	29	
Installed Base									
CPUs	6,015	8,458	11,502	15,900	22,600	30,500	38,300	46,600	32
Seats	6,064	8,469	11,481	15,800	22,500	30,500	38,300	46,600	32
Year-to-Year Increase (%)	58	40	36	38	42	35	26	22	
Revenue Data (U.S.$ Million)									
CPU Revenue	41	45	57	85	129	164	191	244	34
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	1	1	16
Hardware Revenue	42	45	57	85	130	165	191	244	34
Year-to-Year Increase (%)	31	9	26	48	52	27	16	28	
Software Revenue	28	31	41	58	83	104	117	145	29
Year-to-Year Increase (%)	35	13	31	41	42	26	12	24	
Software Service	13	16	22	30	42	50	53	62	23
Hardware Service	11	10	13	19	28	34	38	47	28
Service Revenue	23	26	35	49	70	84	91	109	25
Year-to-Year Increase (%)	65	12	35	39	43	21	9	19	
Total Factory Revenue	93	103	134	192	282	353	400	498	30
Year-to-Year Increase (%)	39	11	30	44	47	25	13	25	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-5
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Singapore, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	672	527	633	900	1,200	1,600	1,900	2,500	32
Seats	664	524	631	900	1,200	1,600	1,900	2,500	32
Year-to-Year Increase (%)	31	-21	20	37	43	26	23	31	
Installed Base									
CPUs	1,878	2,265	2,700	3,200	4,100	5,100	6,200	7,500	23
Seats	1,902	2,276	2,699	3,200	4,100	5,100	6,200	7,500	23
Year-to-Year Increase (%)	44	20	19	19	26	25	22	21	
Revenue Data (U.S.$ Million)									
CPU Revenue	7	4	5	7	11	13	15	18	29
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	0	0	0	0	0	5
Hardware Revenue	7	4	5	7	11	13	15	19	29
Year-to-Year Increase (%)	-5	-45	28	40	53	21	15	20	
Software Revenue	5	3	4	5	7	9	10	11	24
Year-to-Year Increase (%)	-8	-38	31	34	41	20	10	17	
Software Service	2	2	2	3	4	4	4	5	20
Hardware Service	2	1	1	1	2	2	3	3	23
Service Revenue	4	2	3	4	6	7	7	8	21
Year-to-Year Increase (%)	-8	-44	29	36	45	13	6	9	
Total Factory Revenue	16	9	12	16	24	29	32	38	26
Year-to-Year Increase (%)	-7	-43	29	37	47	19	11	17	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-6
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Taiwan, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1,396	1,717	2,804	4,500	7,100	8,700	10,100	12,600	35
Seats	1,398	1,703	2,792	4,500	7,100	8,700	10,100	12,600	35
Year-to-Year Increase (%)	78	22	64	62	56	23	16	25	
Installed Base									
CPUs	3,462	4,869	7,358	11,400	17,800	25,500	33,200	40,600	41
Seats	3,490	4,871	7,339	11,300	17,800	25,500	33,200	40,600	41
Year-to-Year Increase (%)	48	40	51	54	57	43	30	22	
Revenue Data (U.S.$ Million)									
CPU Revenue	20	26	48	79	128	158	182	224	36
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	48
Hardware Revenue	20	26	48	79	128	158	182	224	36
Year-to-Year Increase (%)	12	29	88	65	62	23	15	23	
Software Revenue	14	18	34	53	80	98	109	131	31
Year-to-Year Increase (%)	25	26	93	57	51	23	11	20	
Software Service	7	9	16	24	34	40	43	49	25
Hardware Service	5	6	12	18	29	34	37	44	31
Service Revenue	12	14	28	42	63	74	80	93	27
Year-to-Year Increase (%)	44	20	94	52	49	18	8	16	
Total Factory Revenue	46	57	110	175	271	331	371	448	32
Year-to-Year Increase (%)	23	26	91	59	55	22	12	21	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-7
CAD/CAM/CAE/GIS Software History and Forecast
Detail EDA Forecast, Rest of Asia, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1,475	1,502	1,634	2,400	3,700	4,900	6,400	8,800	40
Seats	1,478	1,500	1,629	2,400	3,700	4,900	6,400	8,800	40
Year-to-Year Increase (%)	44	2	9	48	54	34	28	38	
Installed Base									
CPUs	5,334	5,966	6,673	8,000	10,600	14,100	18,300	23,600	29
Seats	5,451	6,048	6,715	8,000	10,600	14,100	18,300	23,600	29
Year-to-Year Increase (%)	22	11	11	19	33	33	30	29	
Revenue Data (U.S.$ Million)									
CPU Revenue	13	11	13	18	29	37	44	56	35
Terminal Revenue	0	0	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	70
Hardware Revenue	13	11	13	18	29	37	44	56	35
Year-to-Year Increase (%)	6	-14	13	45	60	27	19	27	
Software Revenue	9	8	9	13	19	24	28	34	30
Year-to-Year Increase (%)	11	-9	16	40	48	27	13	23	
Software Service	5	5	6	8	11	13	14	16	22
Hardware Service	3	2	2	3	5	6	7	8	28
Service Revenue	8	7	8	11	16	19	21	24	24
Year-to-Year Increase (%)	4	-13	25	34	47	19	8	15	
Total Factory Revenue	29	26	30	43	65	81	93	114	30
Year-to-Year Increase (%)	7	-12	17	41	53	25	14	23	

NA = Not applicable

Source: Dataquest (September 1996)

Table A-2
CAD/CAM/CAE/GIS Software History and Forecast
Top-Level ECAE Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue (U.S.$ Million)									
Worldwide, All Operating Systems	767	861	1,020	1,217	1,455	1,750	1,936	2,319	17.9
Worldwide									
UNIX	642	724	853	986	1,108	1,203	1,271	1,368	9.9
Windows NT	-	5	18	65	158	338	438	701	107.9
Personal Computer	123	131	148	166	189	209	226	250	11.1
Host/Proprietary	2	2	2	-	-	-	-	-	-42.8
All Operating Systems									
North America	406	445	530	623	716	838	922	1,065	15.0
Europe	164	180	197	219	244	270	290	321	10.2
Japan	156	195	228	272	325	412	454	544	19.0
Asia/Pacific	38	38	60	96	149	186	207	253	33.2
Rest of World	4	3	4	7	20	44	64	136	101.5
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		12.2	18.5	19.3	19.6	20.2	10.7	19.8	
Worldwide									
UNIX		12.8	17.8	15.6	12.4	8.5	5.7	7.6	
Windows NT		15,329.6	283.6	258.0	144.3	114.2	29.6	59.9	
Personal Computer		5.8	13.0	12.7	13.5	10.4	8.5	10.5	
Host/Proprietary		-0.8	-22.6	-86.9	-25.7	-18.1	-16.3	-8.2	
All Operating Systems									
North America		9.6	19.1	17.7	14.9	17.0	9.9	15.6	
Europe		9.6	9.9	10.7	11.8	10.4	7.5	10.5	
Japan		25.3	17.0	19.3	19.5	26.5	10.3	19.8	
Asia/Pacific		1.3	57.0	59.0	55.6	24.4	11.2	22.4	
Rest of World		-21.6	28.3	63.3	192.4	123.5	45.5	114.0	

Source: Dataquest (September 1996)

Table B-8
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Asia/Pacific, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	4,858	4,880	6,782	11,000	17,400	22,400	27,100	36,100	40
Seats	4,828	4,871	6,772	11,000	17,400	22,400	27,100	36,100	40
Year-to-Year Increase (%)	68	1	39	62	59	28	21	33	
Installed Base									
CPUs	12,368	15,998	21,355	30,100	45,100	63,600	83,300	105,200	38
Seats	12,416	16,008	21,330	30,000	45,000	63,600	83,200	105,200	38
Year-to-Year Increase (%)	48	29	33	41	50	41	31	26	
Revenue Data (U.S.$ Million)									
CPU Revenue	57	55	84	142	236	290	334	414	37
Terminal Revenue	0	0	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	1	87
Hardware Revenue	57	55	84	142	236	291	334	415	38
Year-to-Year Increase (%)	18	-3	53	68	66	23	15	24	
Software Revenue	38	38	60	96	149	186	207	253	33
Year-to-Year Increase (%)	24	1	57	59	56	24	11	22	
Software Service	17	20	31	47	71	83	87	100	27
Hardware Service	14	11	19	31	50	59	65	76	32
Service Revenue	31	31	50	78	121	142	152	176	29
Year-to-Year Increase (%)	32	1	61	56	55	17	7	16	
Total Factory Revenue	126	125	195	316	507	618	693	844	34
Year-to-Year Increase (%)	23	-1	56	62	60	22	12	22	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-9
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, China, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	313	243	290	500	700	1,000	1,200	1,700	43
Seats	301	242	290	500	700	1,000	1,200	1,700	43
Year-to-Year Increase (%)	39	-20	20	63	58	34	23	39	
Installed Base									
CPUs	742	911	1,114	1,400	2,000	2,800	3,700	4,700	33
Seats	747	910	1,107	1,400	2,000	2,800	3,600	4,700	33
Year-to-Year Increase (%)	47	22	22	30	41	38	30	29	
Revenue Data (U.S.$ Million)									
CPU Revenue	4	2	3	5	8	10	12	15	39
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	86
Hardware Revenue	4	2	3	5	8	10	12	15	39
Year-to-Year Increase (%)	15	-44	34	66	66	27	15	28	
Software Revenue	2	2	2	3	5	7	8	11	38
Year-to-Year Increase (%)	-3	-27	39	60	58	34	12	30	
Software Service	1	1	2	2	4	4	5	5	28
Hardware Service	1	0	1	1	2	2	2	3	34
Service Revenue	2	1	2	3	5	6	7	8	30
Year-to-Year Increase (%)	40	-16	54	55	55	20	7	20	
Total Factory Revenue	8	5	7	12	19	24	27	34	36
Year-to-Year Increase (%)	14	-34	41	61	60	27	12	27	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-10
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Hong Kong, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	189	180	251	400	700	1,100	1,400	2,100	52
Seats	187	178	250	400	700	1,100	1,400	2,100	52
Year-to-Year Increase (%)	25	-5	40	60	70	59	28	49	
Installed Base									
CPUs	829	891	1,032	1,300	1,800	2,700	3,700	5,100	38
Seats	836	893	1,030	1,300	1,800	2,700	3,700	5,100	38
Year-to-Year Increase (%)	16	7	15	26	42	48	36	37	
Revenue Data (U.S.$ Million)									
CPU Revenue	2	2	2	3	6	9	11	15	48
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	87
Hardware Revenue	3	2	2	3	6	9	11	15	48
Year-to-Year Increase (%)	-23	-29	18	58	78	51	19	41	
Software Revenue	2	1	2	3	5	8	10	15	57
Year-to-Year Increase (%)	-18	-22	31	61	80	80	20	51	
Software Service	1	1	1	2	3	4	5	7	43
Hardware Service	1	0	0	1	1	2	2	2	41
Service Revenue	1	1	2	2	4	6	7	9	43
Year-to-Year Increase (%)	19	-23	36	51	68	47	14	38	
Total Factory Revenue	6	4	5	8	14	23	27	39	50
Year-to-Year Increase (%)	-14	-26	27	57	76	59	18	44	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-11
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Korea, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1,664	1,708	2,066	3,400	5,300	6,700	8,000	10,500	38
Seats	1,653	1,704	2,063	3,400	5,300	6,700	8,000	10,500	39
Year-to-Year Increase (%)	73	3	21	63	58	26	19	32	
Installed Base									
CPUs	3,644	5,092	6,836	9,600	14,200	19,800	25,400	31,600	36
Seats	3,643	5,083	6,820	9,600	14,200	19,700	25,400	31,500	36
Year-to-Year Increase (%)	67	40	34	41	48	39	28	24	
Revenue Data (U.S.$ Million)									
CPU Revenue	23	23	27	45	75	90	103	127	36
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	86
Hardware Revenue	23	23	27	45	75	91	103	127	36
Year-to-Year Increase (%)	30	0	17	68	65	21	13	24	
Software Revenue	15	16	19	30	47	57	63	76	32
Year-to-Year Increase (%)	35	4	21	59	55	22	10	21	
Software Service	6	8	11	17	25	29	30	34	25
Hardware Service	6	5	6	10	16	19	20	24	31
Service Revenue	12	13	17	27	41	47	50	58	27
Year-to-Year Increase (%)	55	14	29	56	54	15	6	15	
Total Factory Revenue	50	52	63	102	163	195	216	260	33
Year-to-Year Increase (%)	37	4	21	62	59	20	10	21	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-12
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Singapore, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	448	263	358	600	900	1,200	1,500	2,000	42
Seats	444	262	358	600	900	1,200	1,500	2,000	42
Year-to-Year Increase (%)	45	-41	36	57	58	30	27	38	
Installed Base									
CPUs	1,140	1,321	1,565	1,900	2,600	3,400	4,400	5,700	29
Seats	1,146	1,323	1,565	1,900	2,600	3,400	4,400	5,700	29
Year-to-Year Increase (%)	54	15	18	23	34	33	28	28	
Revenue Data (U.S.$ Million)									
CPU Revenue	5	2	3	5	8	10	12	15	38
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	-	-	-	-	-	-	NA
Hardware Revenue	5	2	3	5	8	10	12	15	38
Year-to-Year Increase (%)	-3	-54	29	63	67	23	18	27	
Software Revenue	3	2	2	3	5	7	7	9	33
Year-to-Year Increase (%)	-2	-50	34	53	56	24	13	24	
Software Service	2	1	1	2	3	4	4	4	24
Hardware Service	1	0	1	1	2	2	2	2	31
Service Revenue	3	1	2	3	5	5	6	7	26
Year-to-Year Increase (%)	-7	-52	39	50	54	13	8	14	
Total Factory Revenue	12	6	7	11	18	22	25	31	33
Year-to-Year Increase (%)	-4	-52	33	56	60	21	14	23	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-13
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Taiwan, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	992	1,271	2,379	4,000	6,400	7,800	9,100	11,300	37
Seats	992	1,266	2,376	4,000	6,400	7,800	9,100	11,300	37
Year-to-Year Increase (%)	130	28	88	68	60	23	16	25	
Installed Base									
CPUs	2,210	3,276	5,463	9,100	15,100	22,200	29,400	36,100	46
Seats	2,212	3,270	5,453	9,100	15,100	22,200	29,400	36,100	46
Year-to-Year Increase (%)	59	48	67	67	66	47	32	23	
Revenue Data (U.S.$ Million)									
CPU Revenue	13	18	40	69	114	138	158	193	37
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	88
Hardware Revenue	13	18	40	69	114	139	158	193	37
Year-to-Year Increase (%)	32	42	123	72	66	22	14	22	
Software Revenue	9	12	28	46	71	86	95	112	32
Year-to-Year Increase (%)	53	40	129	62	55	21	10	19	
Software Service	4	5	12	18	28	32	33	37	26
Hardware Service	3	4	10	16	25	30	33	38	32
Service Revenue	7	9	21	34	53	61	66	75	29
Year-to-Year Increase (%)	68	30	133	60	55	16	7	14	
Total Factory Revenue	28	39	89	148	237	286	319	380	34
Year-to-Year Increase (%)	46	38	127	66	60	20	12	19	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-14
CAD/CAM/CAE/GIS Software History and Forecast
Detail ECAE Forecast, Rest of Asia, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1,252	1,216	1,438	2,200	3,400	4,600	6,000	8,400	42
Seats	1,251	1,218	1,436	2,200	3,400	4,600	6,000	8,400	42
Year-to-Year Increase (%)	53	-3	18	52	57	35	30	40	
Installed Base									
CPUs	3,803	4,507	5,344	6,700	9,300	12,700	16,700	22,000	33
Seats	3,833	4,529	5,355	6,700	9,300	12,700	16,700	22,000	33
Year-to-Year Increase (%)	34	18	18	25	38	37	32	32	
Revenue Data (U.S.$ Million)									
CPU Revenue	10	8	10	15	25	32	38	49	39
Terminal Revenue	0	0	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	86
Hardware Revenue	10	8	10	15	25	32	38	49	39
Year-to-Year Increase (%)	9	-18	19	56	66	28	20	29	
Software Revenue	7	6	7	11	16	21	24	30	33
Year-to-Year Increase (%)	14	-14	22	47	55	28	14	26	
Software Service	3	3	4	6	8	10	11	13	26
Hardware Service	2	1	2	3	4	5	6	7	32
Service Revenue	6	4	6	8	13	15	17	20	28
Year-to-Year Increase (%)	-3	-20	26	46	56	19	9	17	
Total Factory Revenue	22	19	23	34	54	68	79	99	34
Year-to-Year Increase (%)	7	-17	21	51	60	26	16	26	

NA = Not applicable

Source: Dataquest (September 1996)

Table A-3
CAD/CAM/CAE/GIS Software History and Forecast
Top-Level IC Layout Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue (U.S.$ Million)									
Worldwide, All Operating Systems	175	203	263	340	428	537	624	786	24.4
Worldwide									
UNIX	172	200	258	335	423	532	618	780	24.7
Windows NT	-	-	1	1	1	1	1	1	0
Personal Computer	3	3	4	4	4	4	4	4	4.7
Host/Proprietary	-	-	-	-	-	-	-	-	NA
All Operating Systems									
North America	82	95	126	179	237	282	324	387	25.2
Europe	29	30	37	40	43	47	50	54	8.0
Japan	50	62	80	94	111	158	190	265	27.1
Asia/Pacific	14	15	20	26	35	49	58	79	31.1
Rest of World	1	1	1	1	1	1	1	2	25.4
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		15.9	29.7	29.2	25.8	25.6	16.0	26.1	
Worldwide									
UNIX		16.4	29.2	29.6	26.1	25.8	16.2	26.3	
Windows NT		NA	NA	0	0	0	0	0	
Personal Computer		-9.8	17.0	7.2	6.5	5.3	2.1	2.8	
Host/Proprietary		NA	NA	NA	NA	NA	NA	NA	
All Operating Systems									
North America		16.1	32.4	42.3	32.6	18.8	14.9	19.3	
Europe		3.2	22.5	8.9	7.6	7.9	7.4	8.1	
Japan		24.3	28.1	17.7	18.5	42.3	19.8	39.6	
Asia/Pacific		11.4	34.5	29.9	32.9	39.9	19.0	34.9	
Rest of World		-2.5	5.4	42.0	33.0	18.5	17.4	18.0	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-15
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Asia/Pacific, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	696	772	976	1,300	1,800	2,400	2,900	4,000	32
Seats	678	748	955	1,300	1,800	2,400	2,900	4,000	33
Year-to-Year Increase (%)	2	10	28	35	38	38	20	36	
Installed Base									
CPUs	2,054	2,705	3,488	4,500	6,000	8,100	10,300	12,800	30
Seats	2,041	2,665	3,425	4,500	6,000	8,100	10,200	12,800	30
Year-to-Year Increase (%)	43	31	29	30	34	35	27	25	
Revenue Data (U.S.$ Million)									
CPU Revenue	21	24	31	40	57	81	100	140	36
Terminal Revenue	0	0	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	22
Hardware Revenue	21	24	31	40	57	81	100	140	36
Year-to-Year Increase (%)	-3	11	28	31	43	42	23	40	
Software Revenue	14	15	20	26	35	49	58	79	31
Year-to-Year Increase (%)	-5	11	35	30	33	40	19	35	
Software Service	7	9	13	17	21	28	32	41	25
Hardware Service	6	6	7	9	13	18	21	28	31
Service Revenue	13	14	21	26	34	46	53	69	27
Year-to-Year Increase (%)	29	8	46	25	32	34	15	30	
Total Factory Revenue	48	53	72	93	127	177	212	288	32
Year-to-Year Increase (%)	3	11	35	29	37	39	20	36	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-16
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, China, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	50	39	52	100	100	100	200	200	33
Seats	44	37	51	100	100	100	200	200	34
Year-to-Year Increase (%)	-31	-16	36	33	42	40	22	36	
Installed Base									
CPUs	121	159	200	300	300	400	600	700	28
Seats	118	153	192	200	300	400	500	700	29
Year-to-Year Increase (%)	54	29	25	27	32	34	27	26	
Revenue Data (U.S.$ Million)									
CPU Revenue	2	1	2	2	3	4	5	8	36
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	9
Hardware Revenue	2	1	2	2	3	4	5	8	36
Year-to-Year Increase (%)	-19	-28	33	26	46	44	26	40	
Software Revenue	1	1	1	1	2	3	3	4	32
Year-to-Year Increase (%)	-35	-15	41	29	36	42	21	35	
Software Service	1	1	1	1	2	2	3	4	26
Hardware Service	0	0	0	0	1	1	1	2	31
Service Revenue	1	1	2	2	3	3	4	5	28
Year-to-Year Increase (%)	14	-13	60	23	35	36	17	29	
Total Factory Revenue	4	3	4	5	7	10	13	17	32
Year-to-Year Increase (%)	-17	-20	44	26	40	41	21	35	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-17
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Hong Kong, All Operating Systems

Hardware Shipment Data	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Shipments									
CPUs	28	28	37	0	100	100	100	100	25
Seats	27	23	33	0	100	100	100	100	29
Year-to-Year Increase (%)	-51	-16	44	27	33	32	18	34	
Installed Base									
CPUs	227	230	230	200	300	300	400	400	14
Seats	224	222	218	200	300	300	400	400	14
Year-to-Year Increase (%)	4	-1	-2	5	10	21	18	18	
Revenue Data (U.S.$ Million)									
CPU Revenue	1	1	1	1	2	2	3	4	24
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	5
Hardware Revenue	1	1	1	1	2	2	3	4	24
Year-to-Year Increase (%)	-54	15	23	-8	39	38	21	40	
Software Revenue	1	0	1	1	1	1	2	2	27
Year-to-Year Increase (%)	-55	-14	40	23	29	35	17	34	
Software Service	0	0	1	1	1	1	1	2	22
Hardware Service	0	0	0	0	0	0	1	1	21
Service Revenue	1	1	1	1	1	2	2	3	22
Year-to-Year Increase (%)	-12	7	47	11	28	30	13	29	
Total Factory Revenue	2	2	3	3	4	5	6	9	24
Year-to-Year Increase (%)	-47	5	34	5	33	34	17	35	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-18
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Korea, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	429	507	677	900	1,300	1,700	2,100	2,800	33
Seats	424	501	671	900	1,300	1,700	2,100	2,800	33
Year-to-Year Increase (%)	32	18	34	34	39	38	20	36	
Installed Base									
CPUs	972	1,438	2,046	2,800	4,000	5,500	7,100	8,900	34
Seats	970	1,428	2,030	2,800	3,900	5,500	7,000	8,900	34
Year-to-Year Increase (%)	69	47	42	39	40	39	29	26	
Revenue Data (U.S.$ Million)									
CPU Revenue	13	15	21	28	40	57	71	100	37
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	27
Hardware Revenue	13	15	21	28	40	58	71	100	37
Year-to-Year Increase (%)	23	19	36	35	44	42	24	40	
Software Revenue	9	10	14	19	25	35	41	56	31
Year-to-Year Increase (%)	22	19	42	29	34	40	19	35	
Software Service	4	5	8	10	13	17	19	24	25
Hardware Service	3	4	5	7	9	13	15	20	32
Service Revenue	8	9	13	16	22	29	34	44	28
Year-to-Year Increase (%)	46	13	52	26	33	35	16	30	
Total Factory Revenue	29	34	48	63	87	122	147	200	33
Year-to-Year Increase (%)	28	17	42	31	38	40	21	36	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-19
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Singapore, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	5	1	1	-	-	-	-	-	NA
Seats	0	-	-	-	-	-	-	-	NA
Year-to-Year Increase (%)	-98	NA		NA	NA	NA	NA	NA	NA
Installed Base									
CPUs	153	136	116	100	100	100	100	100	-12
Seats	151	132	110	100	100	100	100	100	-11
Year-to-Year Increase (%)	-2	-13	-17	-19	-24	-6	-2	-2	
Revenue Data (U.S.$ Million)									
CPU Revenue	0	0	0	-	-	-	-	-	NA
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	-	-	-	-	-	-	-	NA
Hardware Revenue	0	0	0	-	-	-	-	-	NA
Year-to-Year Increase (%)	-48	-78	5	NA	NA	NA	NA	NA	
Software Revenue	-	-	-	-	-	-	-	-	NA
Year-to-Year Increase (%)	NA		NA	NA	NA	NA	NA	NA	NA
Software Service	-	-	-	-	-	-	-	-	NA
Hardware Service	0	0	0	-	-	-	-	-	NA
Service Revenue	0	0	0	-	-	-	-	-	NA
Year-to-Year Increase (%)	1	-87	-33	NA		NA	NA	NA	NA
Total Factory Revenue	1	0	0	-	-	-	-	-	NA
Year-to-Year Increase (%)	-59	-81	-4	NA		NA	NA	NA	NA

NA = Not applicable
Source: Dataquest (September 1996)

Table B-20
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Taiwan, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	167	180	189	300	300	500	600	800	32
Seats	166	174	184	300	300	500	600	800	33
Year-to-Year Increase (%)	-5	5	6	40	34	37	18	36	
Installed Base									
CPUs	420	584	740	900	1,200	1,600	2,000	2,500	27
Seats	416	574	725	900	1,200	1,600	2,000	2,500	28
Year-to-Year Increase (%)	57	38	26	29	31	31	24	23	
Revenue Data (U.S.$ Million)									
CPU Revenue	5	6	6	8	11	16	19	27	35
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	7
Hardware Revenue	5	6	6	8	11	16	19	27	35
Year-to-Year Increase (%)	-16	13	7	33	38	41	22	40	
Software Revenue	3	4	4	5	7	9	11	15	31
Year-to-Year Increase (%)	-11	5	11	35	29	39	17	35	
Software Service	2	2	3	4	5	7	8	10	25
Hardware Service	1	1	1	2	3	3	4	5	30
Service Revenue	3	4	5	6	8	10	12	15	27
Year-to-Year Increase (%)	16	11	28	30	28	34	13	29	
Total Factory Revenue	12	13	15	19	26	35	42	57	31
Year-to-Year Increase (%)	-7	10	14	32	32	38	18	36	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-21
CAD/CAM/CAE/GIS Software History and Forecast
Detail IC Layout Forecast, Rest of Asia, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	17	16	20	0	0	0	100	100	30
Seats	16	14	17	0	0	0	100	100	34
Year-to-Year Increase (%)	-37	-16	27	34	40	39	21	36	
Installed Base									
CPUs	161	158	155	200	200	200	200	300	13
Seats	161	156	150	100	200	200	200	300	13
Year-to-Year Increase (%)	10	-3	-4	-1	5	22	20	20	
Revenue Data (U.S.$ Million)									
CPU Revenue	1	1	1	1	1	1	2	3	29
Terminal Revenue	0	0	-	-	-	-	-	-	NA
Peripheral Revenue	-	-	-	-	-	-	-	-	NA
Hardware Revenue	1	1	1	1	1	1	2	3	29
Year-to-Year Increase (%)	-35	-5	24	-1	44	43	24	40	
Software Revenue	0	0	0	0	1	1	1	1	32
Year-to-Year Increase (%)	-41	-15	42	29	34	41	20	35	
Software Service	0	0	0	0	1	1	1	1	25
Hardware Service	0	0	0	0	0	0	0	1	26
Service Revenue	0	0	1	1	1	1	1	2	26
Year-to-Year Increase (%)	9	-2	50	17	32	35	16	29	
Total Factory Revenue	1	1	2	2	3	4	4	6	28
Year-to-Year Increase (%)	-28	-7	35	12	37	40	20	35	

NA = Not applicable

Source: Dataquest (September 1996)

Table A-4
CAD/CAM/CAE/GIS Software History and Forecast
Top-Level PCB/MCM/Hybrid Forecast, Worldwide, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Software Revenue (U.S.$ Million)									
Worldwide, All Operating Systems	244	254	266	293	322	355	374	414	9.3
Worldwide									
UNIX	202	207	214	220	224	226	215	202	-1.2
Windows NT	-	8	14	37	62	92	122	176	65.0
Personal Computer	41	37	37	35	35	36	36	37	0.2
Host/Proprietary	1	1	1	1	1	-	-	-	-36.2
All Operating Systems									
North America	66	67	68	79	93	111	126	149	17.1
Europe	42	40	42	45	48	50	51	53	4.7
Japan	125	134	139	148	157	165	165	176	4.8
Asia/Pacific	10	12	15	19	22	26	28	31	15.4
Rest of World	1	1	1	2	2	3	3	5	35.1
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		3.9	4.7	10.1	10.2	10.0	5.4	10.9	
Worldwide									
UNIX		2.8	3.1	2.8	2.0	0.6	-4.8	-6.2	
Windows NT		NA	77.3	157.3	68.0	48.6	32.0	44.2	
Personal Computer		-9.3	-2.4	-4.7	1.4	1.9	1.3	1.1	
Host/Proprietary		-27.3	5.5	-19.9	-29.1	-37.5	-44.3	-46.6	
All Operating Systems									
North America		1.5	1.9	16.7	17.8	19.1	13.1	18.6	
Europe		-4.9	4.9	7.2	4.7	4.5	2.4	5.0	
Japan		7.2	3.7	6.3	6.2	4.8	0.4	6.4	
Asia/Pacific		13.7	30.8	21.0	20.4	17.4	7.7	11.1	
Rest of World		32.9	18.5	46.1	42.4	30.5	22.7	35.0	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-22
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Asia/Pacific, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	1,446	1,801	1,966	2,400	2,900	3,300	3,700	4,200	16
Seats	1,448	1,787	1,954	2,400	2,900	3,300	3,700	4,200	16
Year-to-Year Increase (%)	50	23	9	21	21	16	11	13	
Installed Base									
CPUs	5,026	6,137	7,416	8,900	10,800	12,700	14,100	15,200	15
Seats	5,270	6,287	7,481	8,900	10,800	12,600	14,100	15,200	15
Year-to-Year Increase (%)	21	19	19	19	21	17	12	8	
Revenue Data (U.S.$ Million)									
CPU Revenue	15	15	19	23	28	33	36	38	15
Terminal Revenue	1	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	1	1	1	9
Hardware Revenue	15	15	19	23	29	34	36	38	15
Year-to-Year Increase (%)	27	-1	27	20	26	17	7	5	
Software Revenue	10	12	15	19	22	26	28	31	15
Year-to-Year Increase (%)	32	14	31	21	20	17	8	11	
Software Service	5	6	7	8	9	10	11	11	10
Hardware Service	3	3	4	5	5	6	6	6	8
Service Revenue	9	9	11	12	15	16	17	17	10
Year-to-Year Increase (%)	69	2	19	15	18	12	2	1	
Total Factory Revenue	34	36	45	54	66	76	81	87	14
Year-to-Year Increase (%)	37	4	26	19	22	16	6	7	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-23
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, China, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	111	133	153	200	300	300	300	400	19
Seats	106	130	150	200	300	300	300	400	20
Year-to-Year Increase (%)	22	22	15	42	22	17	11	10	
Installed Base									
CPUs	332	432	543	700	900	1,100	1,200	1,300	19
Seats	358	444	543	700	900	1,000	1,200	1,300	19
Year-to-Year Increase (%)	26	24	22	26	27	20	14	9	
Revenue Data (U.S.$ Million)									
CPU Revenue	1	1	1	2	2	2	3	3	16
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	16
Hardware Revenue	1	1	1	2	2	2	3	3	16
Year-to-Year Increase (%)	29	-37	46	24	29	19	8	3	
Software Revenue	1	1	1	1	1	2	2	2	14
Year-to-Year Increase (%)	17	-12	57	38	19	15	3	-3	
Software Service	0	0	0	0	0	0	0	0	12
Hardware Service	0	0	0	0	0	0	0	0	13
Service Revenue	0	0	0	1	1	1	1	1	12
Year-to-Year Increase (%)	129	-17	27	29	22	14	2	-2	
Total Factory Revenue	2	2	3	3	4	5	5	5	15
Year-to-Year Increase (%)	37	-27	45	29	24	17	5	0	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-24
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Hong Kong, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	201	198	299	400	500	600	700	1,000	27
Seats	199	196	298	400	500	600	700	1,000	27
Year-to-Year Increase (%)	115	-1	52	21	30	26	23	35	
Installed Base									
CPUs	509	660	906	1,200	1,500	1,900	2,200	2,600	23
Seats	535	675	912	1,200	1,500	1,900	2,200	2,600	23
Year-to-Year Increase (%)	42	26	35	27	30	23	16	20	
Revenue Data (U.S.$ Million)									
CPU Revenue	1	1	2	2	3	3	4	6	31
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	23
Hardware Revenue	1	1	2	2	3	3	4	6	31
Year-to-Year Increase (%)	49	-33	61	24	41	29	22	40	
Software Revenue	1	1	2	2	3	4	5	8	40
Year-to-Year Increase (%)	29	-2	97	38	46	36	29	51	
Software Service	0	0	1	1	1	1	2	3	36
Hardware Service	0	0	0	0	0	0	0	0	10
Service Revenue	0	0	1	1	1	2	2	3	32
Year-to-Year Increase (%)	78	1	59	23	39	31	24	44	
Total Factory Revenue	3	2	4	5	7	9	12	17	35
Year-to-Year Increase (%)	46	-18	73	29	42	33	26	46	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-25
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Korea, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	471	671	828	1,000	1,200	1,300	1,400	1,500	13
Seats	473	667	824	1,000	1,200	1,300	1,400	1,500	13
Year-to-Year Increase (%)	89	41	24	22	19	13	7	6	
Installed Base									
CPUs	1,399	1,928	2,620	3,400	4,400	5,300	5,900	6,200	19
Seats	1,452	1,958	2,632	3,400	4,400	5,300	5,900	6,200	19
Year-to-Year Increase (%)	33	35	34	30	28	21	12	5	
Revenue Data (U.S.$ Million)									
CPU Revenue	6	7	9	12	14	16	17	17	13
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	6
Hardware Revenue	6	7	10	12	15	17	18	18	13
Year-to-Year Increase (%)	58	23	36	23	24	15	5	0	
Software Revenue	4	6	8	9	11	12	13	13	11
Year-to-Year Increase (%)	74	34	39	20	17	14	3	2	
Software Service	3	3	3	3	4	4	4	4	7
Hardware Service	1	1	2	2	3	3	3	3	8
Service Revenue	4	4	5	6	7	7	7	7	7
Year-to-Year Increase (%)	187	6	17	17	16	10	-1	-5	
Total Factory Revenue	14	17	22	27	32	36	37	37	11
Year-to-Year Increase (%)	87	21	32	20	20	13	3	0	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-26
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Singapore, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	219	263	274	300	400	400	400	500	11
Seats	219	262	273	300	400	400	400	500	11
Year-to-Year Increase (%)	25	19	4	11	16	14	8	6	
Installed Base									
CPUs	584	808	1,019	1,200	1,400	1,600	1,700	1,800	12
Seats	605	821	1,025	1,200	1,400	1,600	1,700	1,800	12
Year-to-Year Increase (%)	45	36	25	18	17	12	8	4	
Revenue Data (U.S.$ Million)									
CPU Revenue	2	2	2	2	3	3	3	3	11
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	0	0	0	0	0	0	0	5
Hardware Revenue	2	2	2	2	3	3	3	3	10
Year-to-Year Increase (%)	5	-16	26	12	22	16	5	-1	
Software Revenue	1	1	2	2	2	2	2	2	5
Year-to-Year Increase (%)	8	-9	27	9	13	12	0	-6	
Software Service	0	1	1	1	1	1	1	1	1
Hardware Service	0	0	0	0	1	1	1	1	6
Service Revenue	1	1	1	1	1	1	1	1	4
Year-to-Year Increase (%)	-14	-4	13	8	16	10	-3	-11	
Total Factory Revenue	4	4	5	5	6	7	7	7	7
Year-to-Year Increase (%)	1	-11	24	10	18	13	2	-5	

NA = Not applicable

Source: Dataquest (September 1996)

Table B-27
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Taiwan, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	238	266	236	300	300	400	400	500	16
Seats	239	263	233	300	300	400	400	500	17
Year-to-Year Increase (%)	33	10	-11	24	20	15	13	13	
Installed Base									
CPUs	831	1,009	1,155	1,300	1,500	1,700	1,900	2,000	11
Seats	862	1,026	1,160	1,300	1,500	1,700	1,800	2,000	11
Year-to-Year Increase (%)	23	19	13	13	15	12	9	6	
Revenue Data (U.S.$ Million)									
CPU Revenue	2	2	2	3	4	4	4	5	14
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	14
Hardware Revenue	2	2	2	3	4	4	4	5	14
Year-to-Year Increase (%)	-2	-8	10	16	25	16	10	5	
Software Revenue	2	2	2	2	3	3	4	4	16
Year-to-Year Increase (%)	7	-1	9	23	20	17	10	11	
Software Service	1	1	1	1	2	2	2	2	9
Hardware Service	1	0	1	1	1	1	1	1	9
Service Revenue	1	1	2	2	2	2	3	3	9
Year-to-Year Increase (%)	23	-6	18	16	17	11	3	0	
Total Factory Revenue	6	5	6	7	8	10	11	11	13
Year-to-Year Increase (%)	7	-5	12	18	21	15	8	6	

NA = Not applicable
Source: Dataquest (September 1996)

Table B-28
CAD/CAM/CAE/GIS Software History and Forecast
Detail PCB/MCM/Hybrid Forecast, Rest of Asia, All Operating Systems

	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Hardware Shipment Data									
Shipments									
CPUs	206	271	177	200	200	300	300	300	12
Seats	211	269	176	200	200	300	300	300	12
Year-to-Year Increase (%)	16	28	-35	14	21	15	8	4	
Installed Base									
CPUs	1,370	1,301	1,174	1,100	1,100	1,200	1,300	1,300	2
Seats	1,457	1,363	1,210	1,100	1,100	1,200	1,300	1,300	2
Year-to-Year Increase (%)	-1	-6	-11	-7	1	5	8	1	
Revenue Data (U.S.$ Million)									
CPU Revenue	2	2	2	2	3	4	4	4	12
Terminal Revenue	0	-	-	-	-	-	-	-	NA
Peripheral Revenue	0	0	0	0	0	0	0	0	42
Hardware Revenue	2	2	2	2	3	4	4	4	12
Year-to-Year Increase (%)	12	2	-7	13	26	17	6	0	
Software Revenue	2	2	2	2	2	3	3	3	9
Year-to-Year Increase (%)	18	14	-6	12	18	16	4	-1	
Software Service	1	1	2	2	2	2	2	2	4
Hardware Service	1	0	1	1	1	1	1	1	10
Service Revenue	2	2	2	2	3	3	3	3	6
Year-to-Year Increase (%)	36	9	18	8	17	11	0	-6	
Total Factory Revenue	6	6	6	7	8	9	10	9	9
Year-to-Year Increase (%)	20	8	0	11	21	15	4	-2	

NA = Not applicable

Source: Dataquest (September 1996)

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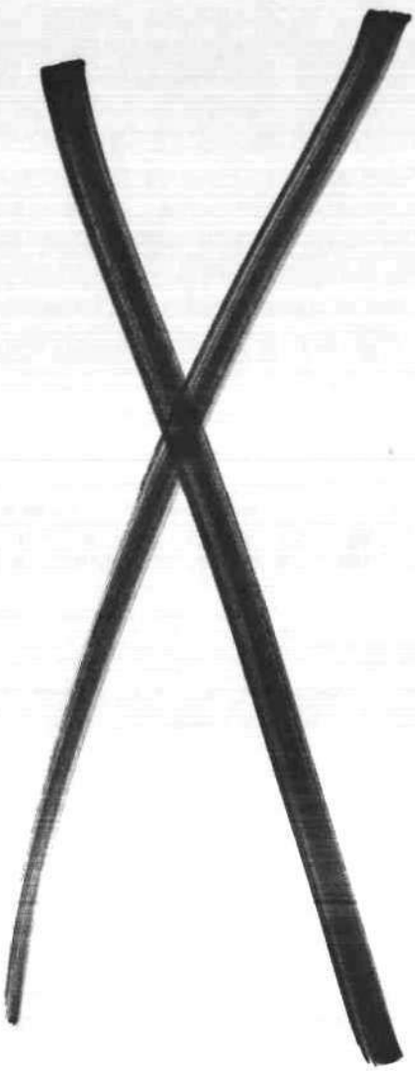

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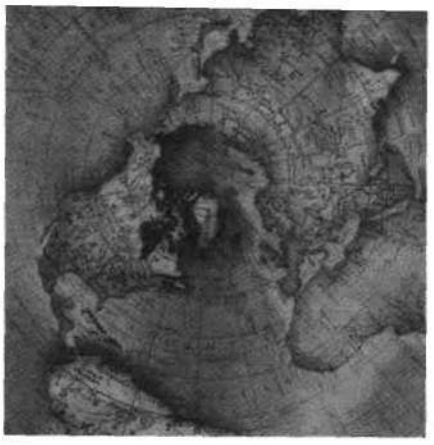

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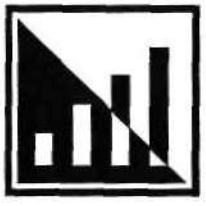
1996—A Year of Transition



Market Trends

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1996—A Year of Transition

Market Trends

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Chapter 1
Executive Summary

Methodology First, Tool Sets Second, Subapplications Third

Dataquest's view is that the EDA market is driven primarily by the design methodologies used to solve design problems. With this in mind, we continue to expand our look at the subapplications, which are defined by the tools needed to carry out the tasks defined by the methodologies. This year we present an-in depth look at CAE (computer-aided engineering), IC CAD (computer-aided design) and PCB (printed circuit board) design, giving us 37 subapplications, or sub-subapplications. It is only by understanding the dynamics of these subapplications that one can get a true picture of the EDA marketplace.

Today's Emerging Issues

The ability to track and understand the world of EDA continues to be a challenge. This year six issues in particular stand out.

The register-transfer-level (RTL) methodology is in the midst of being redefined. This redefinition and the emergence of the RTL virtual prototype will have a major impact on the EDA community and the entire electronics design community.

The mushrooming task of design verification must not only be addressed as the design is being created but also just prior to design implementation. The new physical verification tool suite is being assembled to handle this Herculean task.

Libraries have finally been recognized as the major ingredient to interoperability and the new system level integration design methodology. The spotlight is on this segment—now the industry must perform.

The drive toward hardware/software codesign has brought the emulator onto center stage. Once a tool of the bleeding-edge designer, it soon will be a must-have for every design group.

Windows NT has arrived as an operating system. It is already gaining market share from UNIX. And if the UNIX vendors do not get their act together, NT could take the whole pie.

Project Team: Gary Smith, Jim Tully, and Hiep Luong

Chapter 2
Report Overview, Definitions, and Methodology

Report Organization

This EDA Market Trends report presents the results of our investigations into the current and future conditions of the EDA marketplace. It is intended to provide insight and analysis of the intricacies of this technically demanding and complex market.

We have divided this report into six major sections. Chapter 2 includes an explanation of the methodology used in this report. Our EDA subapplications are defined, our survey methodology and data collection methods are outlined, and our forecast methodology is explained. Chapter 3 identifies the major trends with the greatest impact on the EDA industry. Chapter 4 looks at each of the CAE subapplications in more specific detail. Market share information, trends, and forecasts for each subapplication are included. Chapter 5 looks at the IC CAD subapplications and Chapter 6 deals with PCB Design. Appendix A is the forecast by subapplication.

Data Collection Process

Supply-Side Data

In the fourth quarter of each year, Dataquest surveys all major participants in the EDA industry to obtain preliminary market share data. Each vendor is offered the opportunity to self-report the information required. Although there is a primary contact for each company, large companies are surveyed across product lines and across geographic regions. Thus, there is a corresponding increase in the number of contacts at large companies. Examples of job titles of people contacted for information include the following:

- President and chief executive officer
- Vice president and general manager
- Vice president of marketing
- Vice president of strategic product planning
- Director of strategic planning
- Director of marketing
- Director of market development
- Manager, CAD/CAM/CAE marketing programs
- Market research analyst
- Product manager

We resurvey companies during the second quarter of the following year to verify final annual results and determine the electronic CAE subapplication information. The information in this document is based on this final market share data.

Data supplied by vendors is evaluated against information drawn from many sources, including the following:

- Revenue published by major industry participants
- Estimates made by knowledgeable and reliable industry spokespersons
- Government or trade association data
- Published product literature and price lists
- Annual reports, Securities Exchange Commission documents, and credit reports
- Company publications and press releases
- Reports from financial analysts
- Reseller and supplier reports and reports from a vendor's competitors

Dataquest also sums vendor revenue across other industries covered by Dataquest to make sure that revenue is not credited twice, and checks with multiple sources at one company to cross-check data on that company.

We believe that the estimates presented here are the most accurate and meaningful that are generally available today. Dataquest's EDA market numbers are often higher than those reported by other sources. We survey worldwide, which involves more vendors, higher total market revenue, lower market share per vendor, and a more accurate market picture—particularly useful when comparing regions or applications.

End-User Data

Dataquest also relies heavily on end-user data for validating vendor market share and identifying EDA trends. Demand-side or end-user data is gathered using extensive survey techniques. End users are identified using a variety of means, including databases of past survey respondents, corporate intelligence databases, EDA vendors' registered users lists, and magazine subscriber lists. End-user surveys are often conducted by telephone, to allow for better screening of prospective respondents. At least one major end-user survey is conducted each calendar year, and a number of informal surveys are conducted throughout the year. The results of these surveys are entered into a statistical analysis package for cleansing and analysis of the data. This statistical database allows Dataquest to cross-tabulate the data for improved analysis.

Forecast Methodology

Fundamental to the way Dataquest conducts its research is an underlying philosophy that the best data and analysis comes from a well-balanced program. This program includes the following: balance between primary and secondary collection techniques; balance between supply-side and demand-side analysis; balance between focused industry-specific research and coordinated "big picture" analysis aided by integration of data from more than 25 separate high-technology industries that Dataquest covers; and balance between the perspectives of experienced industry professionals and rigorous, disciplined techniques of seasoned market researchers.

Dataquest also analyzes trends in the macroenvironment, which can have major influences on both supply-side and demand-side forecasting. In addition to demographics, analysts look at gross national product growth, interest rate fluctuations, currency fluctuations, business expectations, and capital spending plans. In the geopolitical arena, the group looks at trade issues, political stability or lack thereof, and tariffs and nontariff barriers. Figure 2-1 depicts the building blocks for the EDA forecast.

EDA Subapplications—Segmentation and Definitions

Market Segmentation by Design Methodology

For the past few years, Dataquest has been subdividing the EDA market in a new way—one based on design methodologies (such as gate-level design, register-transfer-level design, and electronic system-level design). Dataquest's view of the EDA design flow is shown in Figure 2-2.

Under the methodology shown in Figure 2-2, a design is first entered and simulated, ideally at the ES level. It is then synthesized or compiled down to the level below it. This process continues (simulation and synthesis) until the design is placed and routed at the physical design level, at which point timing information is extracted from the physical design. At this point, the verification process begins.

For verification, the process flows in an upward direction. From the physical design level, timing information is extracted, and design rule checkers and logic rule checkers are used to ensure a correct design at the physical level. Verification continues in this upward fashion until the level at which the design process began is reached.

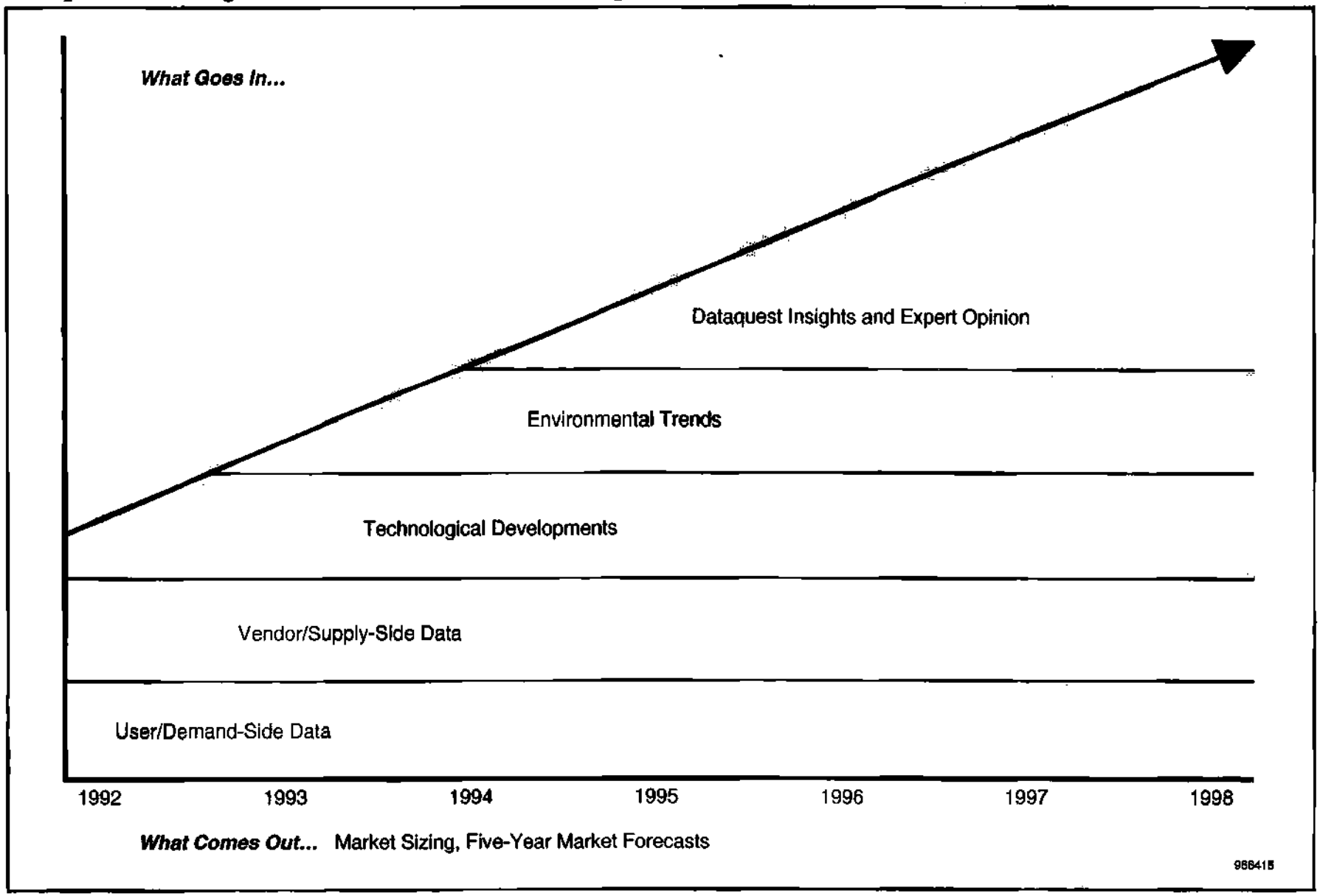
The major changes we have been seeing is the change in the RT level methodology and the added importance of the five sisters (the five analysis tools other than timing) to what was once called DRC subapplication. We are now calling this category physical verification, and the battle over market share has been one of the more exciting events of 1996.

Subapplication Definitions

Dataquest has adopted the following definitions for the electronic EDA subapplications:

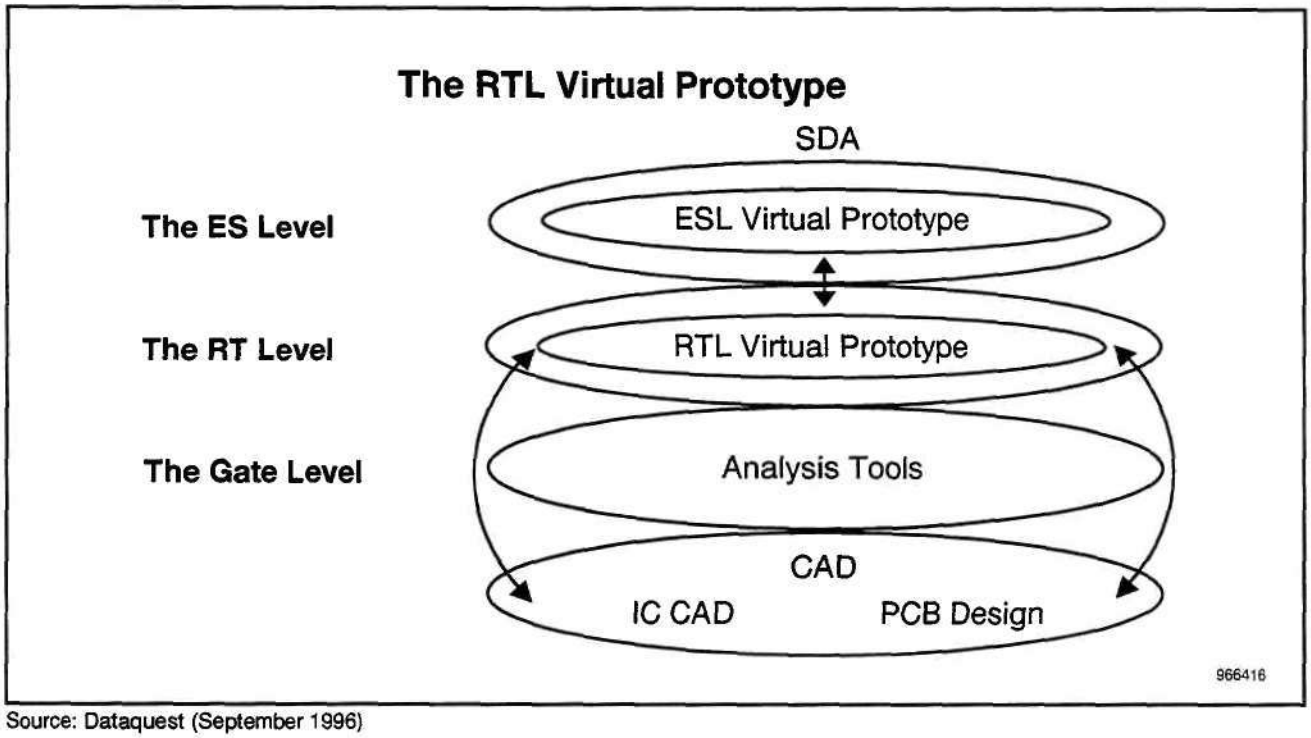
- CAE
  - Electronic system (ES) level
    - Electronic system level design—Design at the conceptual level including hardware/software codesign, design partitioning, and specification; it includes no register transfer or logic level descriptions
    - Behavioral simulation—Nontiming-based simulation
    - Behavioral synthesis—Synthesis of an ES-level design description to the RT level
    - Formal verification—The process of mathematically proving that an RT-level description equates to an ES-level description (or less specifically, that any design representation equates to another)

Figure 2-1
Dataquest's Building Blocks for EDA Market Forecasting



Source: Dataquest (September 1996)

Figure 2-2
EDA Design Flow



Source: Dataquest (September 1996)

- Register transfer level
  - RT level design—Tools designed to assist engineers in entering a design or analyzing the simulated results of that design. This includes the use of graphical symbols to represent RT-level VHDL or Verilog.
  - RT-level simulation—Simulation at the RT level
    - VHDL—Simulation using the VHSIC Hardware Description Language
    - Verilog—Simulation using the Verilog Hardware Description Language
  - Logic synthesis—Synthesis or translation of an RT-level description to a gate-level description
  - Target compiler—A translation of an RT-level description to a silicon implementation.
  - Timing analysis—Verification of the timing of a design; the process usually involves providing inputs to a physical circuit model or computer simulation to test the nondynamic functions of a design. Static timing verification does not require the use of test vectors to determine timing violations.
  - Design for test tools—Tools used to determine, improve, or add to the testability of electronic circuits
  - RTL virtual prototype—Tools that estimate physical performance at the RT level

- Silicon virtual prototype—Tools that estimate silicon level performance at the RT level. This is done by synthesizing the RT level description to a virtual silicon implementation of that code and reflecting the estimated silicon performance back up to the RT level. This is the essence of the new RTL methodology. A new configuration of all six analysis tools will plug into the RTL floor planner to bring back the verification issues to the design team.
- PCB virtual prototype—A process that uses a virtual representation of the PC Board to estimate physical effects, bringing those effects back up to the CAE level of design. As is happening with silicon design, the design engineer will assume more of the responsibility of the end physical design.

- Gate level
  - Schematic capture—A design process that consists of graphical schematic entry and netlist extraction
  - Simulation—The use of representative or artificial data to reproduce conditions in a model that could occur in the performance of a system. Simulation is used to test the behavior of a system under different operating conditions.
    - Gate-level simulation—Simulation based on a gate-level netlist (not VHDL or Verilog)
    - Mixed-signal simulation—Simulation in which both digital and analog inputs are used
    - Analog simulation—Simulation in which only analog inputs are used
    - SPICE simulation—Simulation using a derivative of the Berkeley SPICE transistor-level simulator
  - Analysis tools—Tools used for the analysis of designs
    - Signal analysis (including transmission line and crosstalk analysis)—Analysis of high-speed coupling effects between signal line and reflection/degradation of high-speed signals on PCBs, MCMs, or ICs
    - Power analysis—Analysis of the power consumption of PCBs, ICs, multichip modules (MCMs), and systems
    - Thermal analysis—Analysis of heat distribution in PCBs, ICs, multichip modules (MCMs), and systems
    - Electromagnetic interference (EMI)—Analysis of electromagnetic generation and interference for PCBs, ICs, and cables/connectors/packaging
    - Metal or electromigration—The unauthorized movement of metal in an IC because of excessive current density.

- Miscellaneous
  - Accelerators—Dedicated hardware/software or optimized software used to speed up simulation, typically at the gate level
  - Emulators—Dedicated hardware/software that allows a designer to observe the function of a circuit or design prior to prototype
  - Fault simulation/grading—A process that determines which nodes in a design can be detected by a given set of test vectors
  - Interoperability Tools—Software used for database, library, and tool management. Also includes backplains, file translators, and design environments. In general, all tools are used specifically to integrate a set of EDA tools.
  - Libraries—Description of elements used in EDA designs (for example, components, simulation models, and symbols) and the tools that automate the development of libraries.
  - FPGA tool set—Dedicated EDA software sold as a package for FPGA/CPLD design

- IC CAD
  - Physical verification—The design rule and logic rule checkers used to perform final verification on an IC design prior to making masks. Last year we called this subapplication DRC. We are now seeing the migration of the analysis tools into this category, forming a physical verification tool suite.
  - Floor planner—A tool that allows a designer to place elements of his design so that he or she may look at estimations of the effects of the final place and route
  - FPGA place and route—Tools used to implement the design into the targeted FPGA or CPLD. These are also called fitters as they fit the design into the already existing logic structure of the targeted FPGA or CPLD.
  - IC place and route—Tools used to implement (lay out) designs into silicon
    - Gate array place and route—Tools used to lay out designs into a fixed base array
    - Cell-based IC place and route—Tools used to lay out nonfixed cell base designs
    - Custom IC layout—Silicon design tools that work at the transistor level. These tools can size transistors, accomplish analog design, and generally hand-craft silicon implementations. Sometimes called "layout editors."

- Printed Circuit Board Design—Tools used to implement a design on a printed circuit board or substrate
  - PCB design—Tools used to design, place, and route a printed circuit board
  - MCM and hybrid design—Tools used to design, place, and route a multi-chip module or hybrid substrate

Chapter 3
Major Trends

Emerging Issues

This has been an exciting year, and it doesn't look like the world of EDA is going to calm down for awhile. Accusations, lawsuits, controversy, and companies coming out of no where to upset the status quo have become daily events. Sometimes this job looks like that of a sports reporter or possibly war correspondent. More and more the saying that "you can't tell the players without the scorecard" holds true. Yesterday's information is just not going to hack it. In this section, Dataquest highlights the following issues in the EDA industry:

The RTL Virtual Prototype

The reinvention of the RTL methodology will become the biggest impact item to the EDA community and the working engineer. As Cadence Design Systems Inc. and Synopsys Inc. battle it out, we will see acquisitions, alliances, and an incredible proliferation of start-ups and new tools. The entire electronic world is watching how this one unfolds.

Physical Verification

On the other end of the design problem spectrum lies physical verification. What was simply DRC last year is now what seems to be an ever-expanding suite of verification and analysis tools, all targeted toward the 0.35 micron design problem. The recent accusations by Avant! Corp. and Epic Design Technology Inc. highlight the importance of this market.

Libraries

Libraries and library standards are now the No. 1 issue in tool interoperability and the new system-level integration (SLI) design methodology. The formation of the Virtual Socket Interface Alliance could equal the invention of the microprocessor as a market driver for the entire electronics world.

Emulation

We probably should say emulation and hardware/software codesign go hand in hand. Emulation has become a key technology in the drive toward true system-level design.

Windows NT

The NT operating system has now won in the PCB design space. As the PCB tools are swapped out, a long seven-year process, they will be replaced by either NT-based tools or the new Windows-based shrink-wrapped tools. NT will take a portion of CAE, but will have no impact on the IC layout arena. That is, if the UNIX world gets its act together. If a real standard 64-bit UNIX is not agreed upon, the upcoming 64-bit NT will then take over the rest of the EDA world.

Service

Service has become an emotional subject in the design community. Cadence's outsourcing effort has put the issue on the table. We will start to gather service revenue separately from maintenance revenue and will address this in 1997.

Chapter 4
The CAE Market

Electronic computer-aided engineering (CAE) is comprised of three methodologies and a miscellaneous category. The most advanced methodology, the ESL methodology, sometimes called ESDA, looks at the system from a conceptual basis. Logic flows are not defined and ideally the partitioning of system functions into hardware and software has not been decided. The next methodology, the RT level, is the largest market for EDA tools and possibly the most exciting. RTL tools captured 37 percent of the CAE market—a 4 percent increase over last year. The excitement is that the RTL methodology is being reinvented to deal with the challenges of sub 0.35 micron silicon. Next is the gate-level methodology, a methodology that is slowly losing its relevance in the digital design world. The miscellaneous category contains all tools that fit into multiple methodologies, the largest subapplications being emulation and libraries. Next year we will need to subdivide the library subapplication as we did the analysis subapplication last year. The variation of tools and libraries have made it next to impossible to analyze at the subapplication level.

The Electronic System-Level Methodology

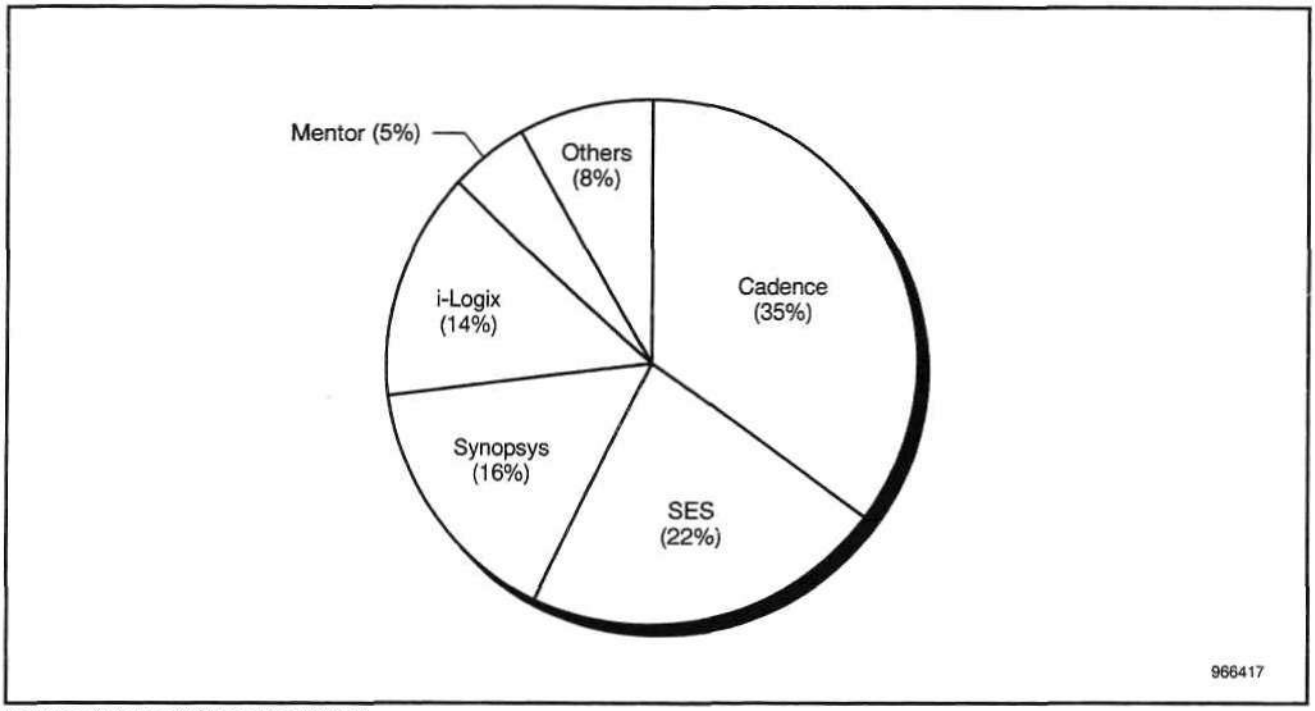
ESL continues to be the most explosive area in EDA, growing 41.1 percent over 1994. Cadence's Alta Group continues its market leadership, but Synopsys has jumped to the No. 2 position by growing 117 percent in 1995. The other company to watch is Chrysalis Symbolic Design Inc. It grew 96 percent, expanding its dominance of formal verification.

ESL Design

This has been an interesting year in ESL design. Design styles are termed "domains" in EDA. There is a control logic domain, a data path domain, and a memory management domain. Each domain calls for tools specifically designed for that style of design. Prior to this year a tool set was optimized for one domain. This year Cadence, Synopsys, and Mentor Graphics Corp. have put together multidomain tool sets optimized for an application area. These now cover the applications of telecommunications design, wireless design, and multimedia design. These tool sets come with a sophisticated library of application-specific elements and now, from Synopsys, application-specific target compilers. The complexity of these application tool sets are now calling for a much higher level of R&D commitment than we have previously seen. This is becoming a large company market (see Figure 4-1).

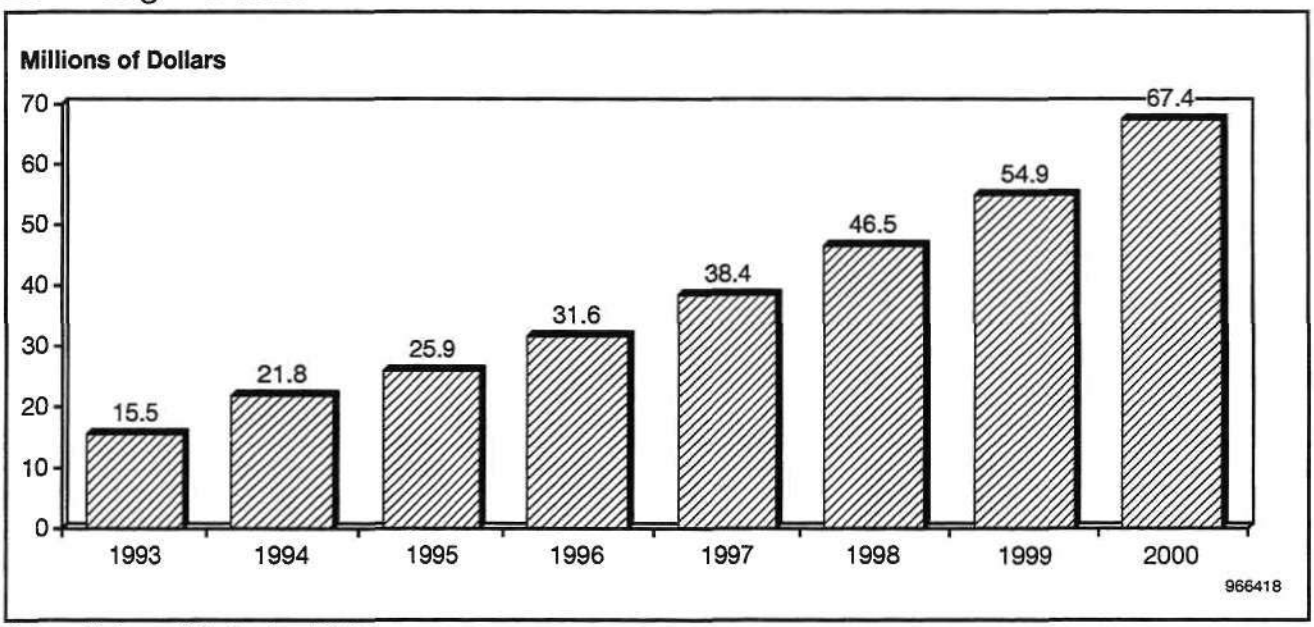
Cadence, Synopsys, Mentor, and i-Logix Inc. all gained market share and SES Inc. held its own. This was at the expense of all the smaller players that made up the "other" category last year. SES is the last of the original players that has not quite decided what market to pursue. As with Cadence's BONeS simulator, it can concentrate on EDA or on network design. The ESL portion of EDA isn't a bad market to go after. It is expected to grow at a 21.1 percent compound annual growth rate (CAGR) for the next five years (see Figure 4-2).

Figure 4-1
1995 ESL Design Market Share



Source: Dataquest (September 1996)

Figure 4-2
ESL Design Forecast



Source: Dataquest (September 1996)

Behavioral Simulation

As usual, behavioral simulation was difficult to track. Last year SES held 29 percent market share, and this year SES says its simulator was only sold into network design applications (a nonEDA market). Synopsys' COSSAP simulator has been getting good reviews, however, Synopsys was unable to separate its sales from the design tools. It's unclear if the new application specific tool sets will make it completely impossible to separate the simulator from the design tools or not—we'll just have to wait and see (see Figure 4-3).

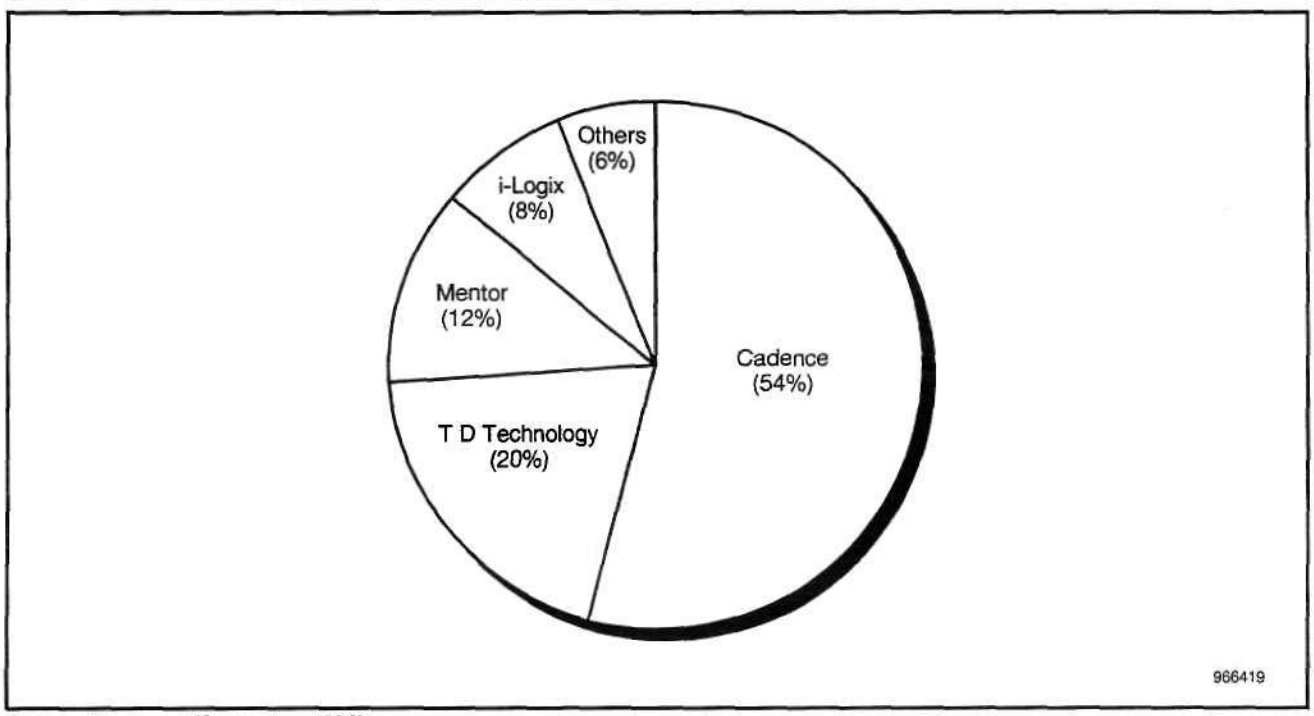
These two areas are tracking fairly consistently with behavioral simulation, coming in at nearly one half of the ESL Design subapplication (see Figure 4-4).

Behavioral Synthesis

Behavioral synthesis has taken off. Synopsys, as expected, jumped into the lead, grabbing 50 percent of the market (see Figure 4-5).

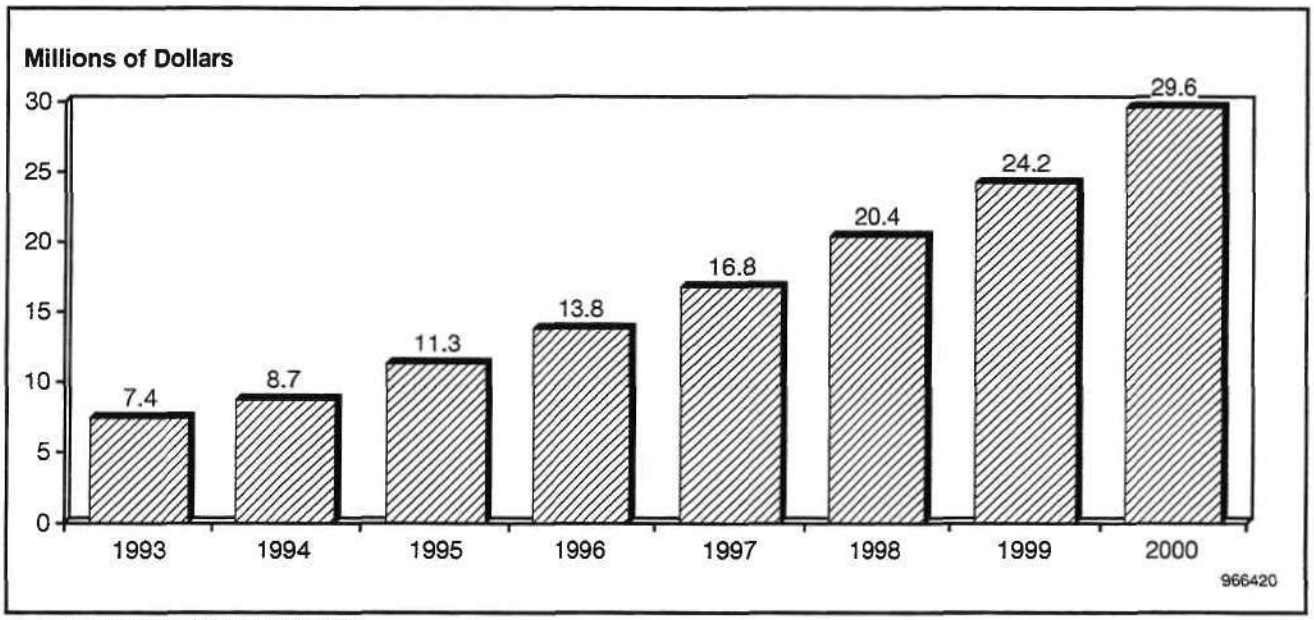
Although a 37.2 percent CAGR is exciting, we have now downgraded this subapplication to the second-fastest growth area in the ESL methodology (see Figure 4-6).

Figure 4-3
1995 Behavioral Simulation Market Share



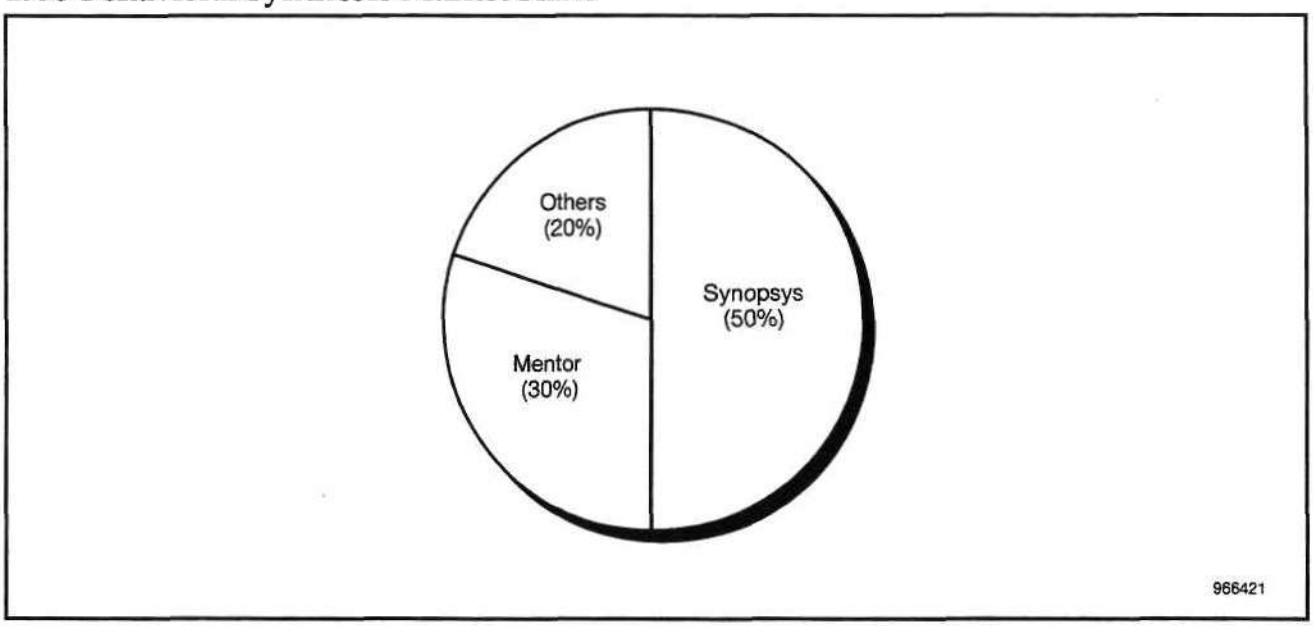
Source: Dataquest (September 1996)

Figure 4-4
Behavioral Simulation Forecast



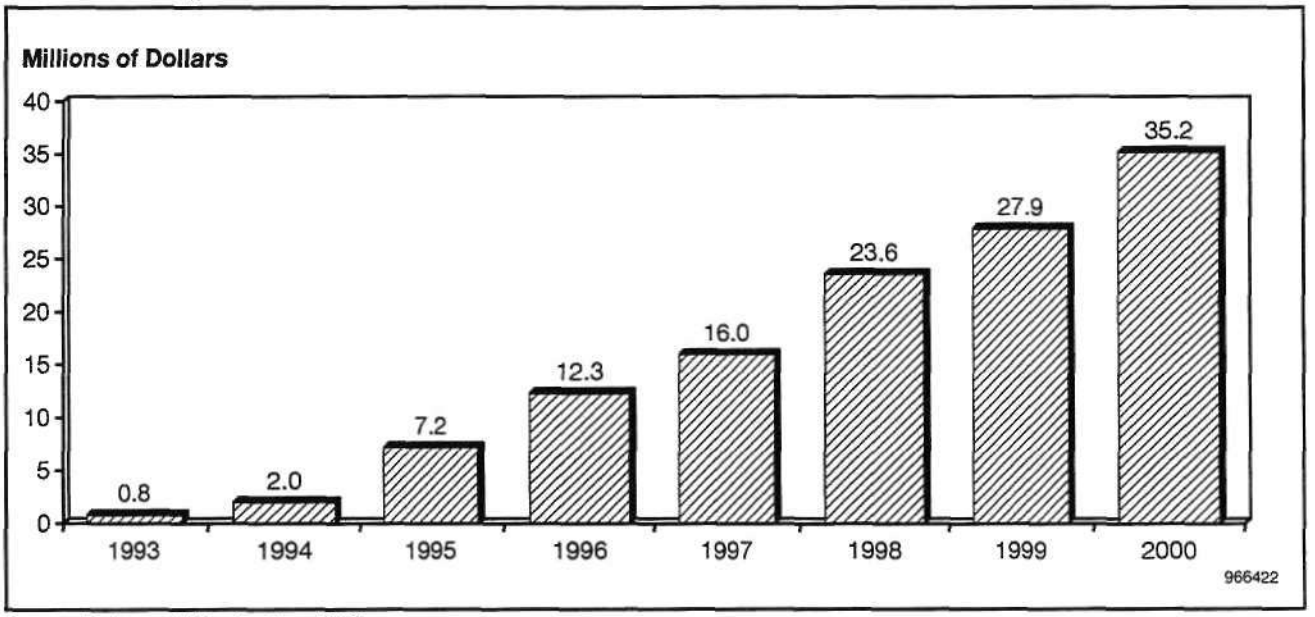
Source: Dataquest (September 1996)

Figure 4-5
1995 Behavioral Synthesis Market Share



Source: Dataquest (September 1996)

Figure 4-6
Behavioral Synthesis Forecast



Source: Dataquest (September 1996)

Formal Verification

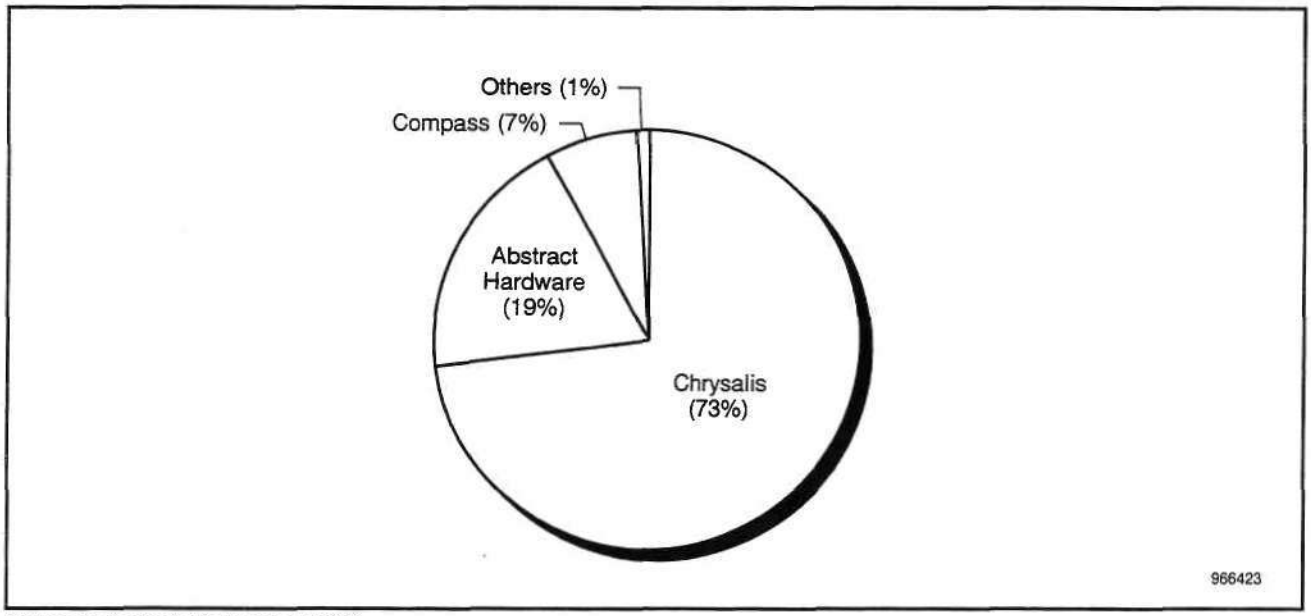
Formal verification has become the fastest-growing segment in the ESL methodology. Chrysalis has grown its market share to 73 percent. The new player in the subapplication is Compass Design Automation, which grabbed 7 percent of the market in 1995. Compass will provide Chrysalis the technical challenges needed to continue to drive the formal verification technology (see Figure 4-7).

These tools are being used at all levels of design. Most sales today are being made in the RTL methodology. Memory CASH design seems to be the predominant application. Dataquest believes that these tools will become a mainstay of design from the ES level down to the physical level. And no, these tools will not replace simulation—they will augment the present tool set (see Figure 4-8).

The RTL Methodology

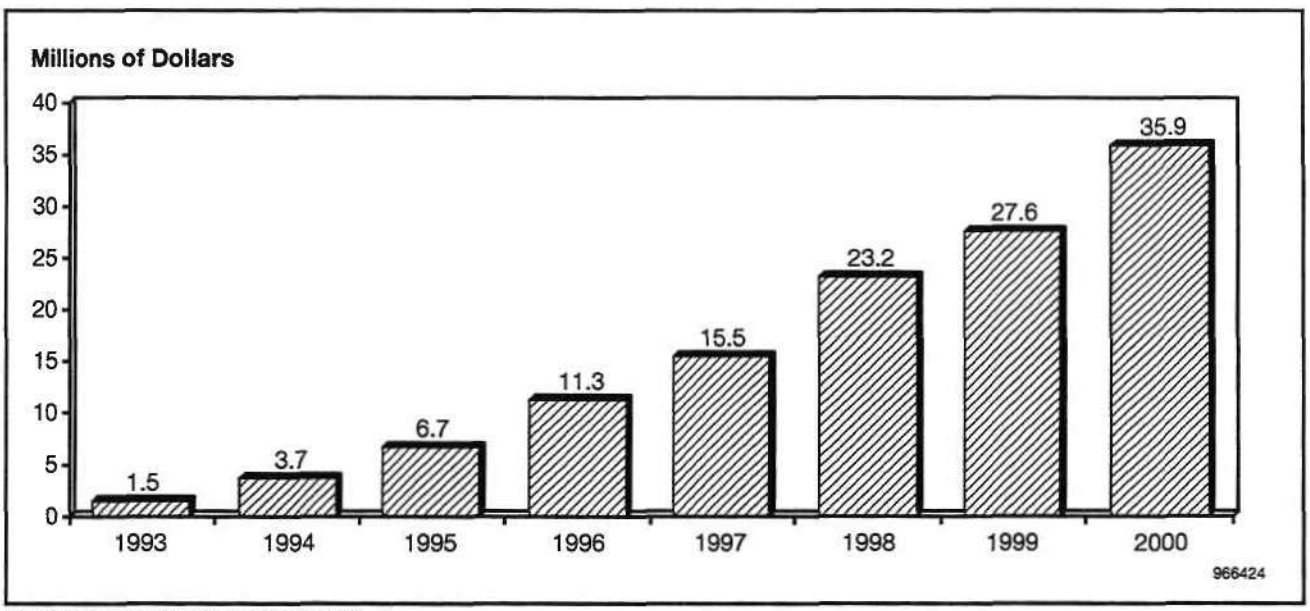
The RTL methodology is in the midst of being redefined. The methodology, as we know it today, is incapable of designing the new sub 0.35 micron silicon. Not only is timing critical, but the five sisters (power, signal integrity, EMI, metal migration, and thermal) have become critical factors in the success of a design. Power, in fact, has replaced area as the second most important consideration during the design. RTL floor planners have emerged, becoming the cockpits that will drive tomorrow's designs. Placement is no longer enough. Designers also must have good estimations of their routes. This is the new area of RTL virtual prototyping. And from the outside world of software design comes the information necessary for true hardware/software codesign. This too will plug into the RTL virtual prototype, which means that emulation is now becoming an indispensable tool at the RT level. The winner in the battle for the RTL virtual prototype will become the sales leader in the world of EDA.

Figure 4-7
1995 Formal Verification Market Share



Source: Dataquest (September 1996)

Figure 4-8
Formal Verification Forecast



Source: Dataquest (September 1996)

RTL Design

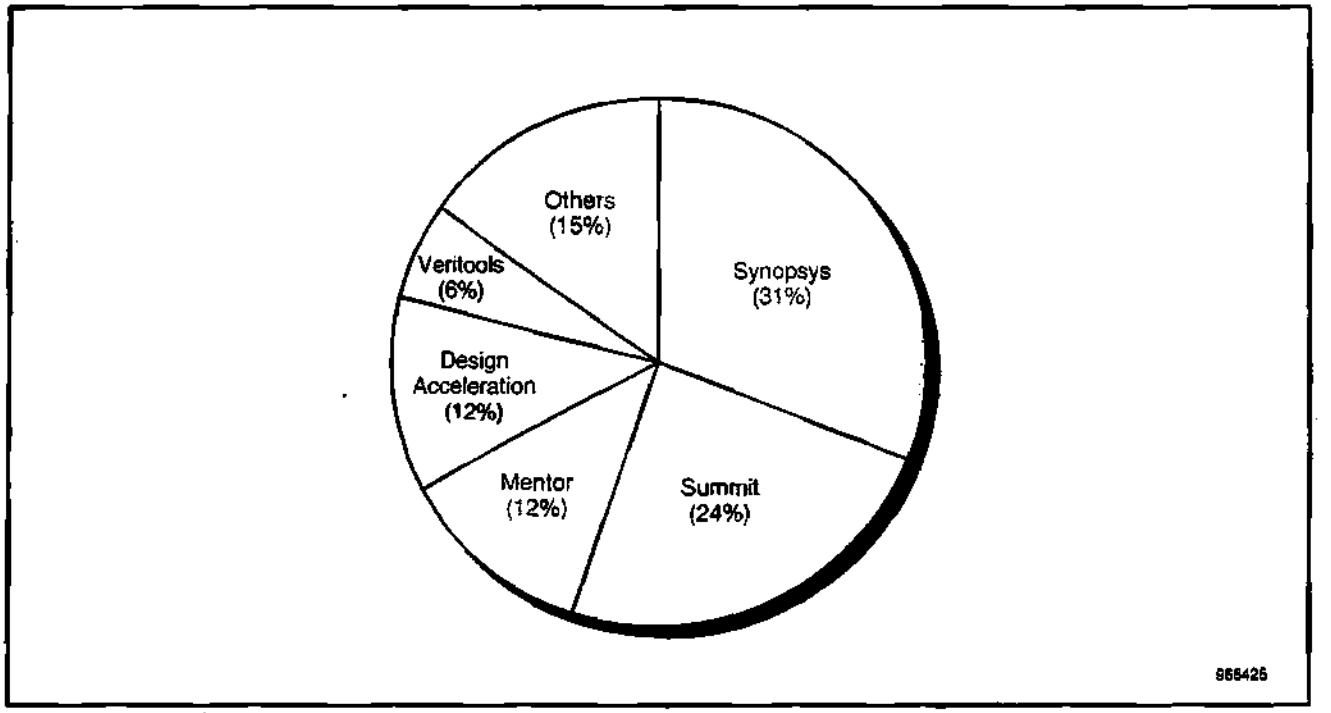
This is still a market where the nimble will win. It is a subapplication of a few grand strategies but with many market niches. Synopsys introduced its HDL Adviser and DesignSource tools and went from a nonparticipant to No. 1 in that subapplication—it's that kind of a market (see Figure 4-9).

A recent trend has been the introduction of test bench development tools. However, as the hardware and software worlds come closer together, the test bench as we know it today will be replaced by the software designer's behavioral code description. A new concept—both the hardware designer and the software developer working off the same specs! Keep your eye on Design Acceleration. It is trying to redefine this market of multiple low-cost tools (see Figure 4-10).

RT Level Simulation

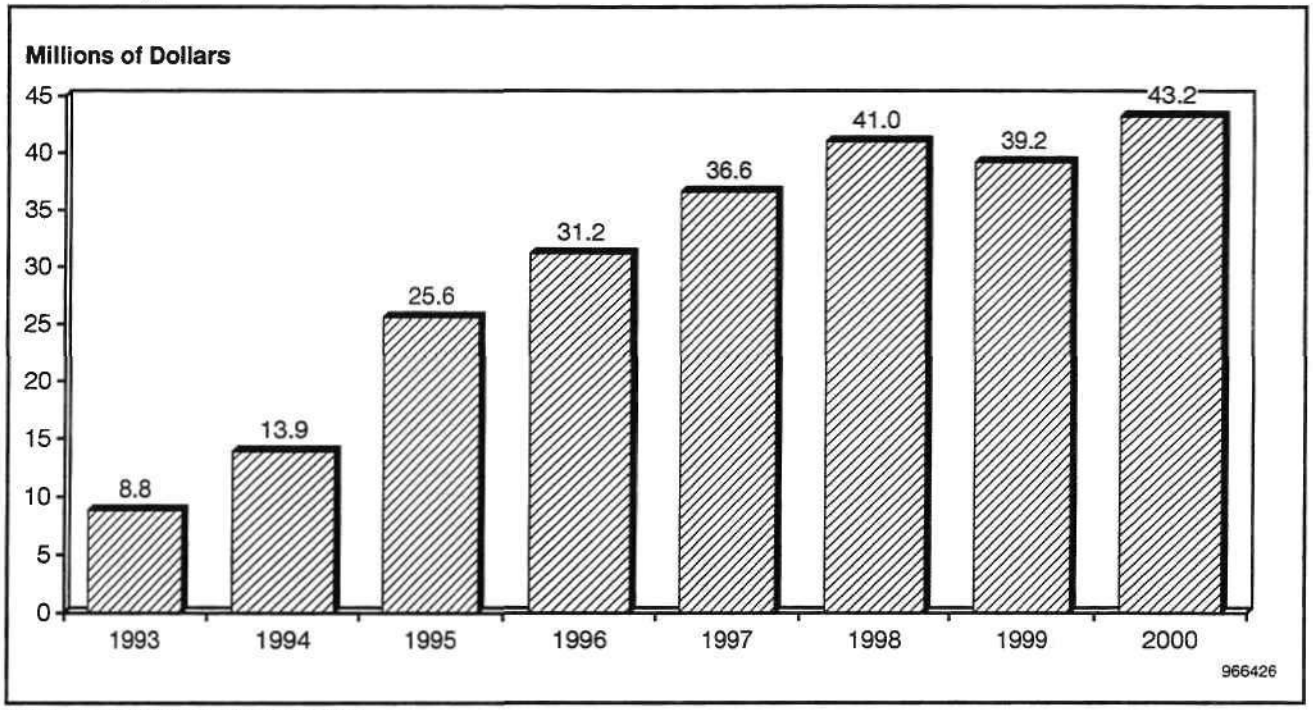
The Verilog/VHDL war is over, right? But in 1995 VHDL actually shrunk while Verilog grew by 39.1 percent. What's going on!? It's called competition. VHDL seat sales continue to outstrip Verilog, but at an average selling price (ASP) that is 38 percent of the Verilog ASP. Cadence and Viewlogic System's Chronologic Group continue to dominate the Verilog world where the only high-priced VHDL simulator to gain market share was Leapfrog, from Cadence—possibly the best VHDL simulator on the market today (see Figure 4-11).

Figure 4-9
1995 RTL Design Market Share



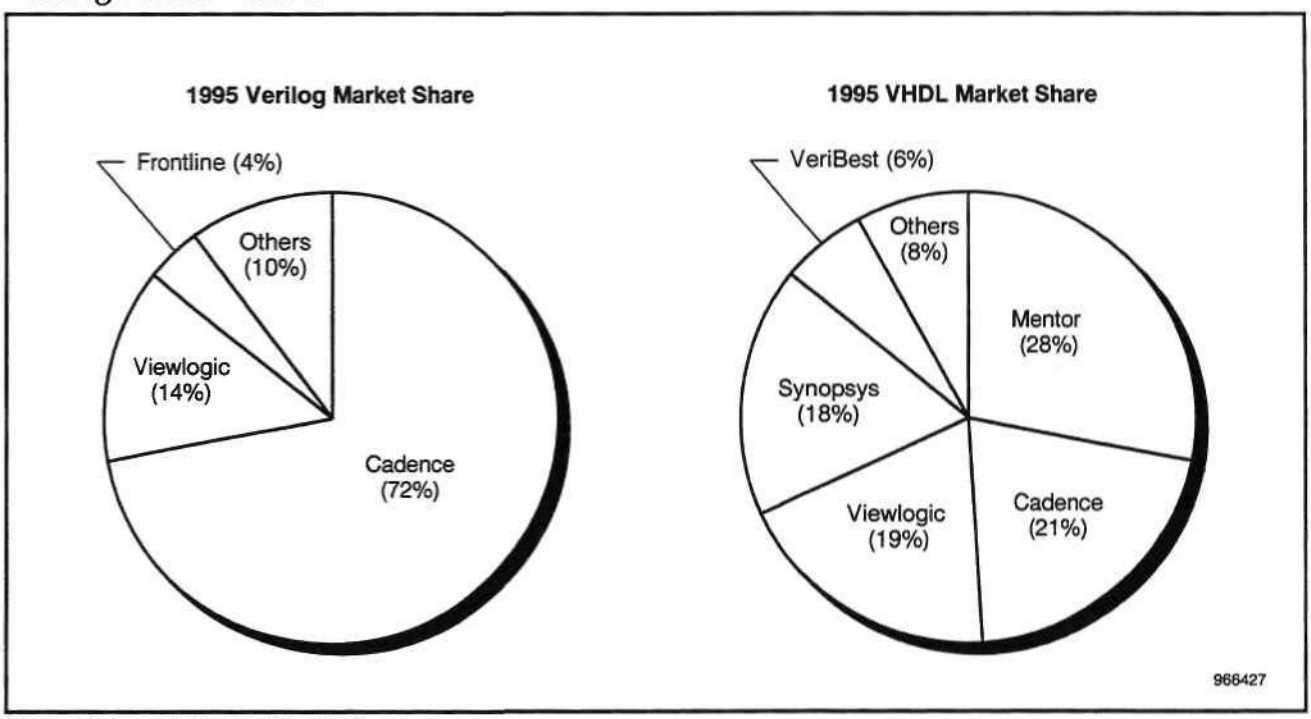
Source: Dataquest (September 1996)

Figure 4-10
RTL Design Forecast



Source: Dataquest (September 1996)

Figure 4-11
Verilog versus VHDL



Source: Dataquest (September 1996)

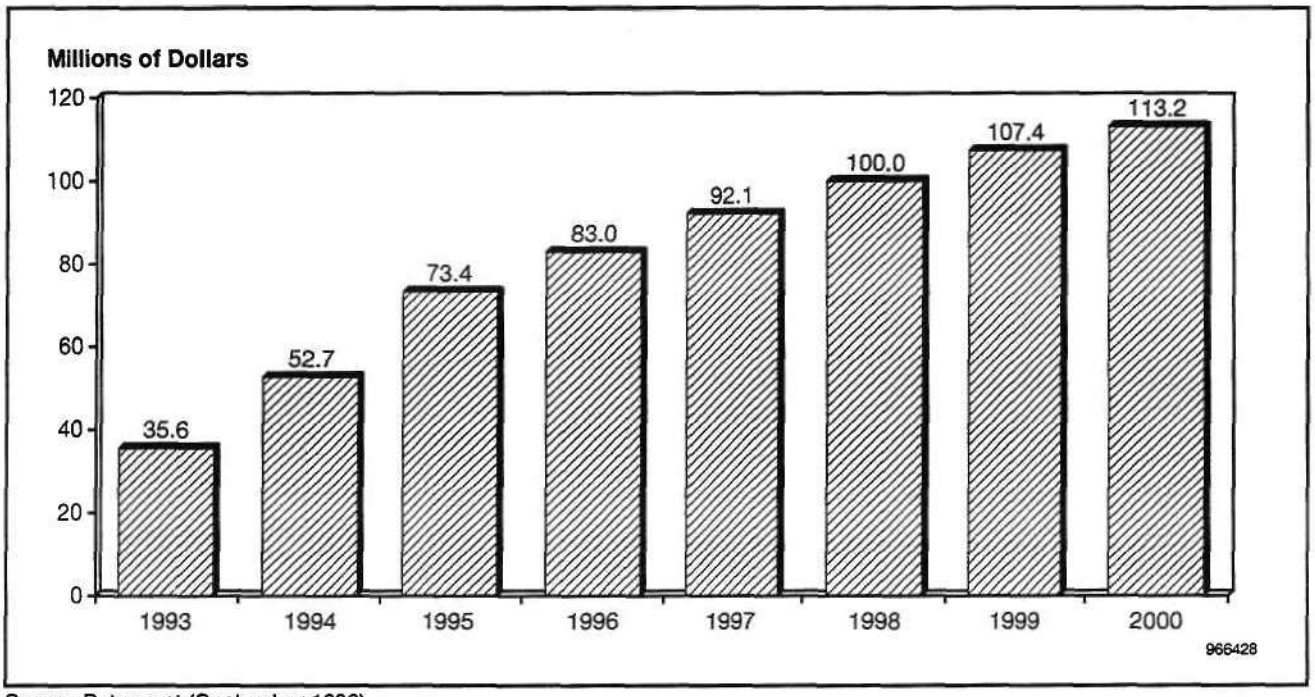
Both simulators have their advantages and disadvantages. Verilog is quick to learn and easy to use. VHDL allows true ESL design and you can remember what you were trying to design a year after you finished. Dataquest believes that there is yet another shoe left to drop in this war. FrontLine Design Automation Inc. has appeared on the radar screen with an excellent Verilog simulator priced below Cadence and Viewlogic. There are rumors of new introductions that could easily drive Verilog's ASP down to a VHDL simulator's level. We have forecast VHDL to overcome Verilog's new lead in the year 2000. If Verilog's ASP takes a nose dive sooner than we predicted, so will Verilog's market lead (see Figure 4-12 and 4-13).

Logic Synthesis

Synopsys grew its domination of the logic synthesis market by a full 10 percent in 1995. The only other company on the chart is Mentor and that today is primarily being driven by its Exemplar sales. Although Compass and VeriBest Inc. have good synthesizers, neither seem able to grab enough sales to get out of the "other" category. Synplicity Inc. is recording sales and could be a third entry next year (see Figure 4-14).

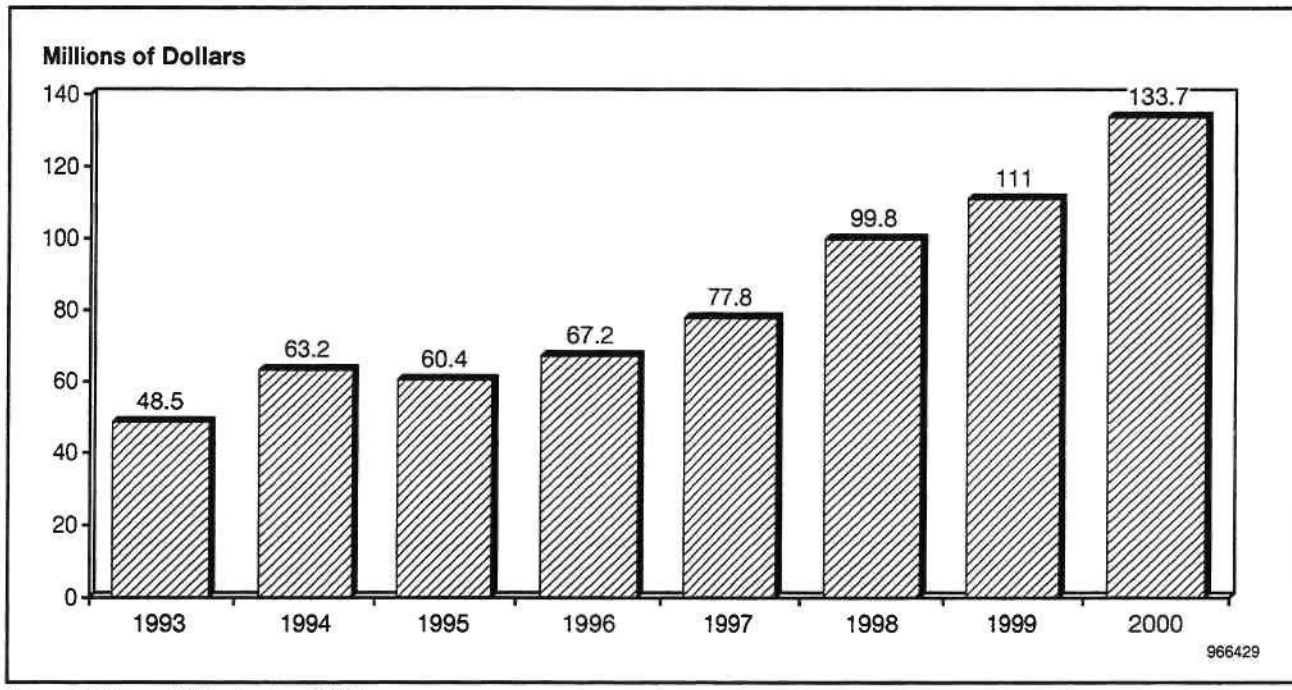
We still expect strong growth and we still expect Synopsys to dominate this subapplication. This is one of the areas that will not be affected by the RTL virtual prototype (see Figure 4-15).

Figure 4-12
Verilog Forecast



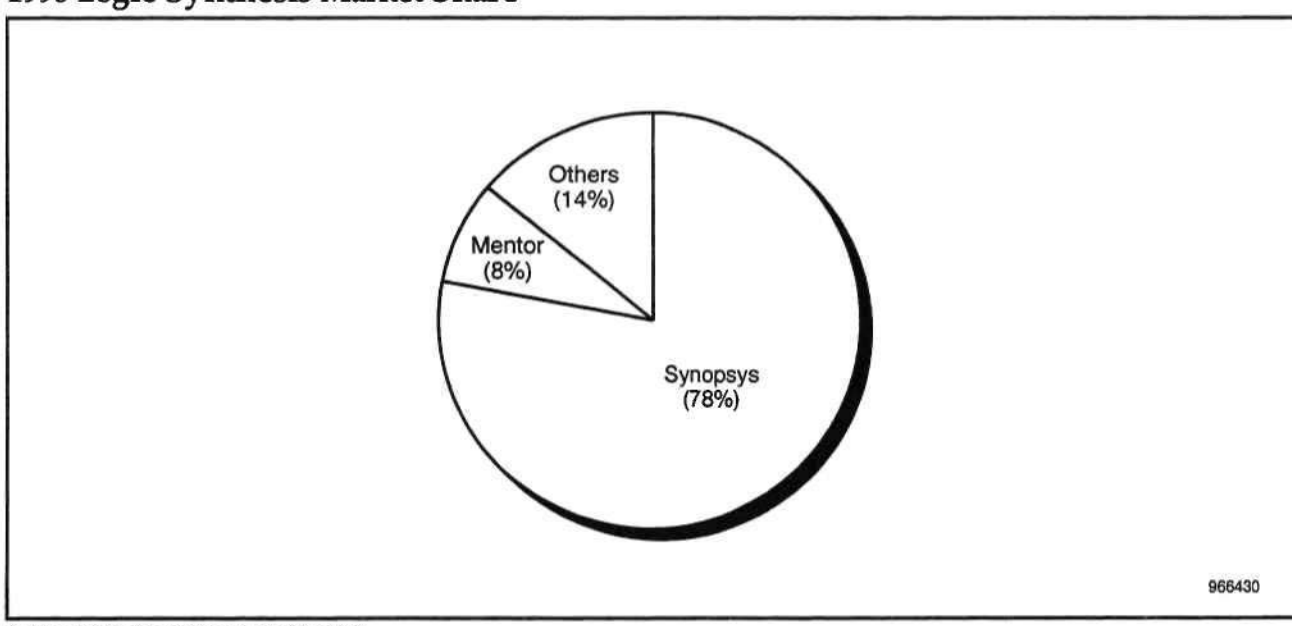
Source: Dataquest (September 1996)

Figure 4-13
VHDL Forecast



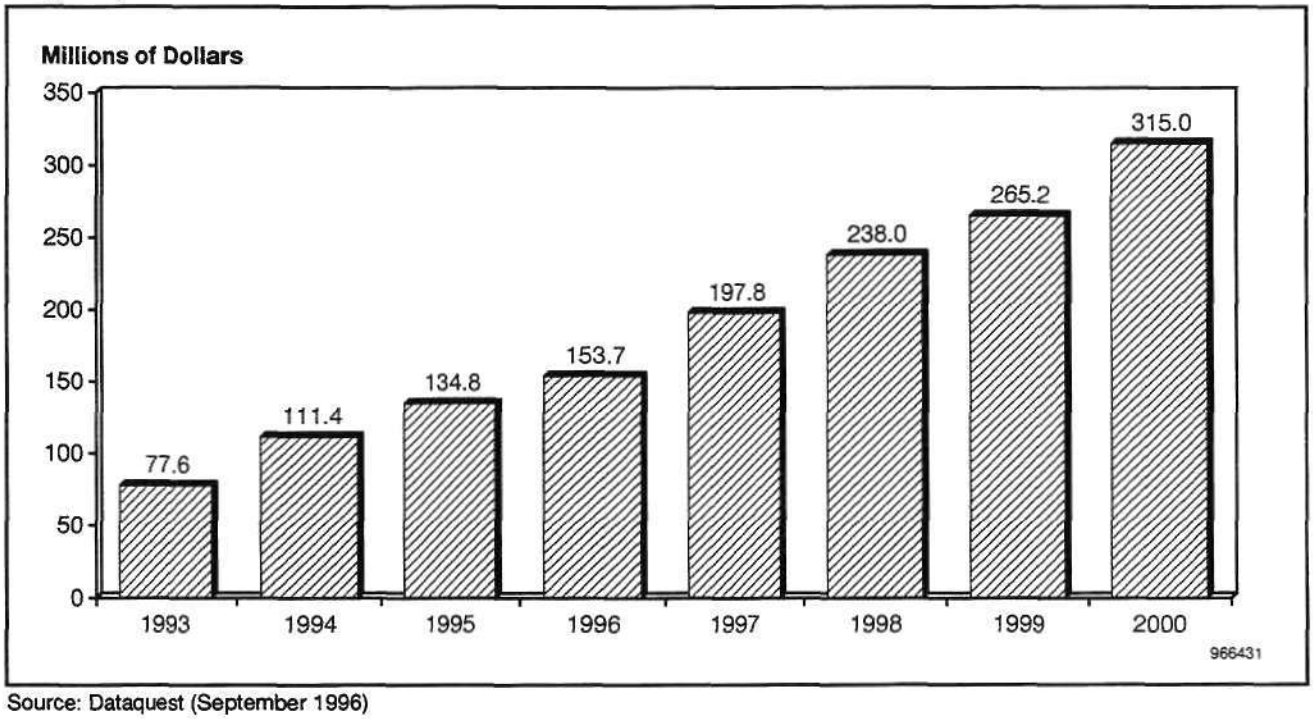
Source: Dataquest (September 1996)

Figure 4-14
1995 Logic Synthesis Market Share



Source: Dataquest (September 1996)

Figure 4-15
Logic Synthesis Forecast



Source: Dataquest (September 1996)

Target Compiler

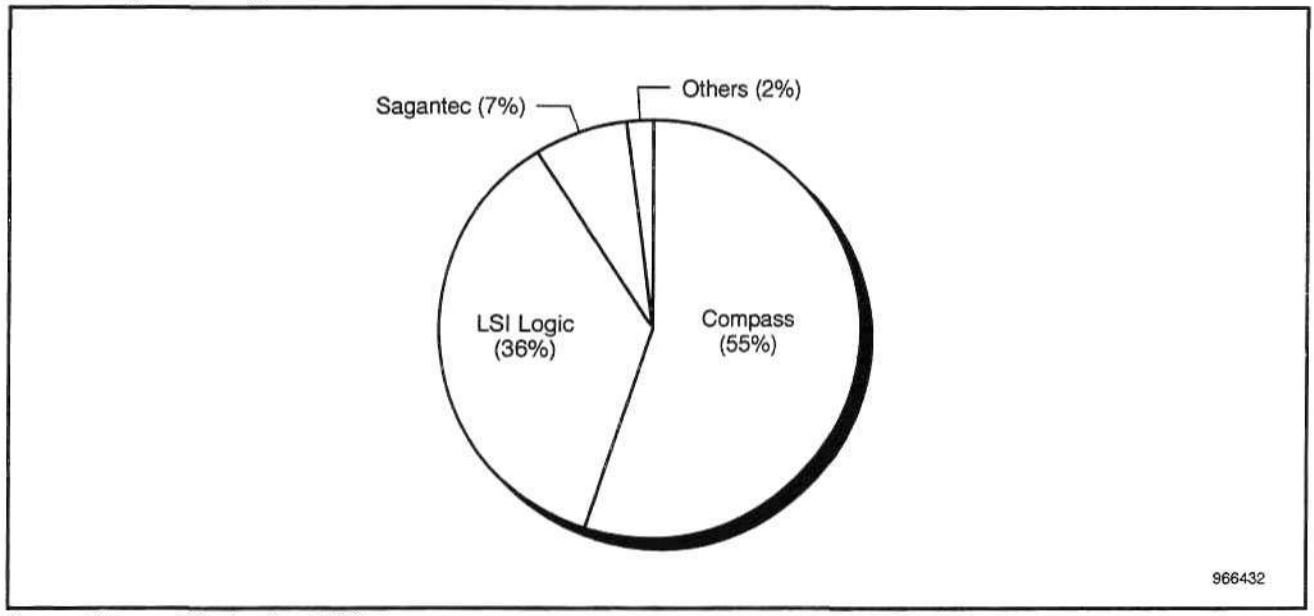
Target compilers have finally taken off, exceeding 100 percent growth in 1995. The major push was by Compass, who grabbed 55 percent market share. LSI Logic Corporation's sales actually declined (see Figure 4-16).

Compass' market penetration was expected. Compass has been targeting the library area and those tools fit hand in hand with target compilers. Expect to see companies such as Cascade Design Automation also targeting the library generator market and becoming a major player in this subapplication. So far the market has been made up of memory compilers, but we have now seen the introduction of some excellent data path compilers. Cadence's SmartPath and Viewlogic's PathBlazer are two to watch. One of the more exciting announcements this year was Cadence's Alta Group's introduction of a filter compiler in conjunction with its EnWave design suite. This subapplication will be one of the fastest growing, coming in at 45.7 percent CAGR (see Figure 4-17).

Timing Analysis

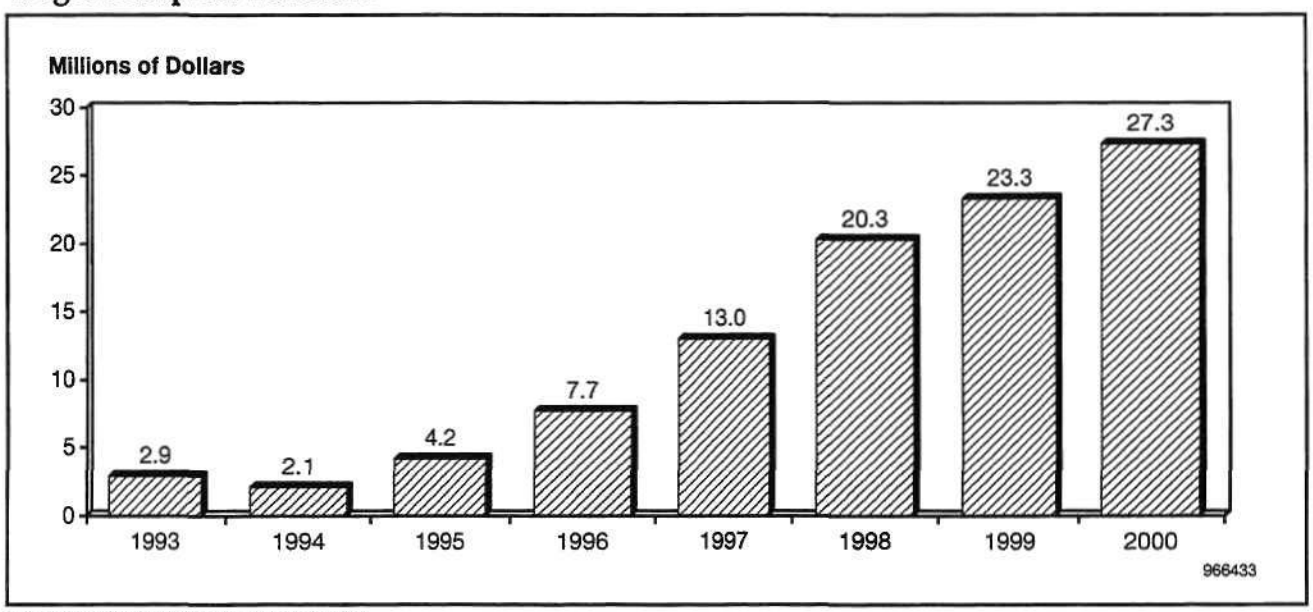
Epic has taken the market leadership position from Viewlogic's Quad Design Group. Quad's MOTIVE has had a lock on this market for a good five years. This is a good example of being in the train business instead of the transportation business. If you define your market by your technology instead of your customers' needs, sooner or later your company will fall out of the leadership position (see Figure 4-18).

Figure 4-16
1995 Target Compiler Market Share



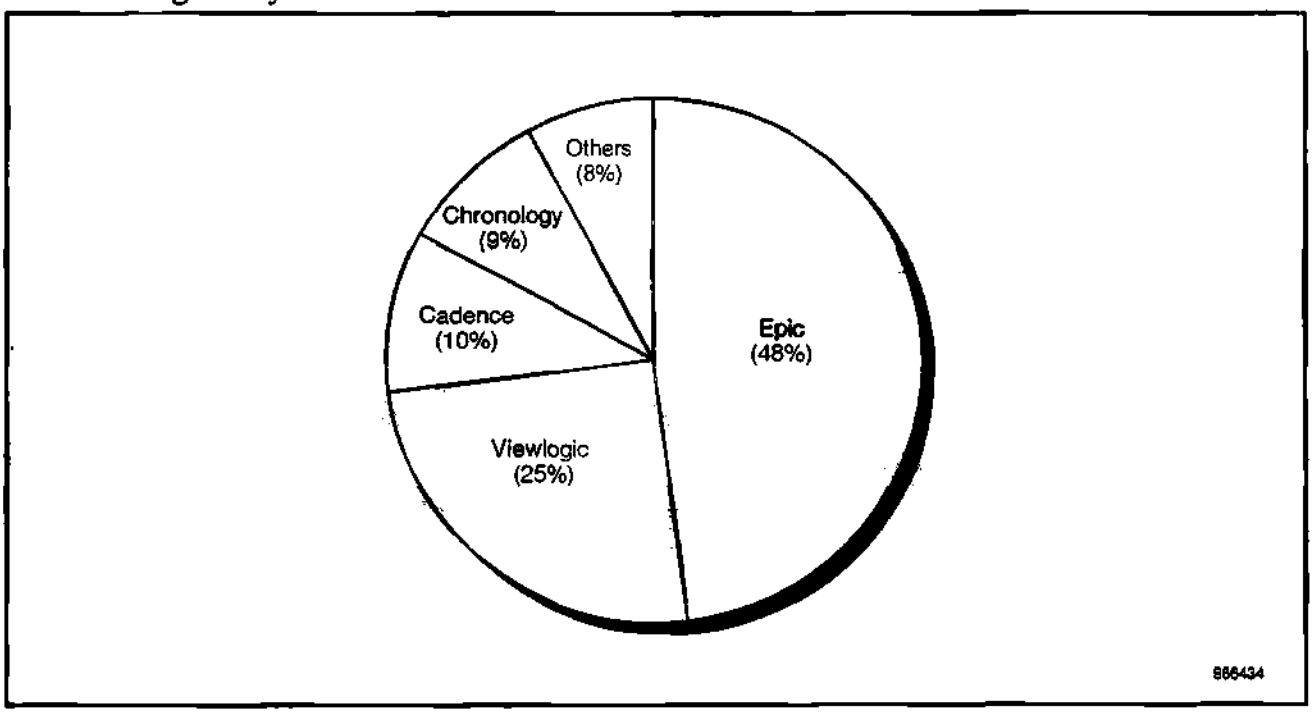
Source: Dataquest (September 1996)

Figure 4-17
Target Compiler Forecast



Source: Dataquest (September 1996)

Figure 4-18
1995 Timing Analysis Market Share



Source: Dataquest (September 1996)

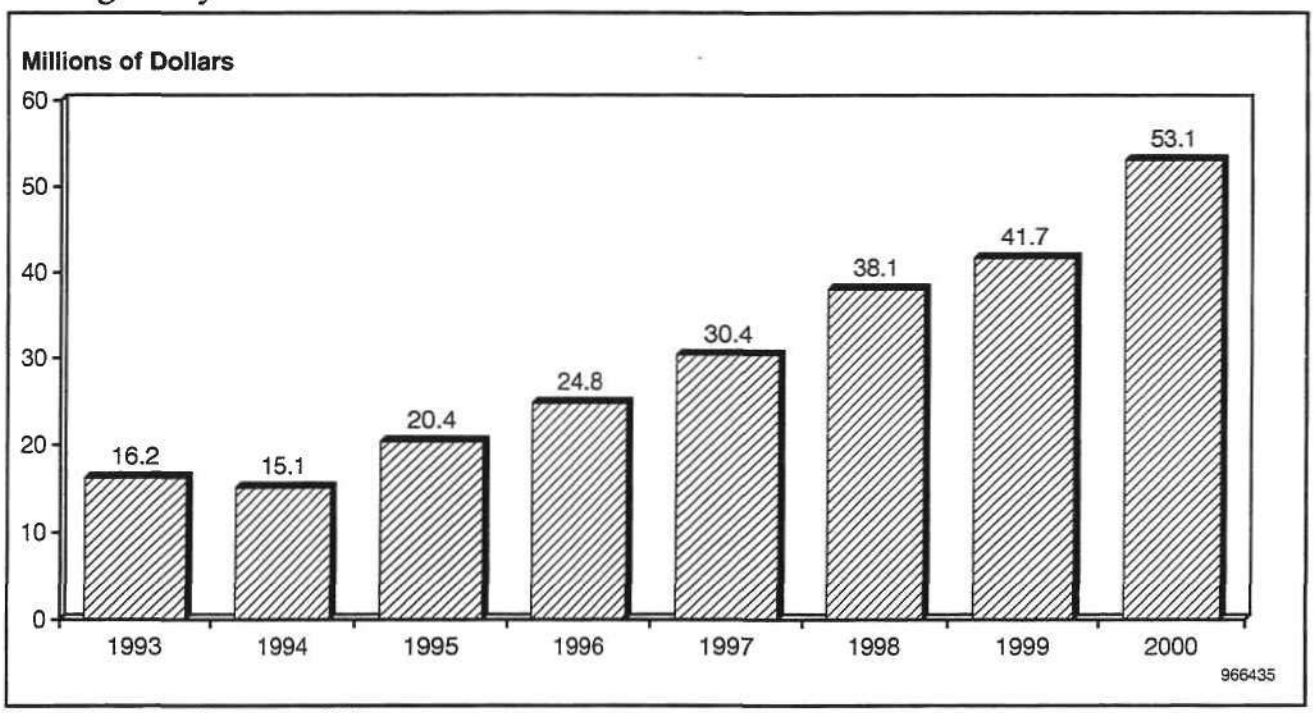
The only other company to gain market share besides Epic was Cadence with Pearl. In the long term, Pearl is more of a threat to MOTIVE than Epic's tools. Epic is concentrating on the physical verification subapplication. MOTIVE is more of a RTL design tool and Pearl is looking more and more like it can do both (see Figure 4-19).

Design For Test

In 1994, Mentor had the best DFT tool on the market and came in No. 4. In 1995, Mentor jumped to first place. There is justice in the world (see Figure 4-20).

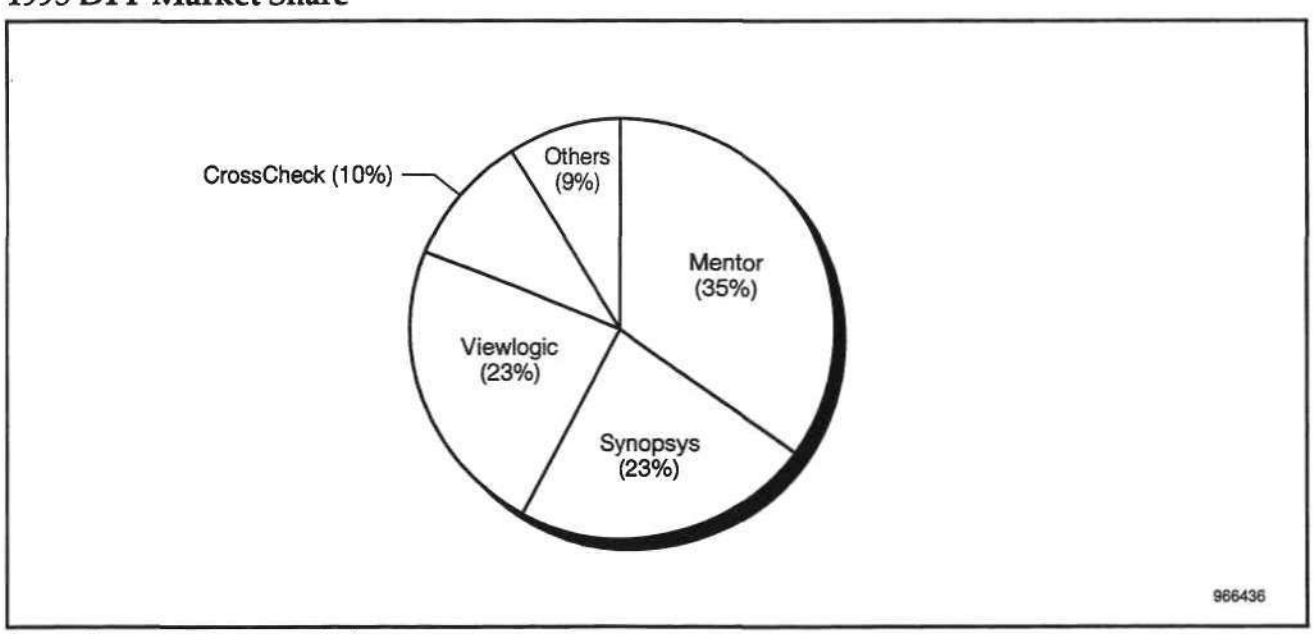
However, this is no market to become complacent. Viewlogic's Sunrise group has continued to upgrade its tools and has learned the lesson of targeting the ASIC vendors, as Mentor did. And then there's Synopsys. It has almost completely rewritten Test Compiler and if we're not mistaken, the next release will turn it into the test tool to watch. In the meantime, Logic Vision has been busy attracting all the test talent it can find. Its new focus of solving the built-in self-test (BIST) problem and letting the other DFT vendors take care of scan and IDDQ, will make it another company to watch. We will see Logic Vision on the pie chart next year (see Figure 4-21).

Figure 4-19
Timing Analysis Forecast



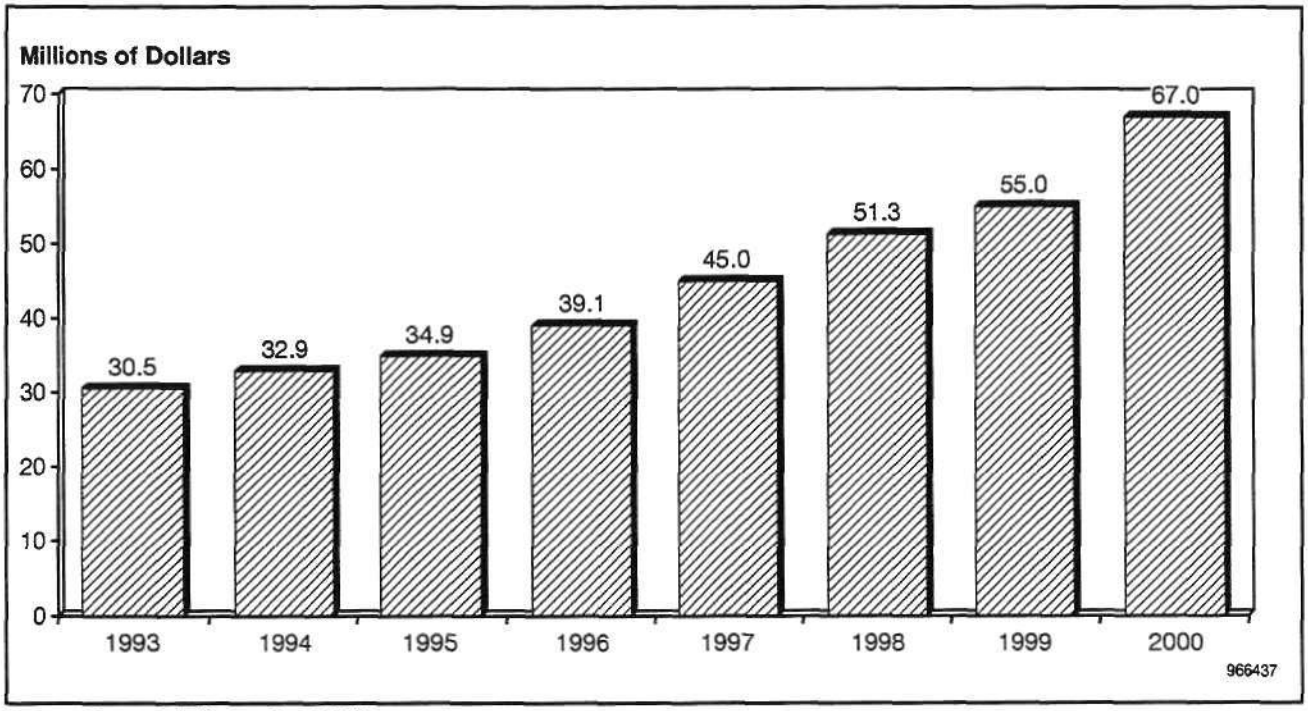
Source: Dataquest (September 1996)

Figure 4-20
1995 DFT Market Share



Source: Dataquest (September 1996)

Figure 4-21
DFT Forecast



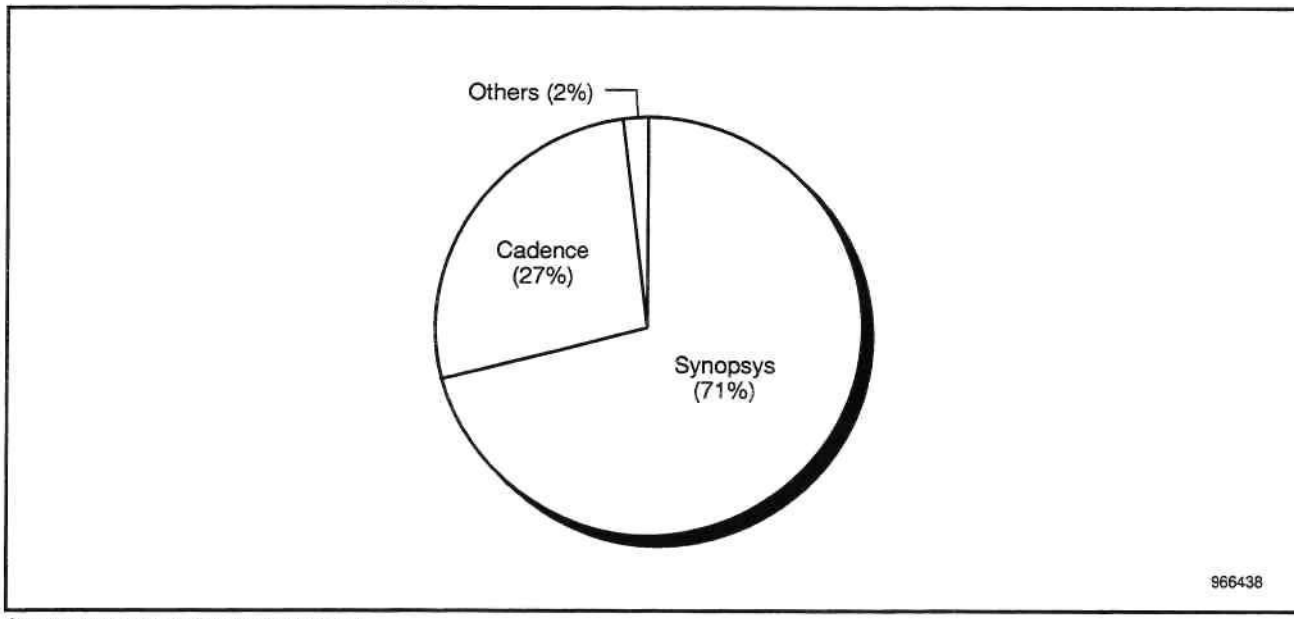
Source: Dataquest (September 1996)

The Silicon Virtual Prototype

The silicon virtual prototype and the PCB virtual prototype make up the RTL virtual prototype. As the companies targeting these areas are different, we need to address them separately. The silicon virtual prototype is the big race. Synopsys leads with 71 percent of the market but Cadence is gaining, and today Cadence has the better technical solution. Synopsys has countered by partnering with IBM and Cooper & Chyan, pulling in the Sematech development contract. Cadence added to its internal tools SiliconQuest and Pearl by partnering with Sente Inc. Sente may have the best power solution out there today, offering power tools both at the RT level and the physical verification subapplication (see Figure 4-22).

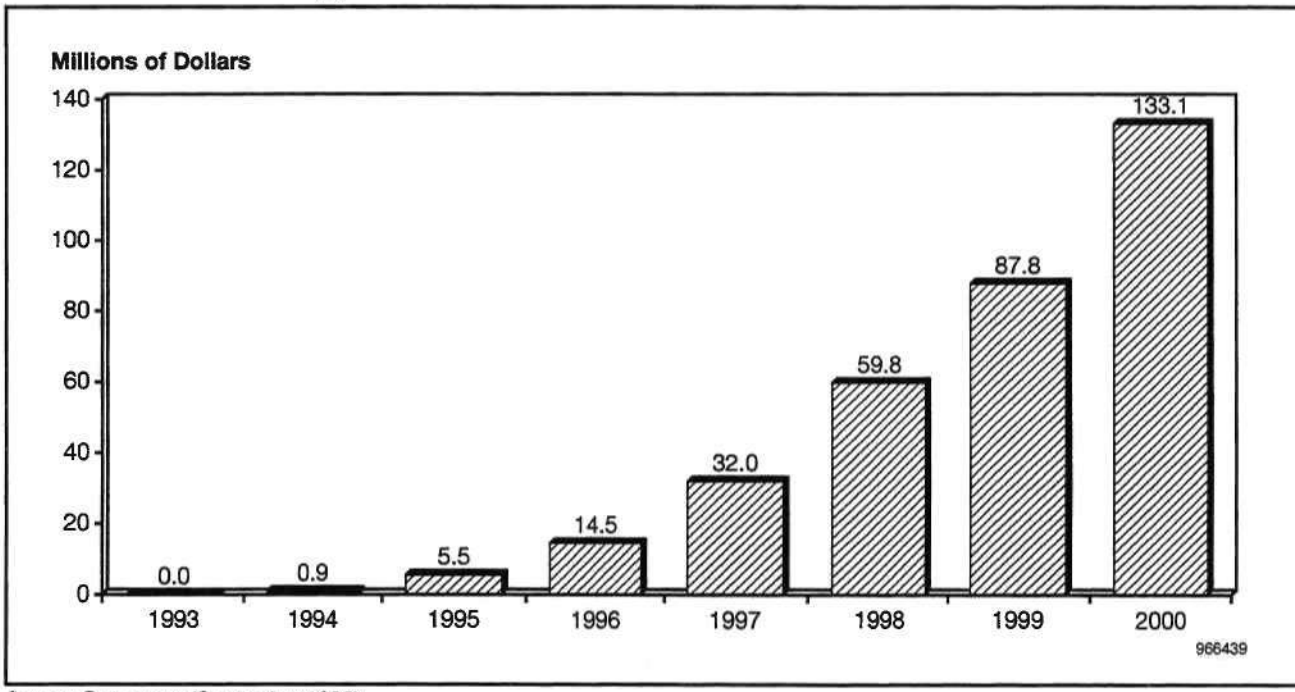
This subapplication (or sub-subapplication) will be the second-fastest growing area in EDA, with a 89.4 percent CAGR. But it's far bigger than that. Synopsys is the largest vendor in CAE today. It has grown to No. 1 by dominating the synthesis area. If Synopsys wins the race it will be in a position of becoming No. 1 in EDA without having to offer CAD tools, as Cadence and Mentor do. On the other hand, if Cadence wins, it will hold the high ground over the synthesis tool and can take the No. 1 position in CAE away from Synopsys. Stay tuned—this is really interesting (see Figure 4-23).

Figure 4-22
1995 Silicon Virtual Prototype Market Share



Source: Dataquest (September 1996)

Figure 4-23
Silicon Virtual Prototype Forecast

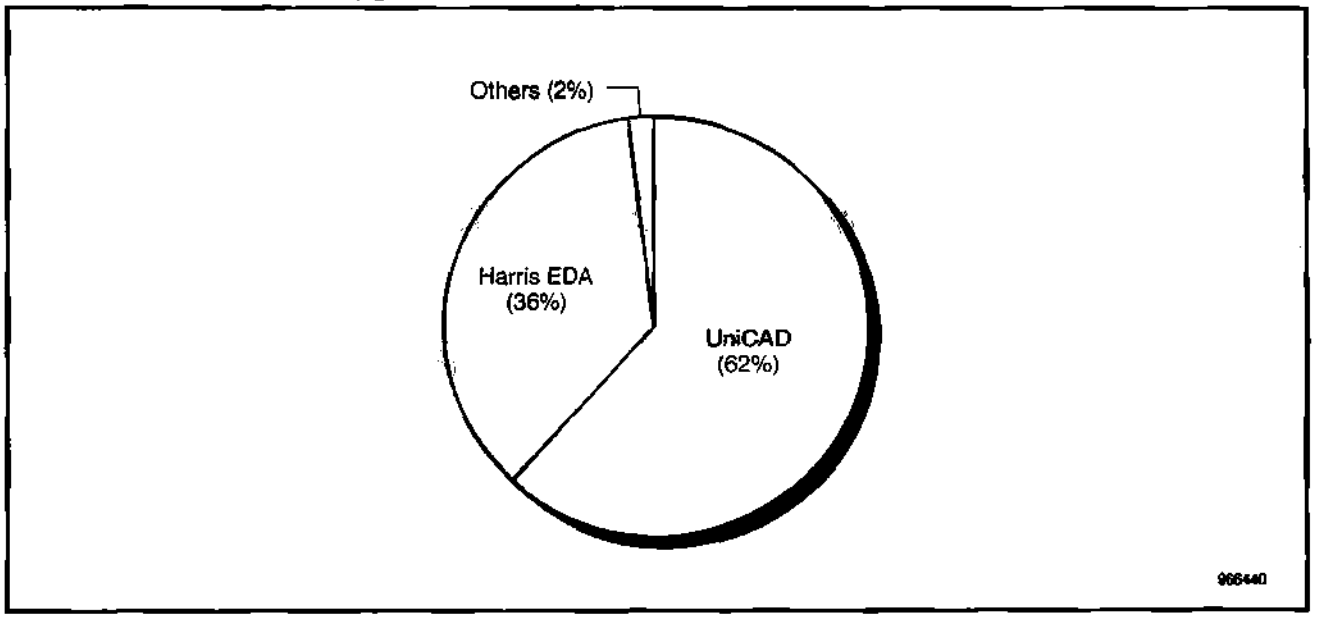


Source: Dataquest (September 1996)

PCB Virtual Prototype

There are three leading vendors in the PCB virtual prototype market. UniCAD comes in No. 1, Harris EDA No. 2 and Interconnectix Inc. is at No. 3. Interconnectix has had a good year and will show up as a major player in next year's Market Trends book. But it won't show up as Interconnectix because Mentor just bought it. In fact UniCAD will show up next year in the Cooper & Chyan's numbers unless someone buys Cooper in the meantime. So that leaves Harris EDA. Doesn't it make you wonder what it will show up as (see Figure 4-24)?

Figure 4-24
1995 PCB Virtual Prototype Market Share



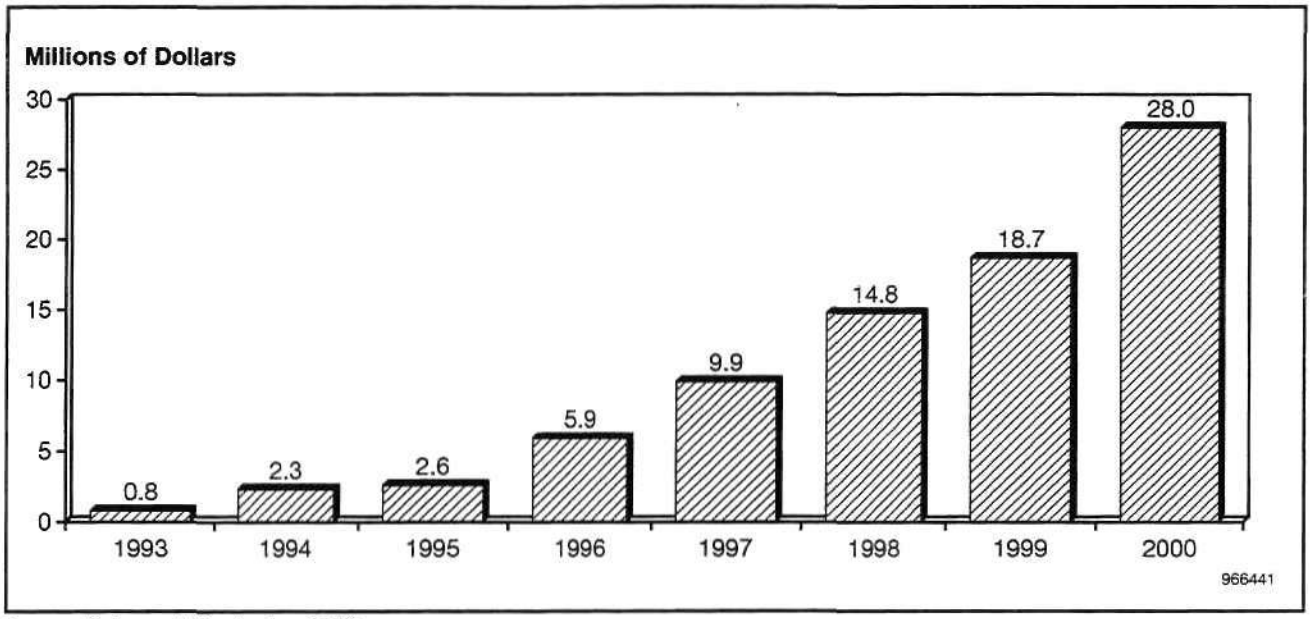
Source: Dataquest (September 1996)

This market isn't growing quite as fast as the silicon virtual prototype but you can't sneeze at a 60.7 percent CAGR. But more importantly, if a company wants to sell into tomorrow's high-speed board design market, it must have a PCB virtual prototype tool to drive the design (see Figure 4-25).

The Gate-Level Methodology

The gate-level methodology is continuing to lose its importance in the digital design world. We have forecast that it will grow 13.1 percent in the next three years. This is a little misleading as we have shifted the analysis subapplication into this area this year. Unfortunately, the dynamics of this market have once again shifted, and what was a good idea a year ago is not so good today. These tools are shifting in two directions. One incarnation of these tools will plug into the RTL virtual prototype, while another will join DRC to form the new physical verification subapplication in IC CAD. Once these tools are removed, the only gate-level growth area will be in the analog market.

Figure 4-25
PCB Virtual Prototype Forecast



Source: Dataquest (September 1996)

Schematic Capture

Once again, Autodesk leads in this subapplication. However, the Japanese company Wacom has passed Mentor to become No. 2. There are eight companies that hold a 5 percent or greater market share in the schematic capture market—three Japanese companies, the leading ready-to-use vendor VeriBest, and the leading shrink-wrapped vendor OrCAD (see Figure 4-26).

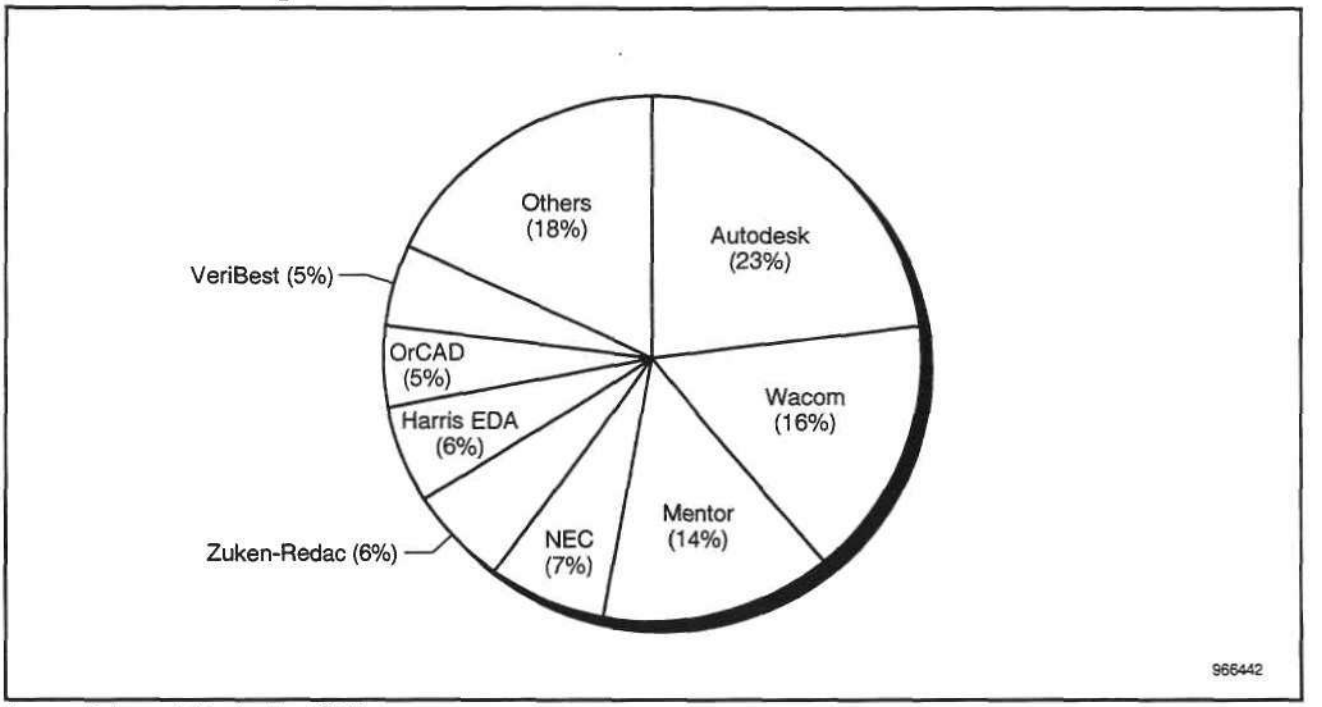
An informal survey, held during the PCB Design Show this spring, clarified the continued dominance of Autodesk in this subapplication. The question was how the low-end PCB design engineers designed their boards. Of particular interest was simulation. Last year's Dataquest User Wants and Needs survey showed 43 percent of all board designers didn't even own a simulator. The answer was that these engineers use spreadsheets, Excel or Lotus 123, for their timing analysis and do no simulation. Autodesk is a perfect tool for these low end users. We forecast a negative 3.5 percent growth in this subapplication (see Figure 4-27).

Gate-Level Simulation

This is another area that is going the way of the dodo bird. Gate-level simulation is too slow for large designs and not accurate enough for high-speed designs. Verilog and VHDL are slowly taking over this market. Mentor and Viewlogic, the two major mainstream vendors, have the one and two positions here. IKOS Systems Inc. holds down the No. 4 position based on its total verification tool set strategy—probably the only tool that will grow market share in the future. The other possibility is Aldec Inc., which is just starting its penetration into the shrink-wrapped market. Aldec has been well respected in the low-end market for years and its new market direction should be interesting to watch (see Figure 4-28).

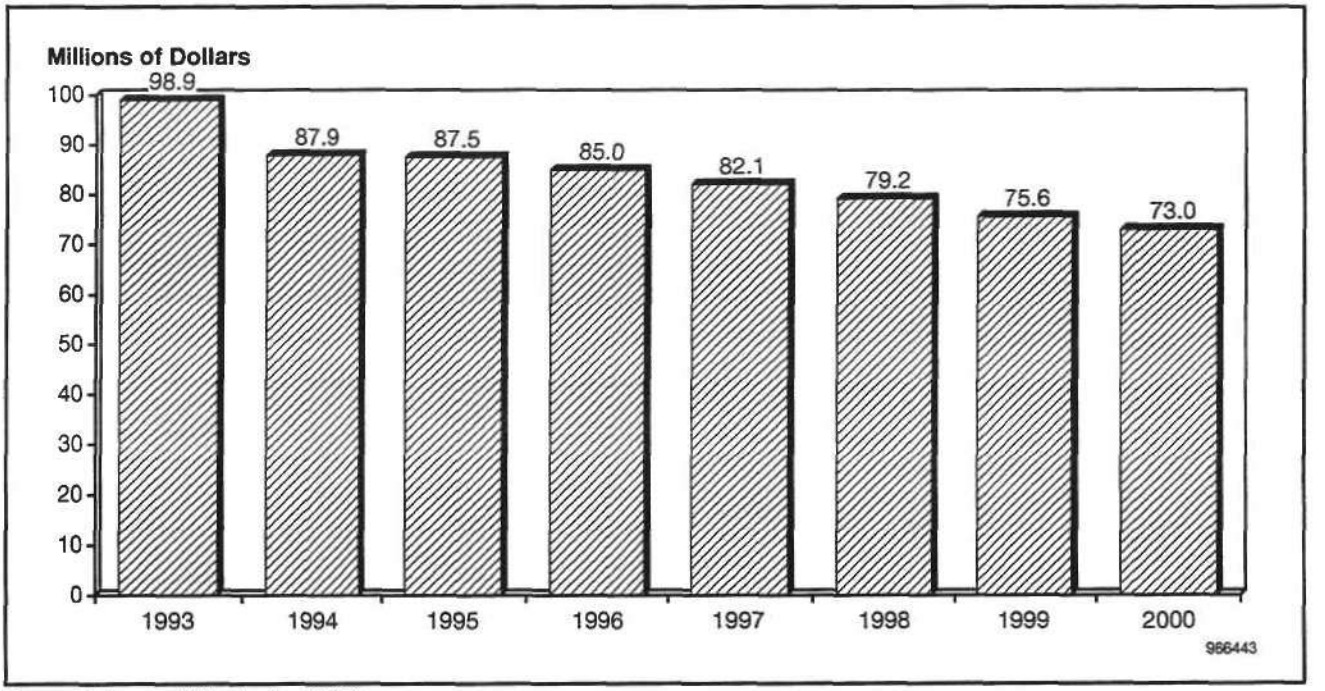
We continue our forecast of a steady decline in this market, a negative 19.7 percent CAGR (see Figure 4-29).

Figure 4-26
1995 Schematic Capture Market Share



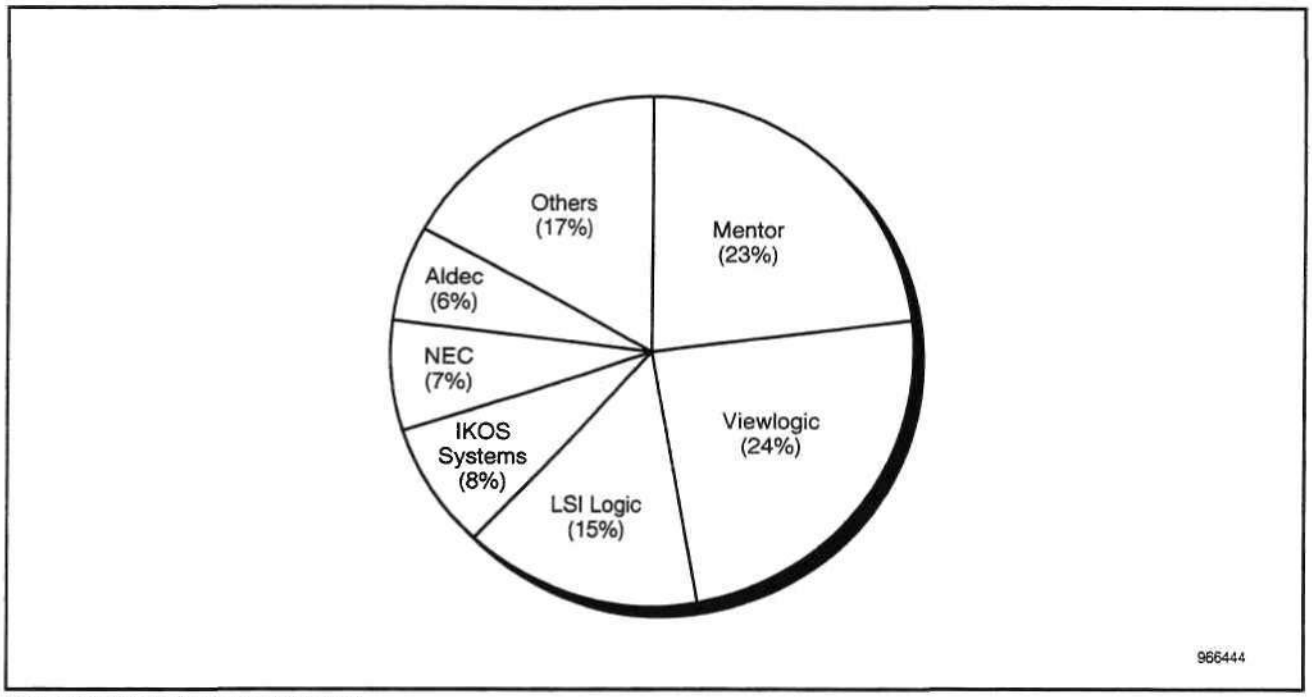
Source: Dataquest (September 1996)

Figure 4-27
Schematic Capture Forecast



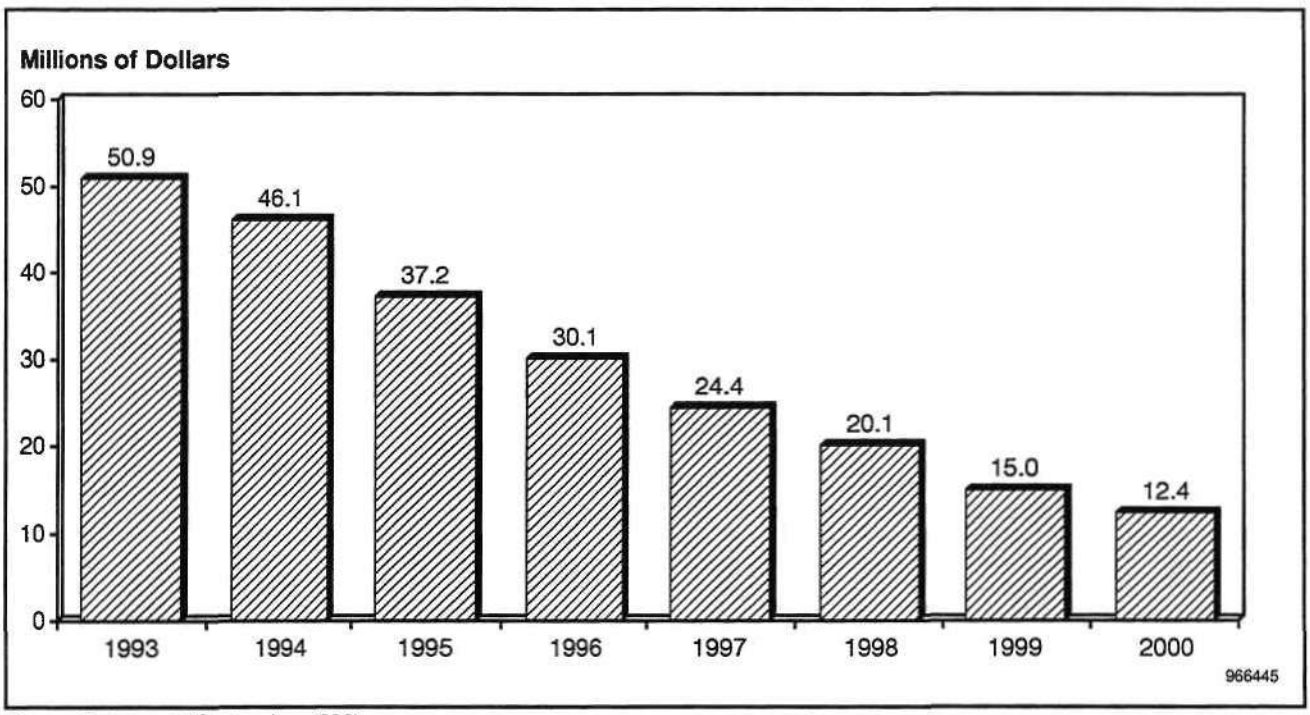
Source: Dataquest (September 1996)

Figure 4-28
1995 Gate-Level Simulation Market Share



Source: Dataquest (September 1996)

Figure 4-29
Gate-Level Simulation Forecast

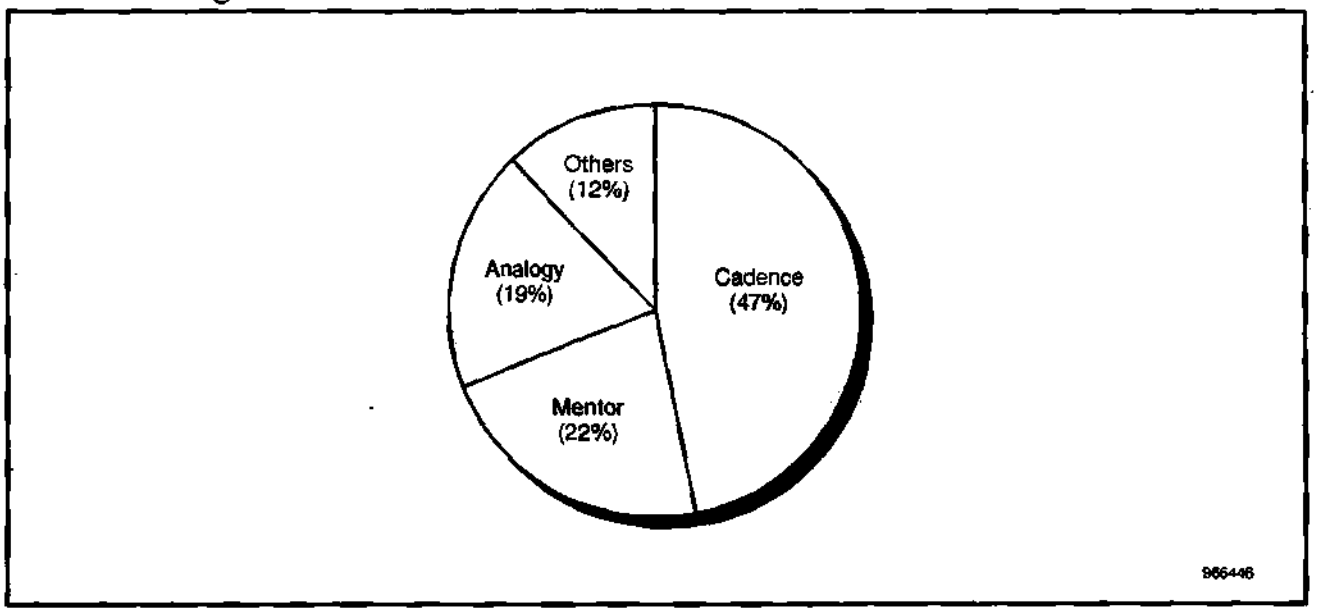


Source: Dataquest (September 1996)

Mixed Signal Simulation

The major growth area at the gate level category is mixed signal simulation. Unfortunately this is another area that is in transition. The introduction of Verilog-A and VHDL-A will move this technology from the gate level up into the RT level. Cadence continues to lead this subapplication but it has lost market share to both Mentor and Analogy Inc. this year (see Figure 4-30).

Figure 4-30
1995 Mixed Signal Simulation Market Share



Source: Dataquest (September 1996)

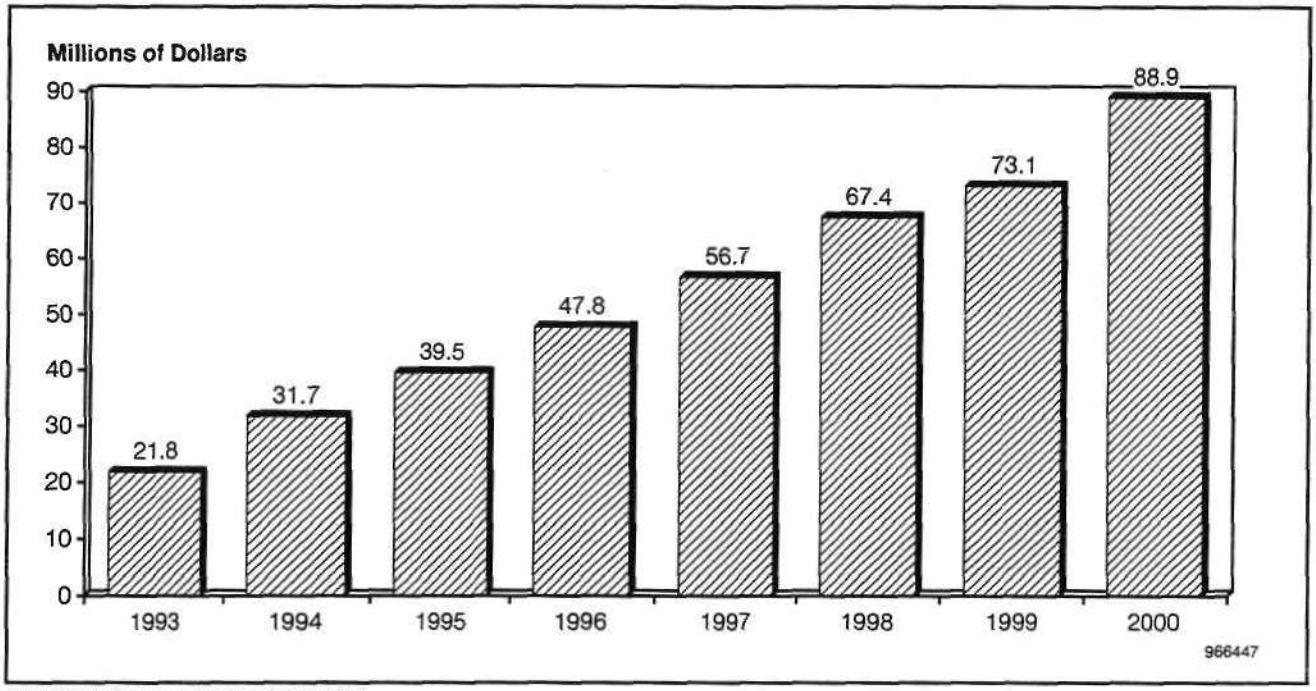
Meta-Software Inc. introduced a Verilog-A simulator this year that not only will impact the market, but insures Verilog-A will be viable in the future. If Cadence had tried to go it alone, as it did originally with Verilog, it probably wouldn't have gotten off the ground. We have forecast a 17.6 percent growth in this subapplication (see Figure 4-31).

Analog Simulation

Hewlett-Packard Company's HP EEsof Divison continues to lead in this market with its RF simulation products. Next year we will take another look at spinning frequency-based simulation into a separate subapplication, but today it still doesn't make too much sense. Cadence has entered the RF simulation market and traditional RF vendors such as Compact Software have started to pick up sales volume. We'll have to see how it looks in the next survey. Mentor took a major leap, grabbing 5 percent market share. It is now No. 3 behind Cadence (see Figure 4-32).

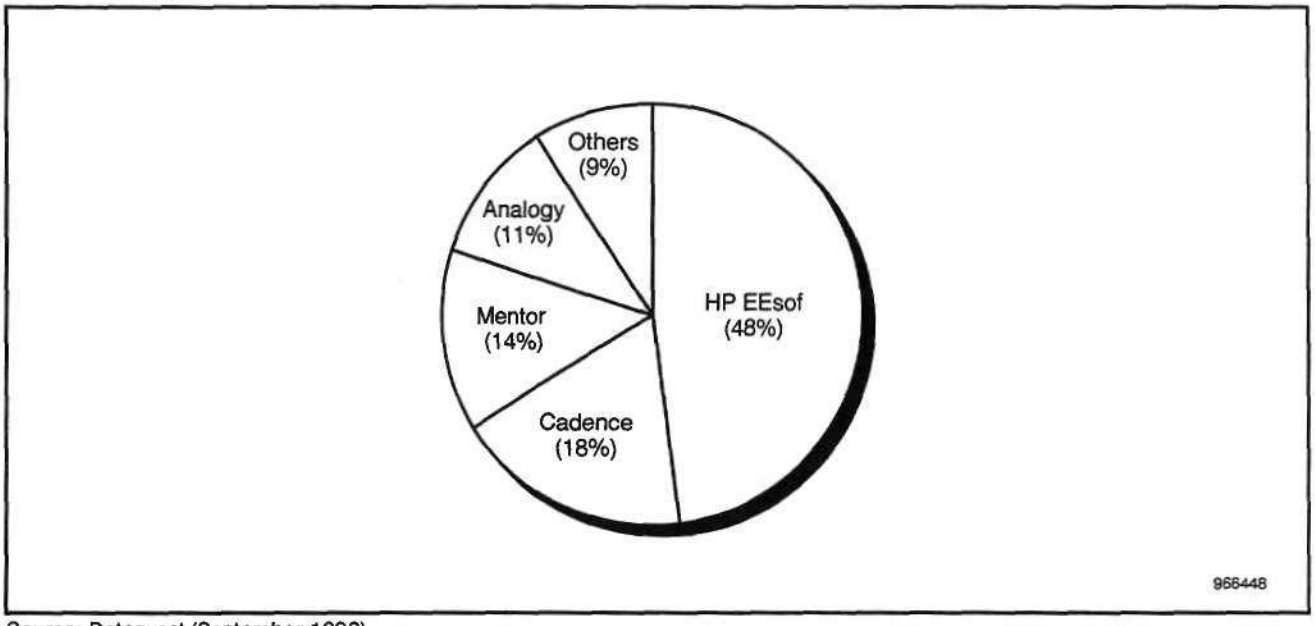
There is an aspect of the new RTL methodology that most people have missed. What the industry is trying to do is devise a methodology that takes into account the analog affects of high speed, interconnect intensive, sub 0.35 micron silicon design. Once the industry solves these problems, it will have not only solved the digital design problem but, it will have come up with a methodology to automate analog design. This and the increased availability of component level libraries will drive this market to a 11.2 percent growth rate (see Figure 4-33).

Figure 4-31
1995 Mixed Signal Simulation Market Share



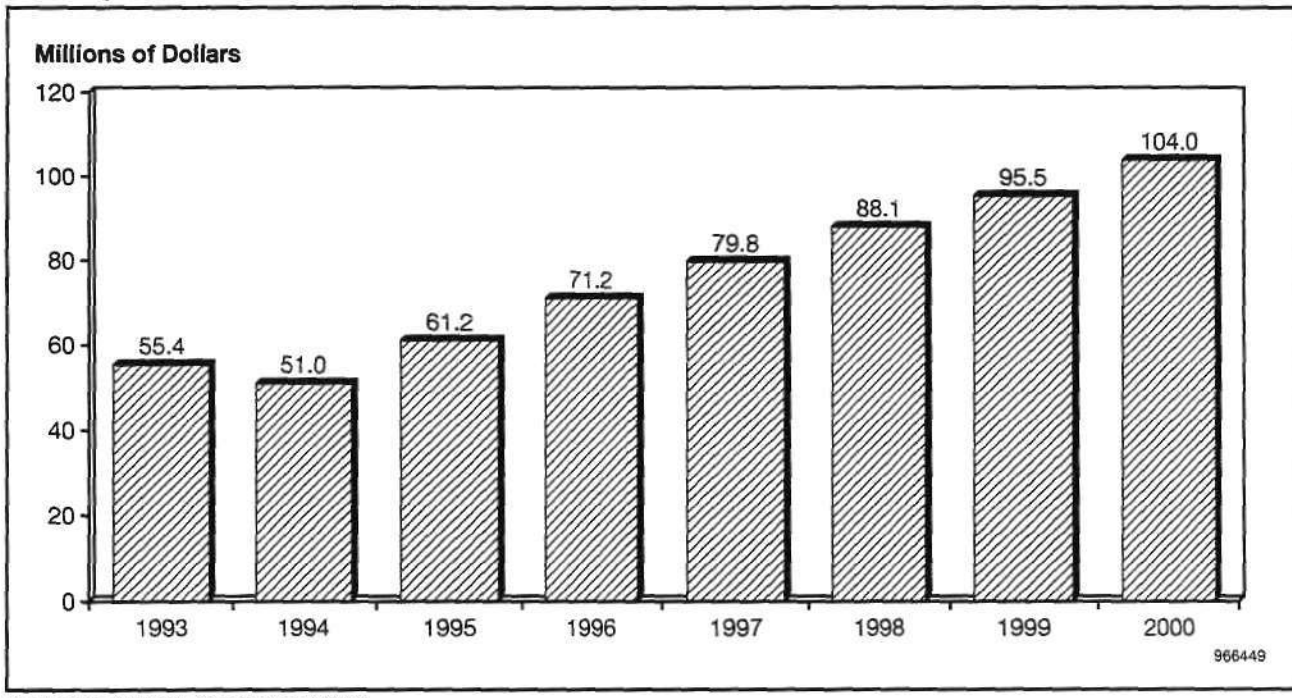
Source: Dataquest (September 1996)

Figure 4-32
1995 Analog Simulation Market Share



Source: Dataquest (September 1996)

Figure 4-33
Analog Simulation Forecast



Source: Dataquest (September 1996)

SPICE Simulation

SPICE grew 17.9 percent in 1995, causing us to re-examine our growth forecast. It is not yet clear whether the SPICE-like simulators will have the expected impact on this market. Our User Wants and Needs survey showed a lot of companies developing their own internal variations on the classic Berkeley SPICE simulator. MicroSim Corp. continues to hold the No. 1 position by dominating the board design market, and Meta-Software continues to hold No. 2 by dominating the silicon design market. The Japanese company Contec Microelectronics Inc. has joined the fray at the No. 4 position behind Cadence (see Figure 4-34).

We have upped the SPICE forecast and are now showing a 7.3 percent CAGR (see Figure 4-35).

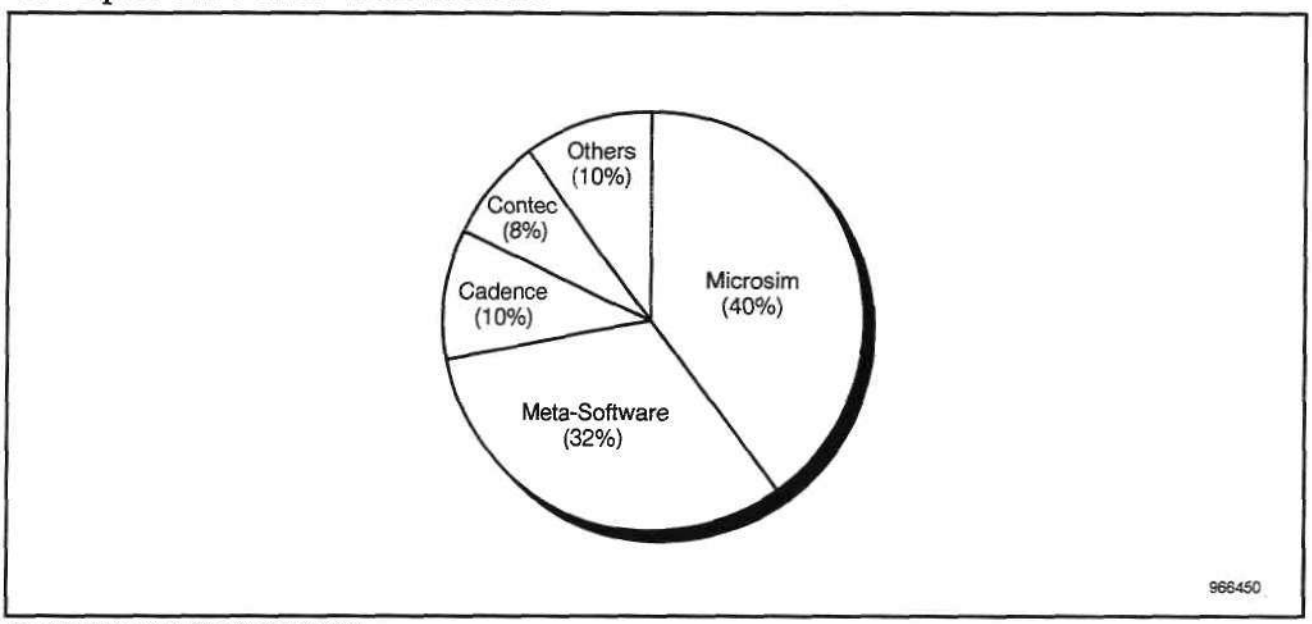
Analysis Tools

Here we seem to have the gypsies of the EDA market. Listed in miscellaneous last year, we decided at the first of the year to move them into the gate level. Now we are seeing them split with one configuration migrating to the RT level and another headed down to the CAD realm. One thing is certain—this is a fast-growing subapplication showing a 40.9 percent five-year CAGR.

EMI

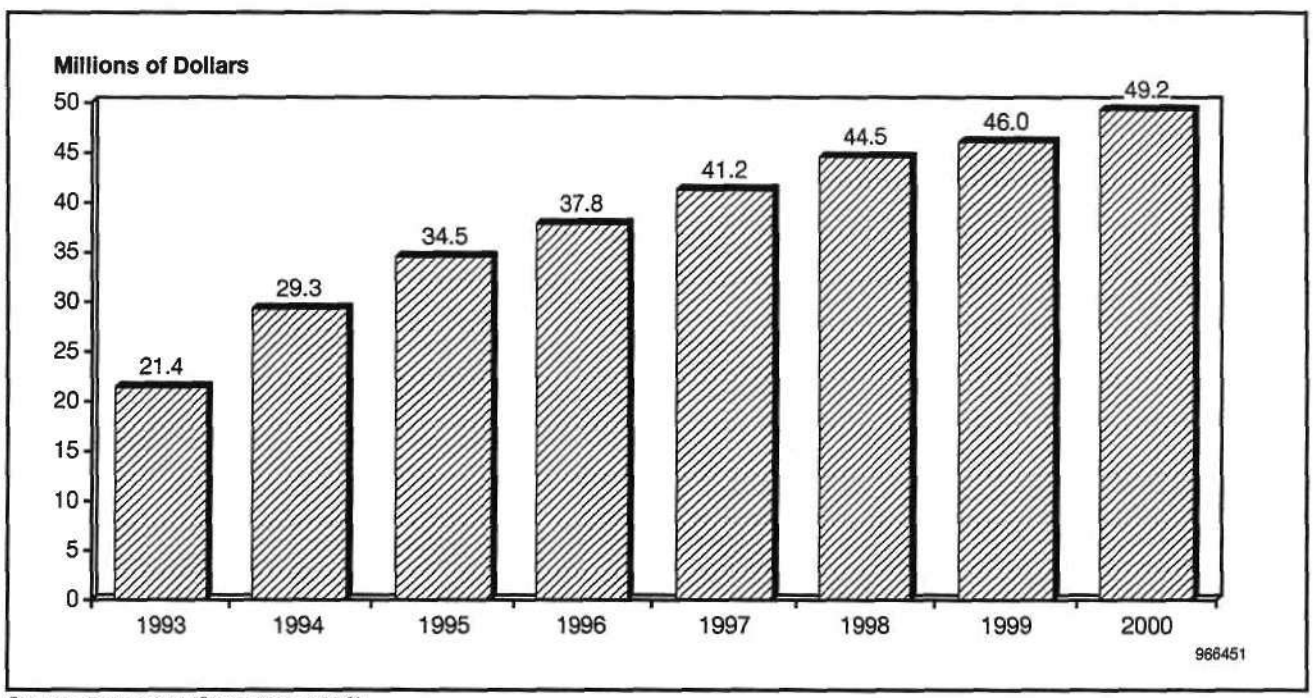
Electromagnetic interference lost its No. 2 spot in the five sisters to power this year. Still, with the new European specifications going into effect in 1997, we should see good sales. Ansoft Corp. dominates this market with a 79 percent market share (see Figure 4-36).

Figure 4-34
1995 Spice Simulation Market Share



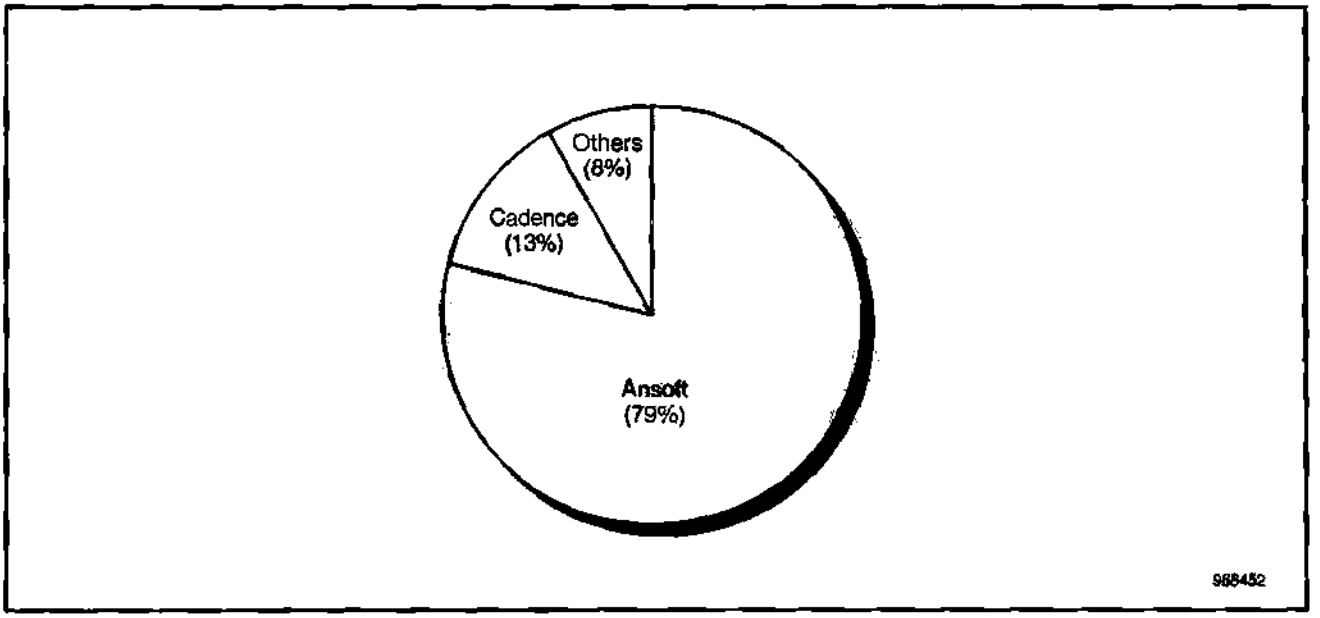
Source: Dataquest (September 1996)

Figure 4-35
SPICE Simulation Forecast



Source: Dataquest (September 1996)

Figure 4-36
1995 EMI Market Share



Source: Dataquest (September 1996)

We should see some acquisition action in this area this year. EMI tools will become part of the physical verification tool suite. This sub-subapplication will grow at a 26.4 percent rate (see Figure 4-37).

Power Analysis

Power analysis grabbed the majority of attention—and growth—this year. It also became evident that power analysis was not just for low-power design. The major application will be in the detection of hot spots in an IC design. This means that all silicon designers need these tools, not just the handheld guys. Epic dominates this area with 88 percent market share. Synopsys comes in second (see Figure 4-38).

Sente is another company to watch. It has introduced a tool for the RTL virtual prototype and a tool for the physical verification market. This market became the largest analysis tool sub-subapplication and will continue to grow at a 51.6 percent CAGR (see Figure 4-39).

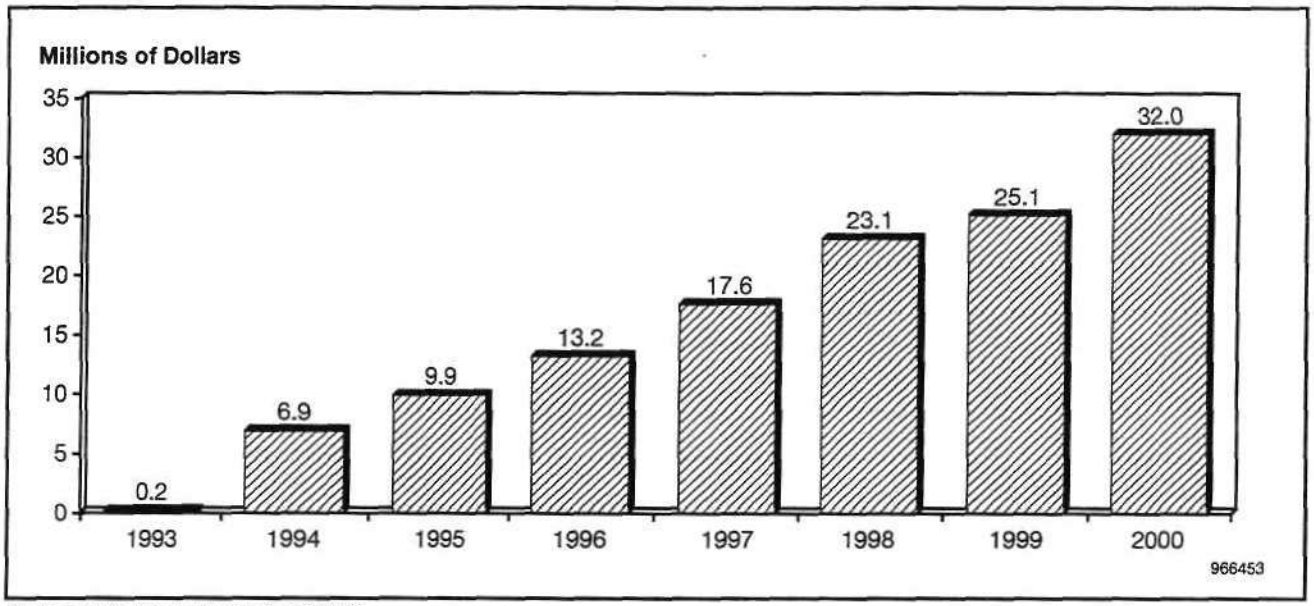
Thermal Analysis

This is the mystery analysis tool. It continues to report low sales in EDA, reporting most of its sales in the mechanical world. The question is, will it become a factor or not? There is a small group of engineers who do not believe that power analysis tools will be sufficient in tomorrow's IC design. They feel that a version of a thermal analysis tool will be needed to keep us from burning up our silicon. Mentor is the only company that reported significant thermal analysis tool sales in 1995 (see Figure 4-40).

Signal Integrity

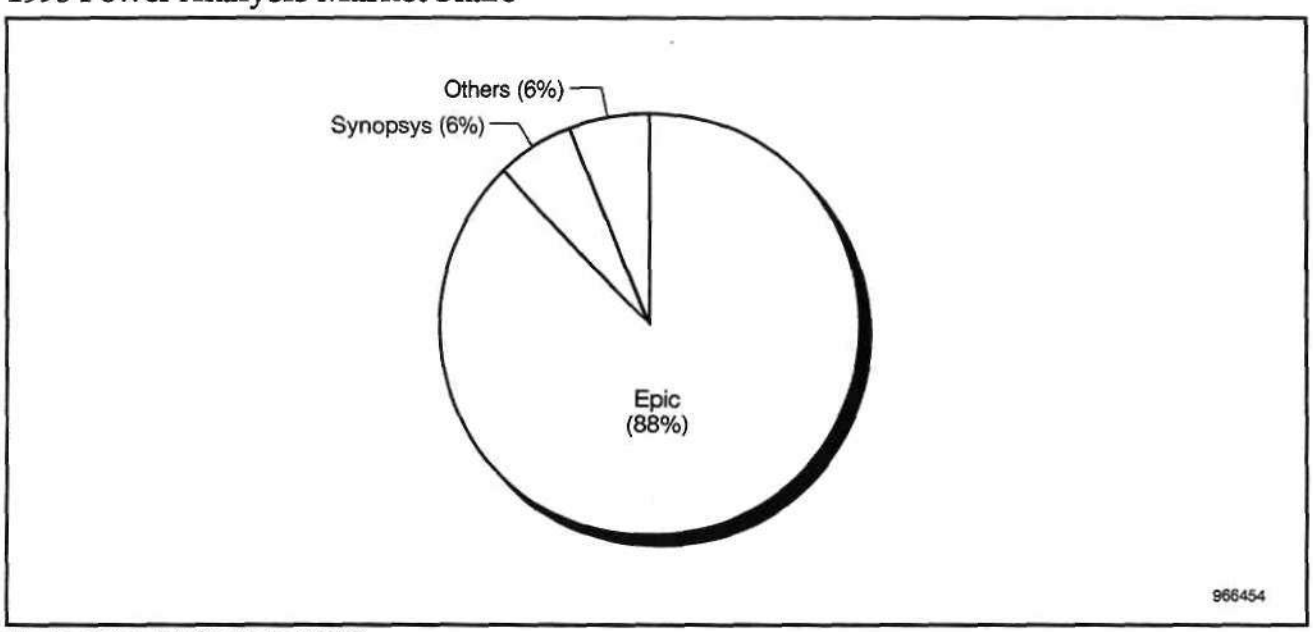
Signal integrity once was the only analysis tool that mattered. That has changed. Viewlogic's Quad Design has continued to hold onto first place, followed by Quantic Laboratories and Mentor (see Figure 4-41).

Figure 4-37
EMI Market Forecast



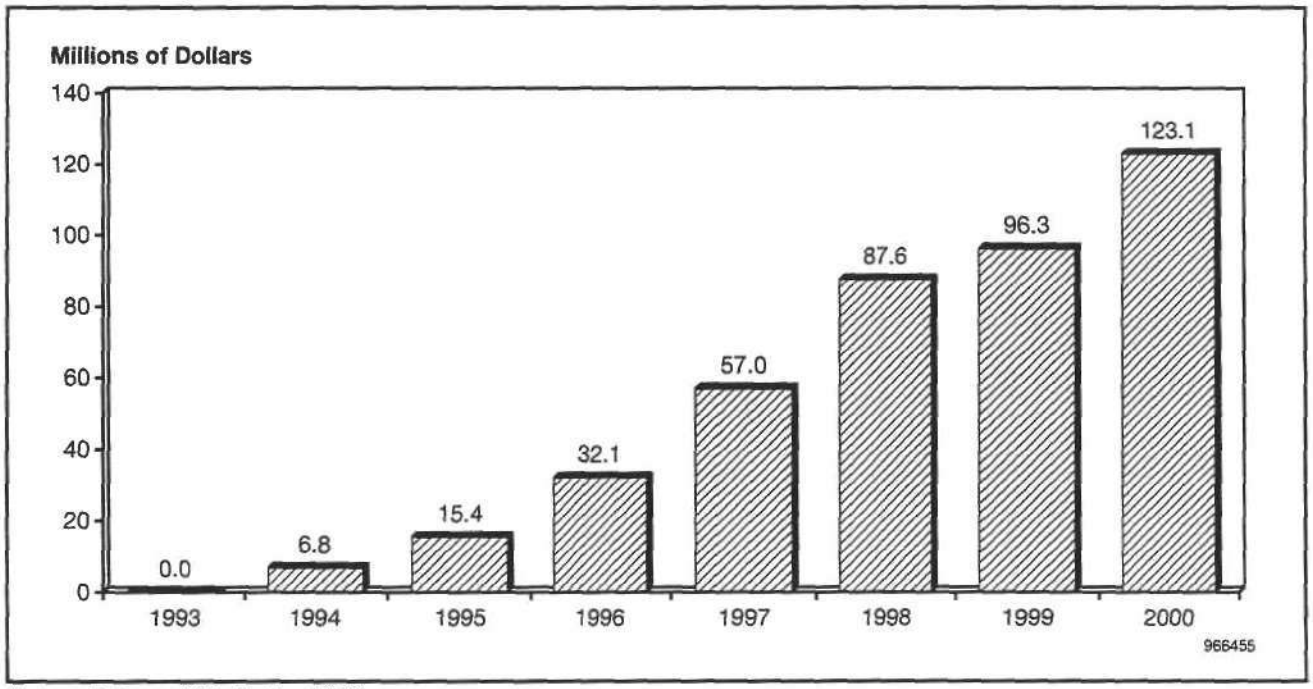
Source: Dataquest (September 1996)

Figure 4-38
1995 Power Analysis Market Share



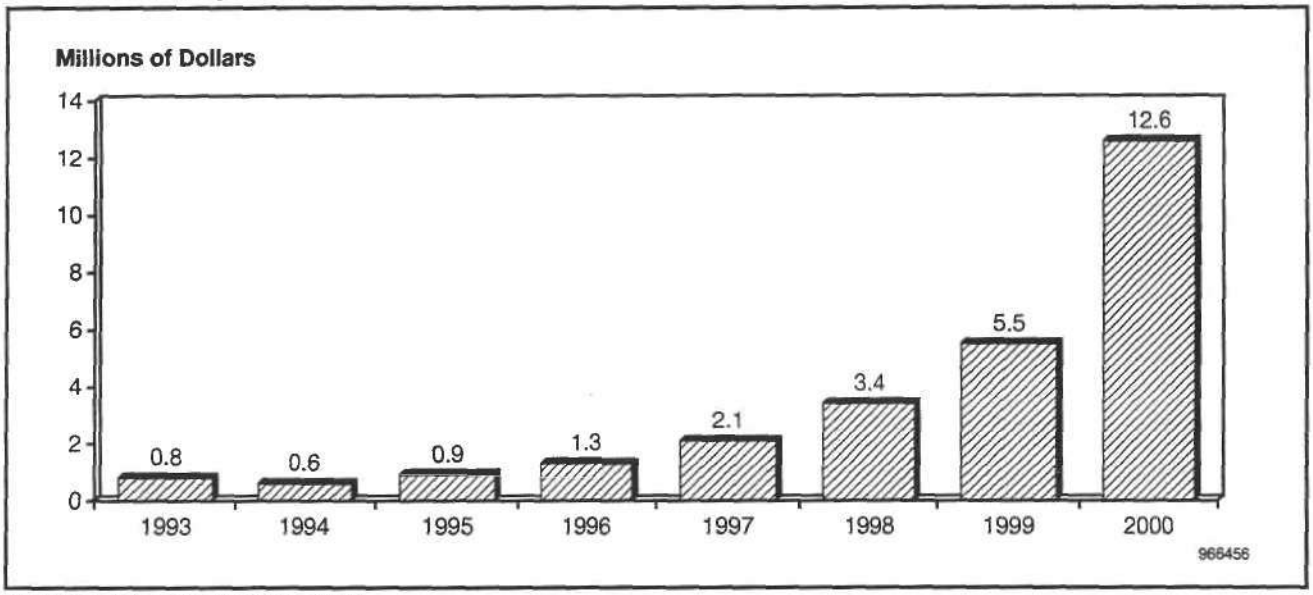
Source: Dataquest (September 1996)

Figure 4-39
Power Analysis Forecast



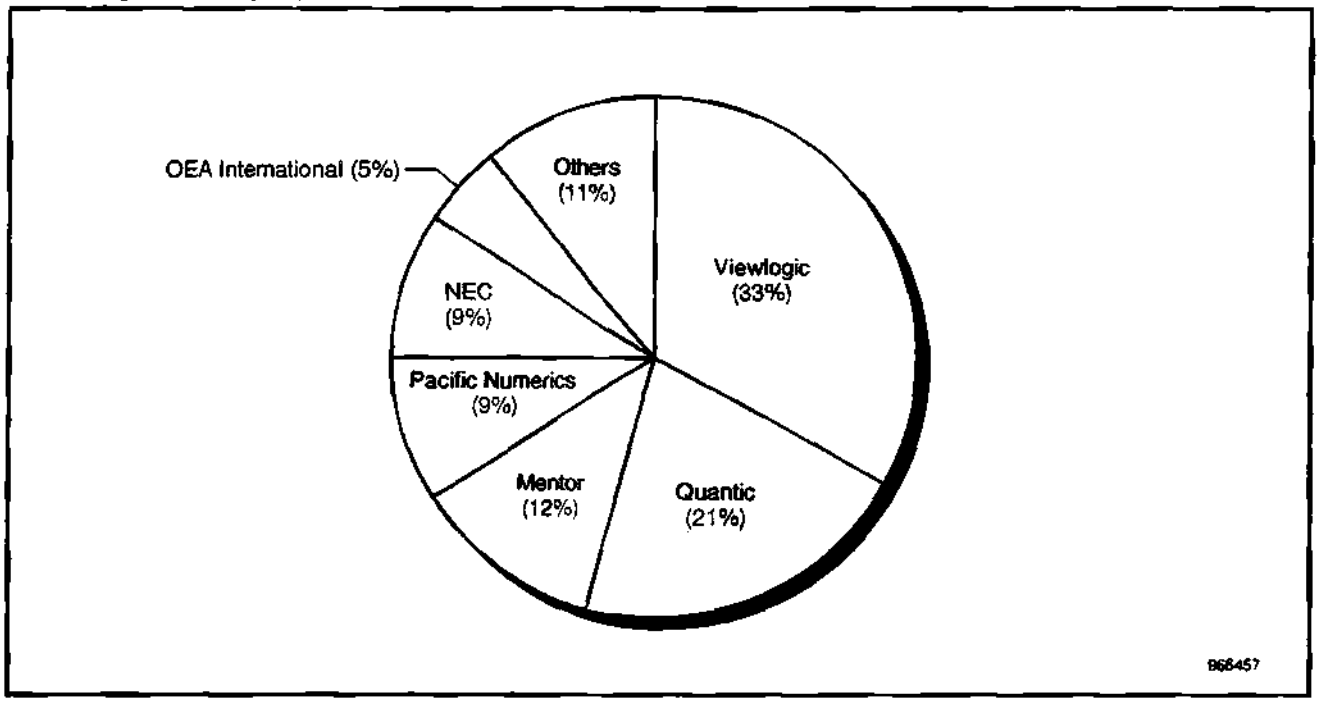
Source: Dataquest (September 1996)

Figure 4-40
Thermal Analysis Forecast



Source: Dataquest (September 1996)

Figure 4-41
1995 Signal Integrity Market Share



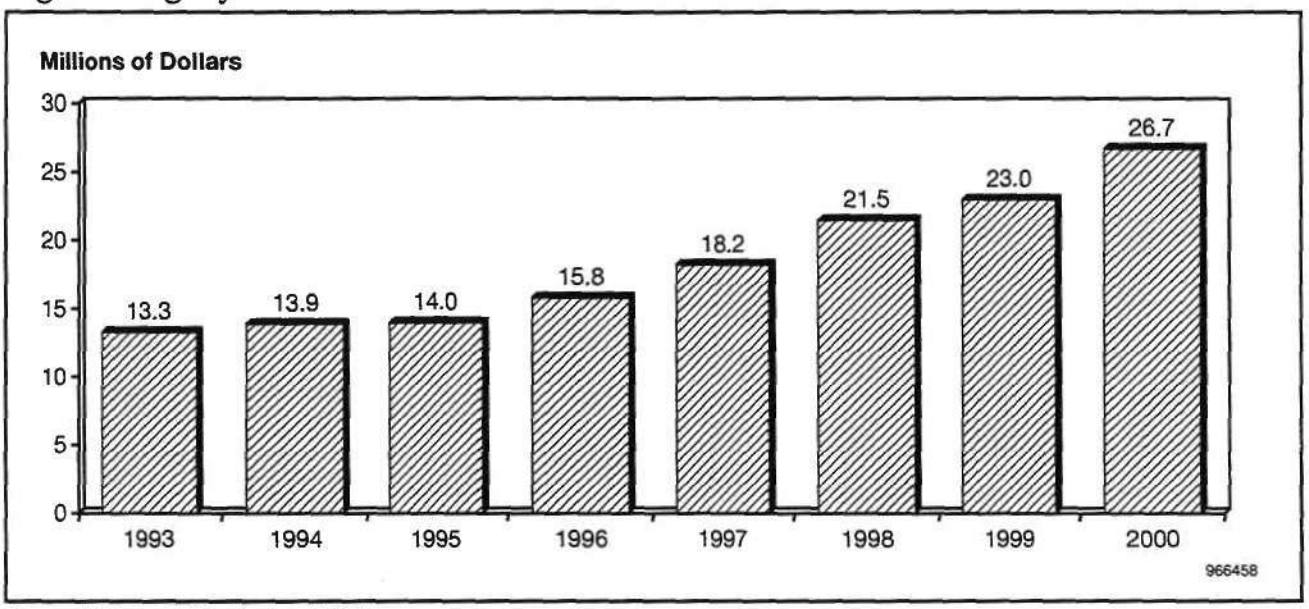
Source: Dataquest (September 1996)

We are predicting fairly average growth in this segment—13.7 percent over the next five years (see Figure 4-42).

Metal Migration

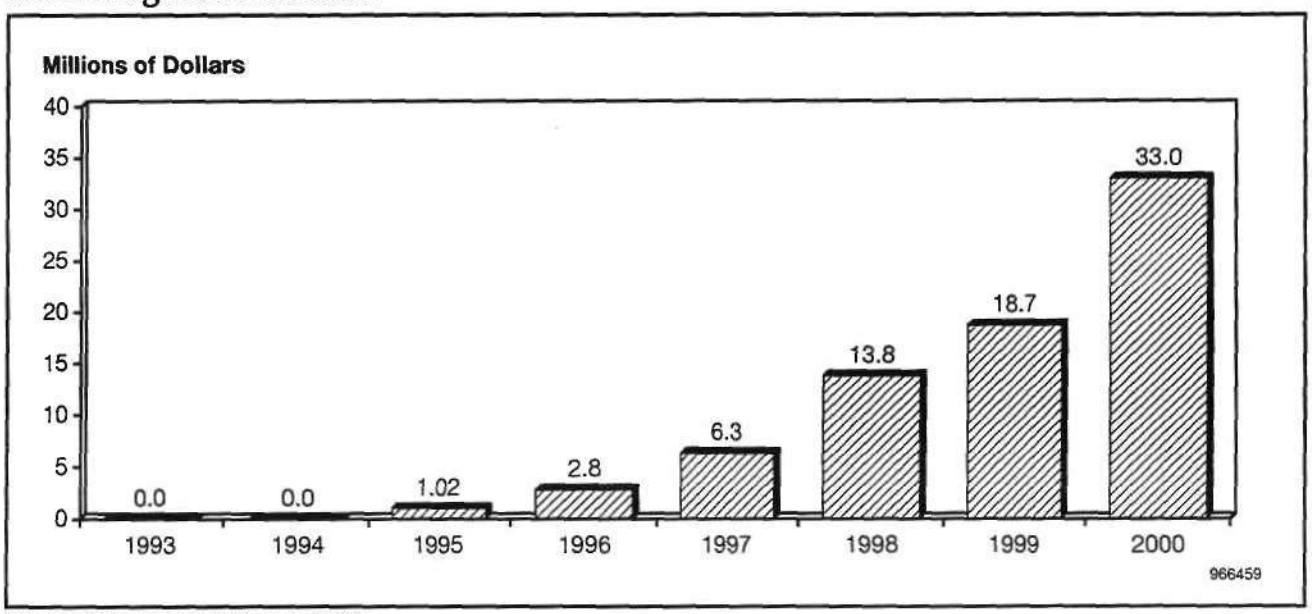
Metal migration is the new analysis tool. Electro migration is a common term for this effect. However, in discussing the five sisters with engineers, it became evident that the term electromigration was being confused with electro magnetic interference (EMI). We therefore decided to go back to the label we used in the early 1970s when the RF transistor designers first ran into the problem. Motorola did some of the classic studies of this phenomena. What happens is that the metal lines move. This sooner or later creates shorts in the design. This is a design-dependent failure. The exciting part is that every IC using the faulty design will fail, often within a two- or three-week period. And if these ICs are in the field, it gets to be a very interesting customer service problem. We expected to start seeing metal migration failures in 1997. We were off by a year. There have been three failures reported at three different semiconductor manufacturers. Fortunately all three were caught at product qualification burn-in. It is good news for Epic, which owns the market today (see Figure 4-43).

Figure 4-42
Signal Integrity Forecast



Source: Dataquest (September 1996)

Figure 4-43
Metal Migration Forecast



Source: Dataquest (September 1996)

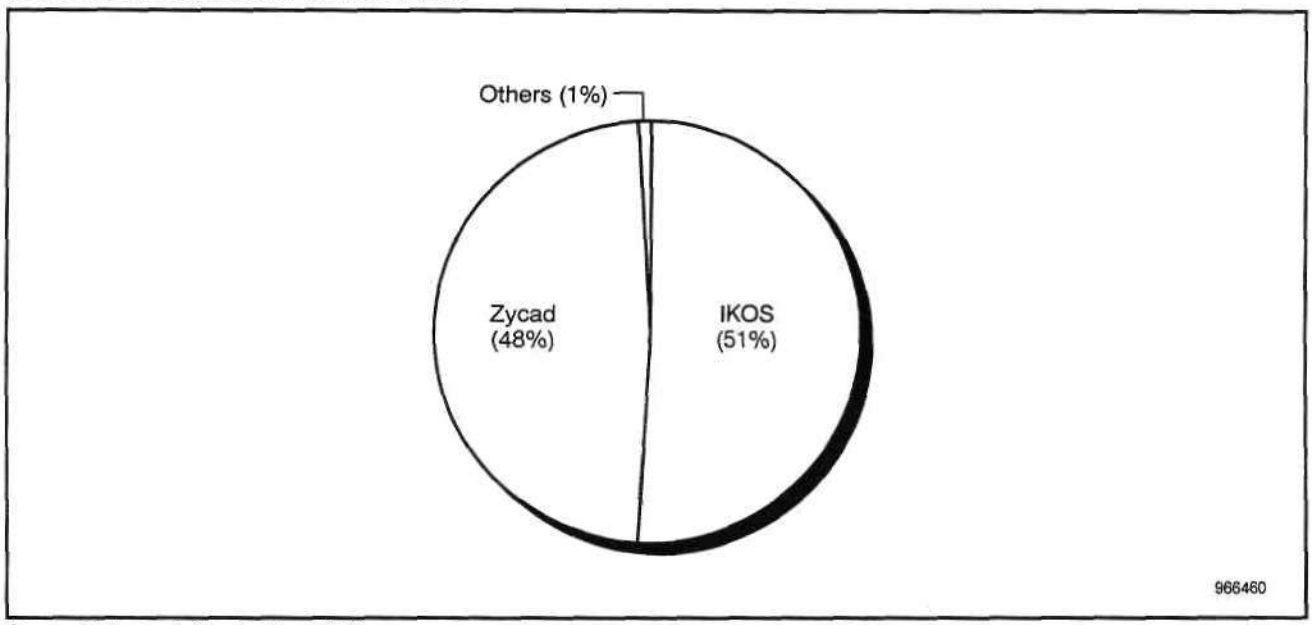
Miscellaneous CAE Tools

The miscellaneous category is comprised of tools that fit in multiple methodologies. Some of these tools migrate into specific methodologies, as has the analysis tools. The two largest subapplications here are emulation and libraries.

Acceleration

This was a big year in acceleration. IKOS, buoyed by a strategy of attacking the entire verification problem, has taken over the No. 1 spot from Zycad Corp. Zycad has been distracted in recent years by an attempt to enter the FPGA market (see Figure 4-44).

Figure 4-44
1995 Acceleration Market Share



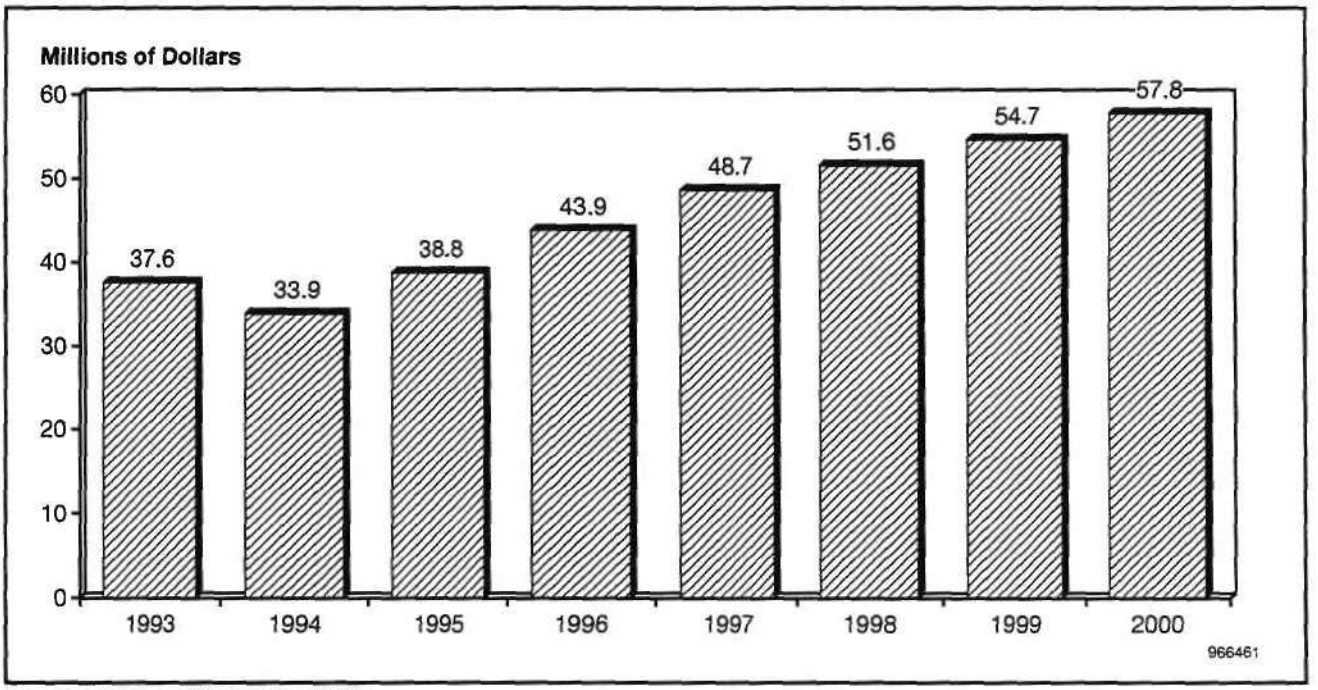
Source: Dataquest (September 1996)

This subapplication will continue with moderate growth, coming in at a 8.3 percent CAGR (see Figure 4-45).

Emulation

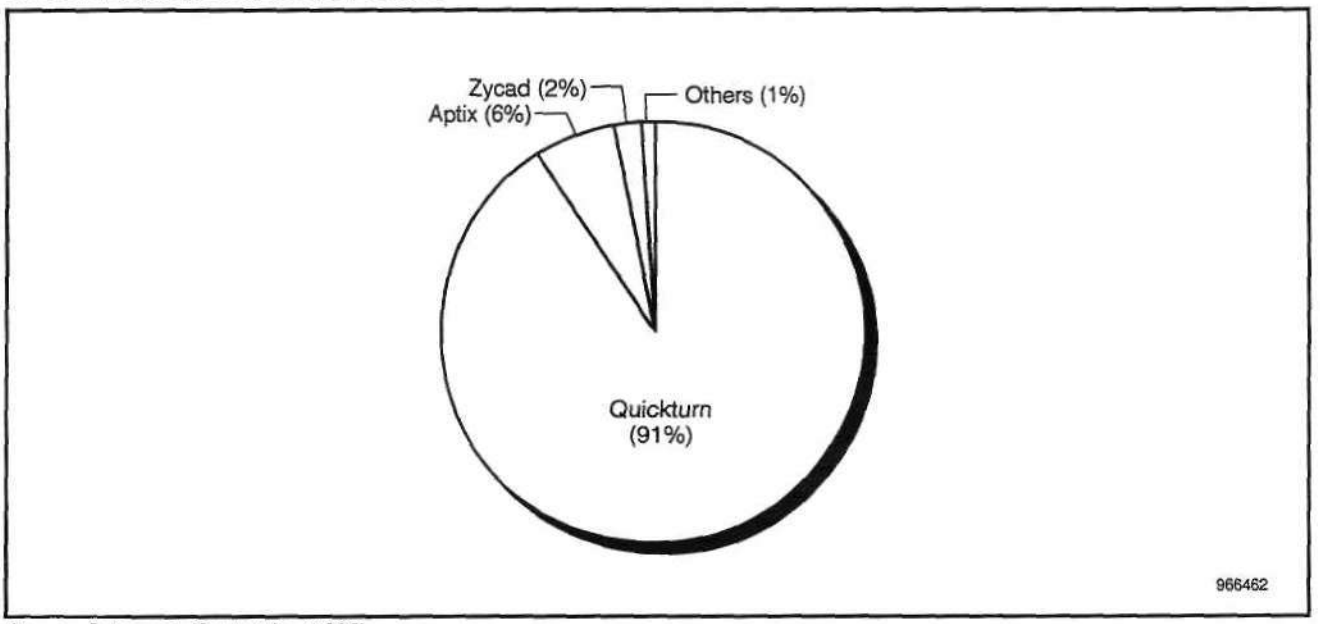
This is one of the most exciting areas in EDA. Emulation is spreading into all methodologies. Synopsys bought Arkos Design Inc. to target the ESL virtual prototype. Emulation is a must-have to do hardware/software codesign. Mentor followed suit by buying Meta Systems in France. In the meantime Zycad dropped its emulation efforts leaving Quickturn Design Systems Inc. once again the only gate-level player. But not for long, as IKOS bought Virtual Machine Works, targeting the gate-level market. Aptix continued as the lone player targeting the RTL area, and grew their market share by 1 percent. This year will be different, as both Mentor and Synopsys are now also targeting the RTL virtual prototype and Quickturn has joined them with its new emulator. Still, in 1995, Quickturn was king—the company actually increased its market share by 1 percent (see Figure 4-46).

Figure 4-45
Acceleration Forecast



Source: Dataquest (September 1996)

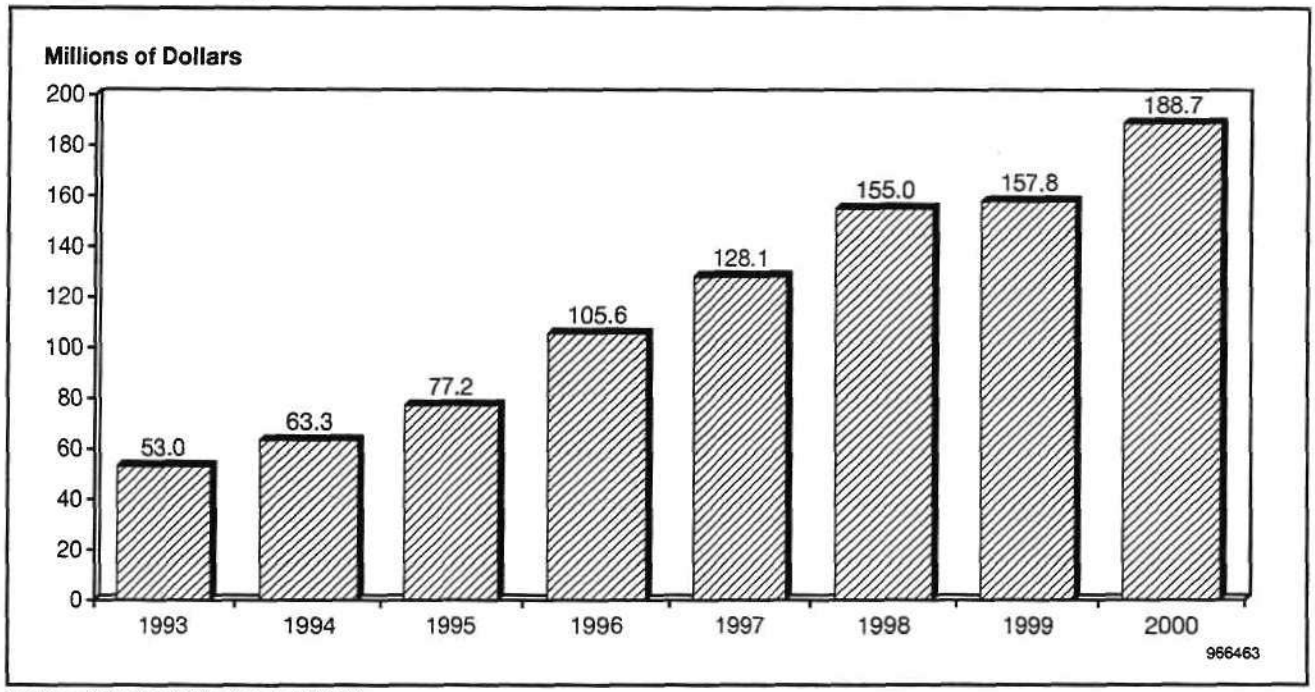
Figure 4-46
1995 Emulation Market Share



Source: Dataquest (September 1996)

Growth continues strong. This year the subapplication will exceed $100 million dollars. The competitive activity will continue hot and heavy; Quickturn has its work cut out, but it seems to be handling it quite well (see Figure 4-47).

Figure 4-47
Emulation Forecast



Source: Dataquest (September 1996)

Fault Simulation

There isn't a lot to say about fault simulation. Zycad continues to grow its market dominance but primarily because the market is moving into DFT (see Figure 4-48).

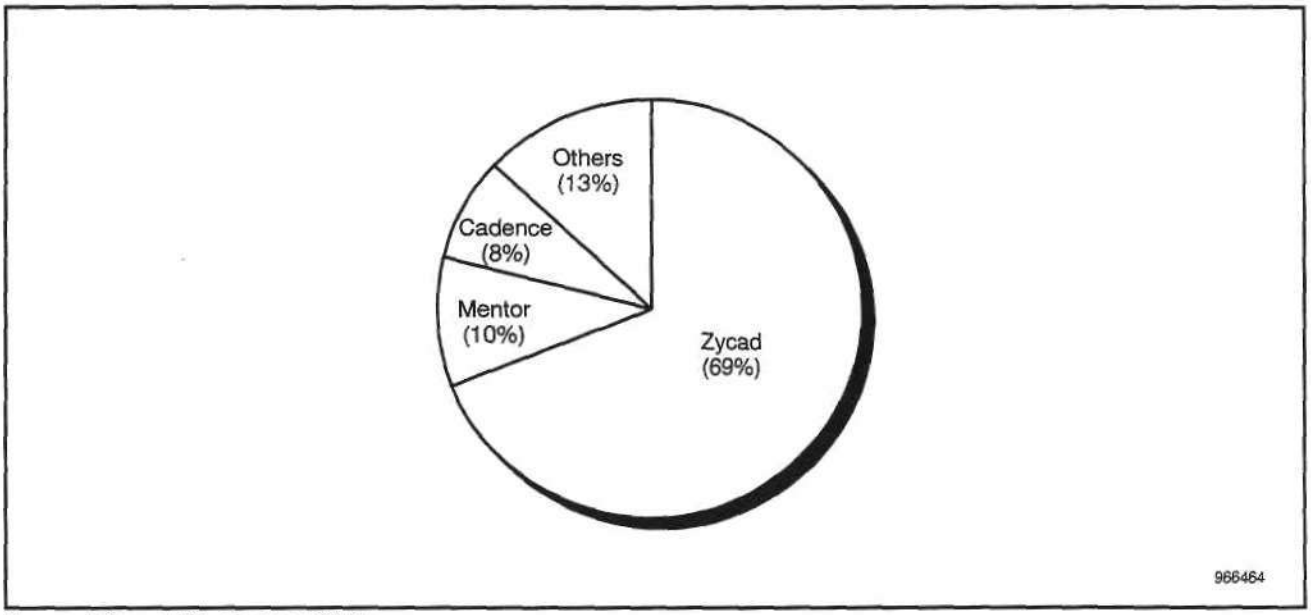
The market will continue to decline as the fault simulator becomes a standard part of the design-for-test tool set. Zycad's hardware implementation is what will remain (see Figure 4-49).

Interoperability Tools

These tools are starting to take on a nonframework characteristic. Basically the great ideas that were buried in frameworks are now coming to the surface. Mentor's market share grew based on the old Falcon framework; however, we expect to see a shift to the new interoperability tools this year (see Figure 4-50).

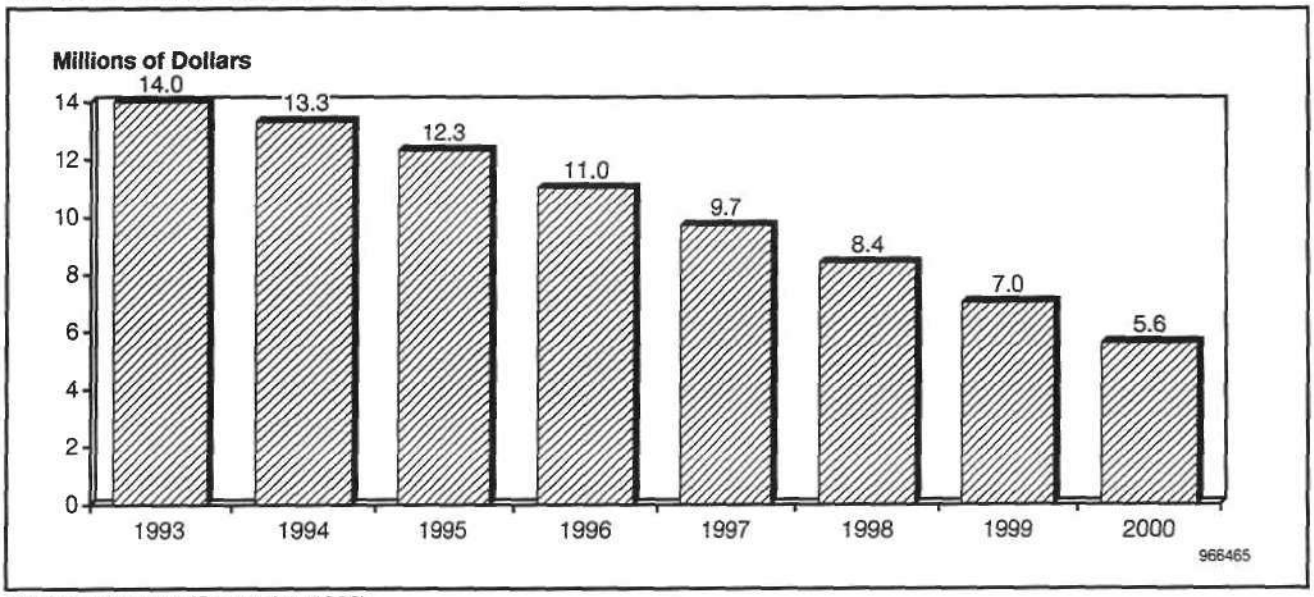
The market continues its decline in 1995, but we are predicting the new tool introductions will start another growth phase. This will be interrupted in the slowdown, predicted for 1999, but will then continue its growth (see Figure 4-51).

Figure 4-48
1995 Fault Simulation Market Share



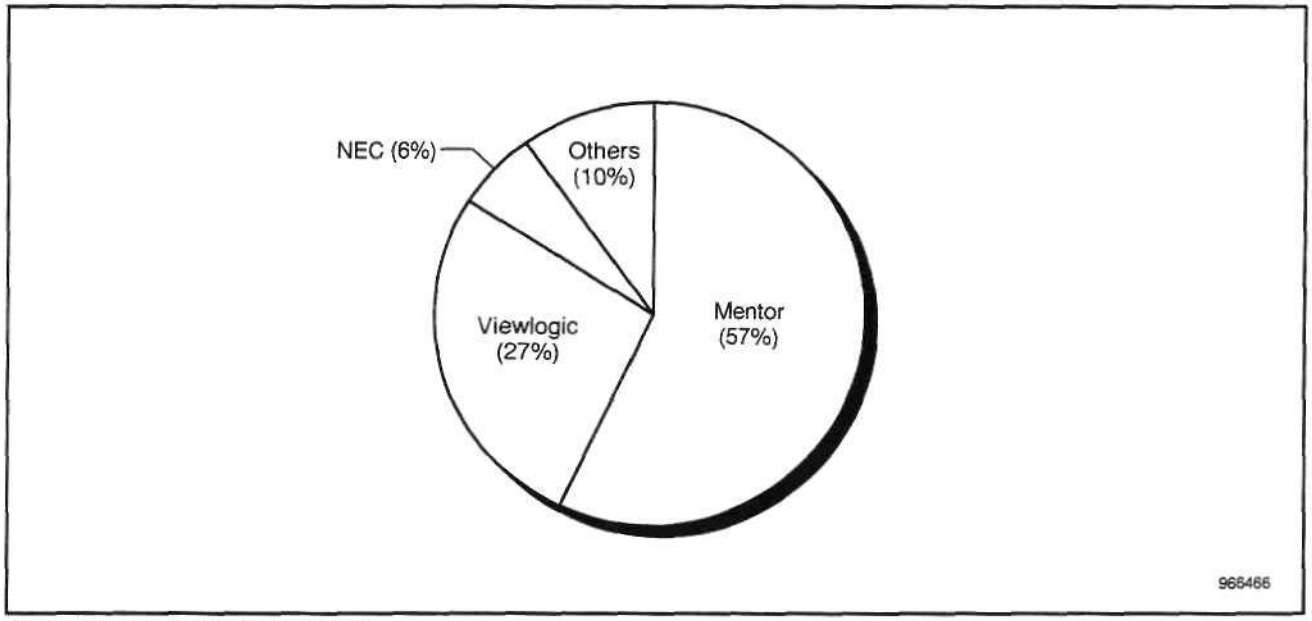
Source: Dataquest (September 1996)

Figure 4-49
Fault Simulation Forecast



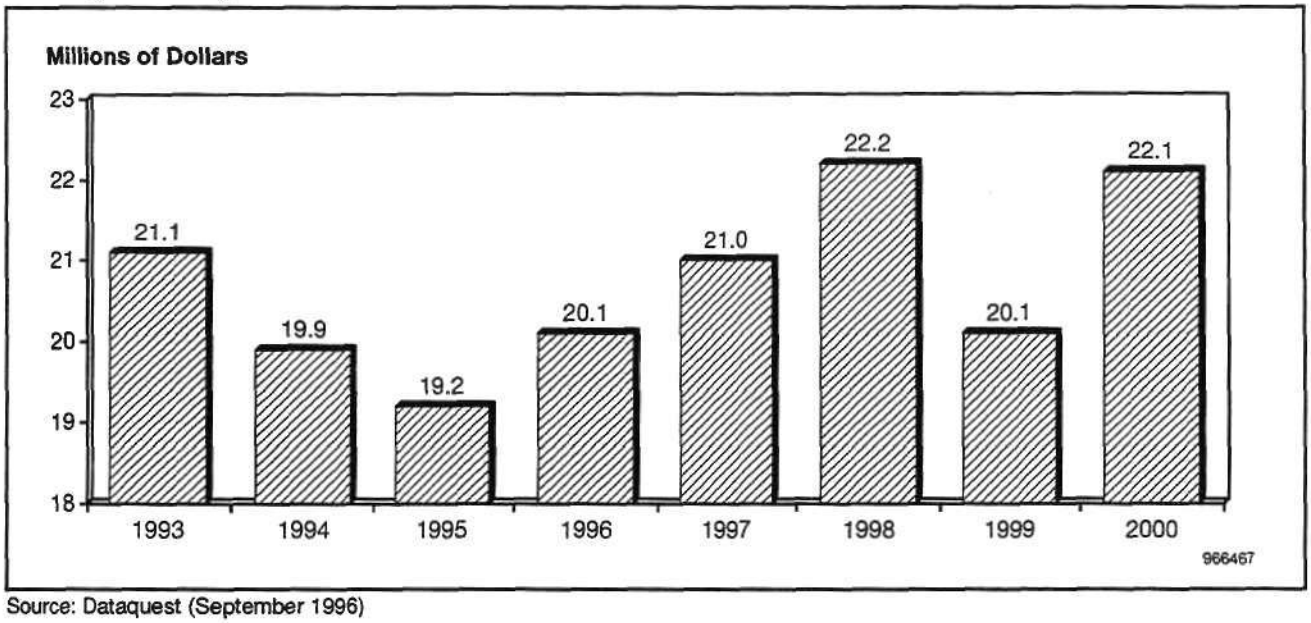
Source: Dataquest (September 1996)

Figure 4-50
1995 Interoperability Tools Market Share



Source: Dataquest (September 1996)

Figure 4-51
Interoperability Tools Forecast

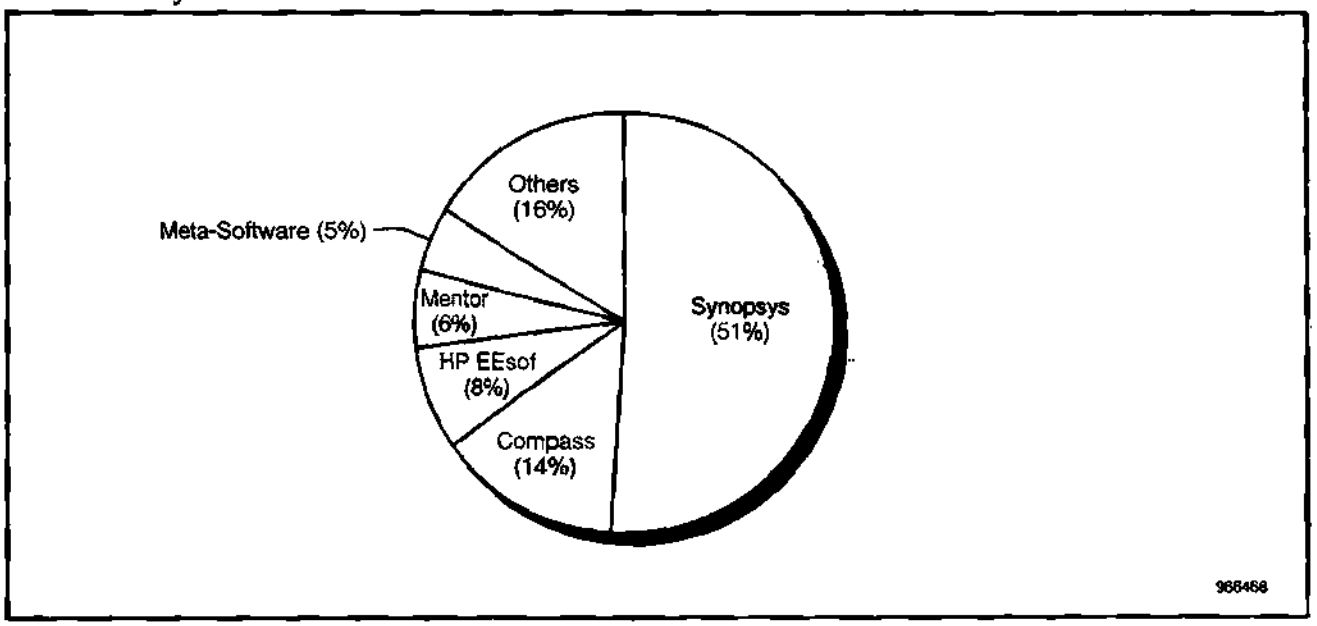


Source: Dataquest (September 1996)

Libraries

Libraries are in the same state as analysis tools were in last year. The sub-subapplications are becoming so important, and diversified, we will have to split them up next year. Compass is a good example. It came from no where into second place with a combined offering of full libraries and also library generation tools. A normal ASP for these types of offerings is about $250,000, and an order can easily run into the multiple millions of dollars; it is easy to see how Compass grabbed so much market share so quickly (see Figure 4-52).

Figure 4-52
1995 Library Market Share



Source: Dataquest (September 1996)

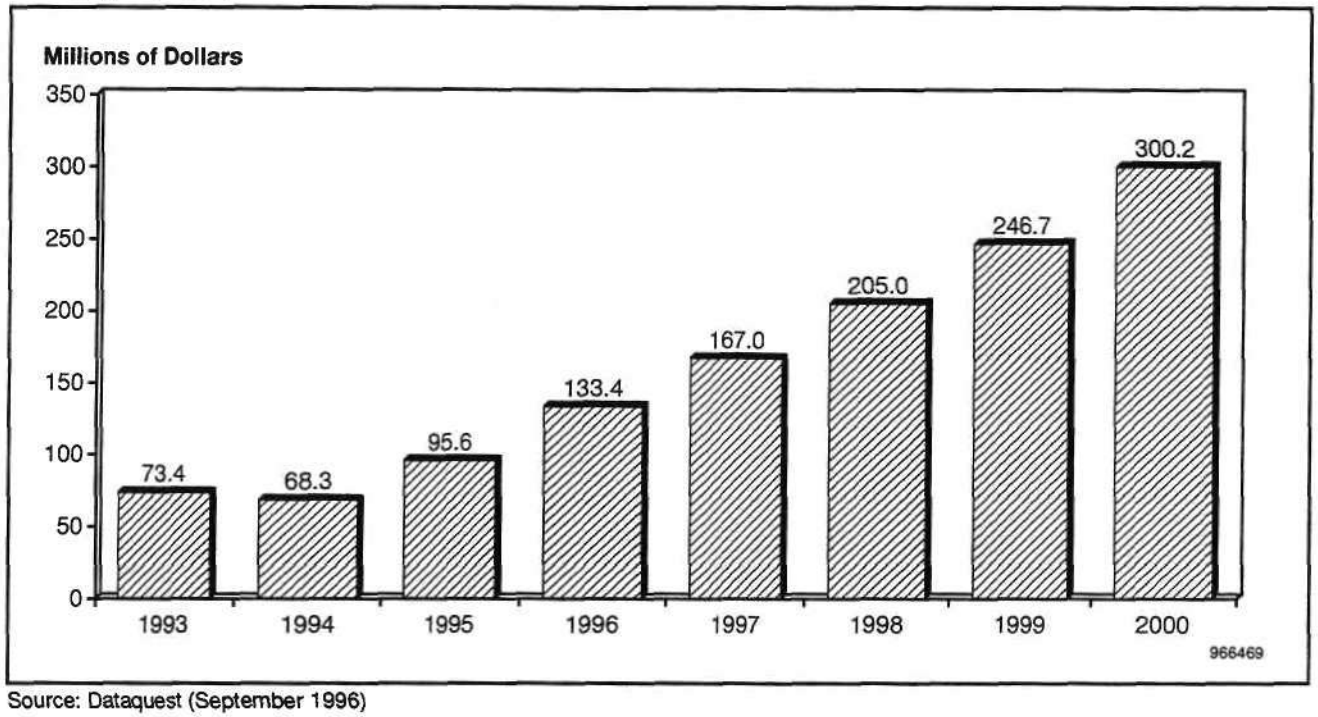
This is the one subapplication where we missed some important vendors. We were unable to get numbers for ASPEC Technology Inc. and we will need to concentrate on the system level macro (SLM) vendors in next year's survey. Keeping up with this subapplication has proven to be a challenge (see Figure 4-53).

FPGA/CPLD Tool Sets

The FPGA/CPLD vendors seem intent on not following the path of the gate array companies. As each vendor offers its unique architecture, it is in essence forced to offer tools that take advantage of those architectures. The EDA community has found chasing the multitude of architectures unprofitable. What's left is a subapplication dominated by FPGA/CPLD vendors (see Figure 4-54).

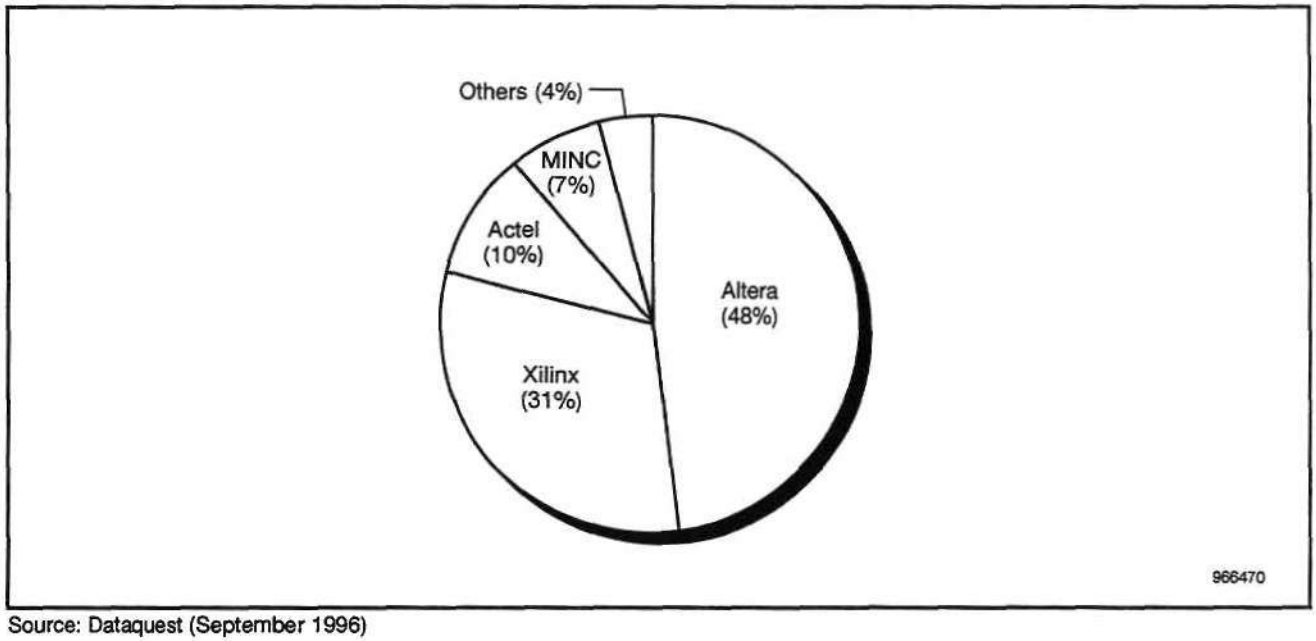
MINC is the lone holdout, and it seems to be a prime target for acquisition. On the other hand, designers are starting to abandon these tool sets as they move up to the RT level. Still, with the growth in FPGA/CPLD sales, and the proliferation of new architectures, this subapplication will grow nicely (see Figure 4-55).

Figure 4-53
Library Forecast



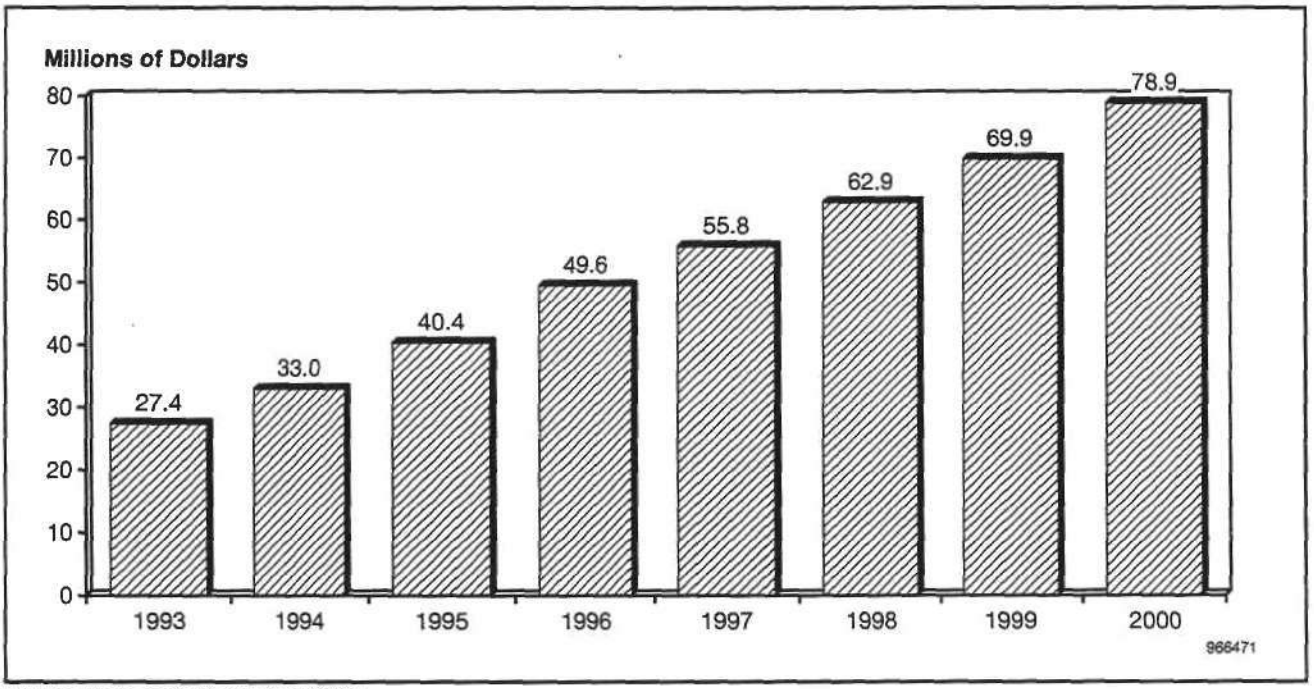
Source: Dataquest (September 1996)

Figure 4-54
1995 FPGA Tool Set Market Share



Source: Dataquest (September 1996)

Figure 4-55
FPGA Tool Set Forecast



Source: Dataquest (September 1996)

Chapter 5
IC CAD

This is by far the most exciting area in EDA today. By far the fastest growing—just under 30 percent in 1995—with an expected five-year growth rate of 24.4 percent. It has been sensationalized by the first real competition Cadence has seen this decade. Avant! isn't Cadence's only headache. Epic has been quietly redefined the methodology, turning what was known as DRC into a far more complex physical verification subapplication.

Physical Verification

Last year this subapplication was called DRC. We actually could keep the same name this year as the 1995 numbers were all DRC tool numbers. However, that would mask the dramatic changes we have seen in this subapplication this year. ArcSys merged with ISS to form Avant!. In this subapplication it picked up 3 percent market share from Cadence in 1995 (see Figure 5-1).

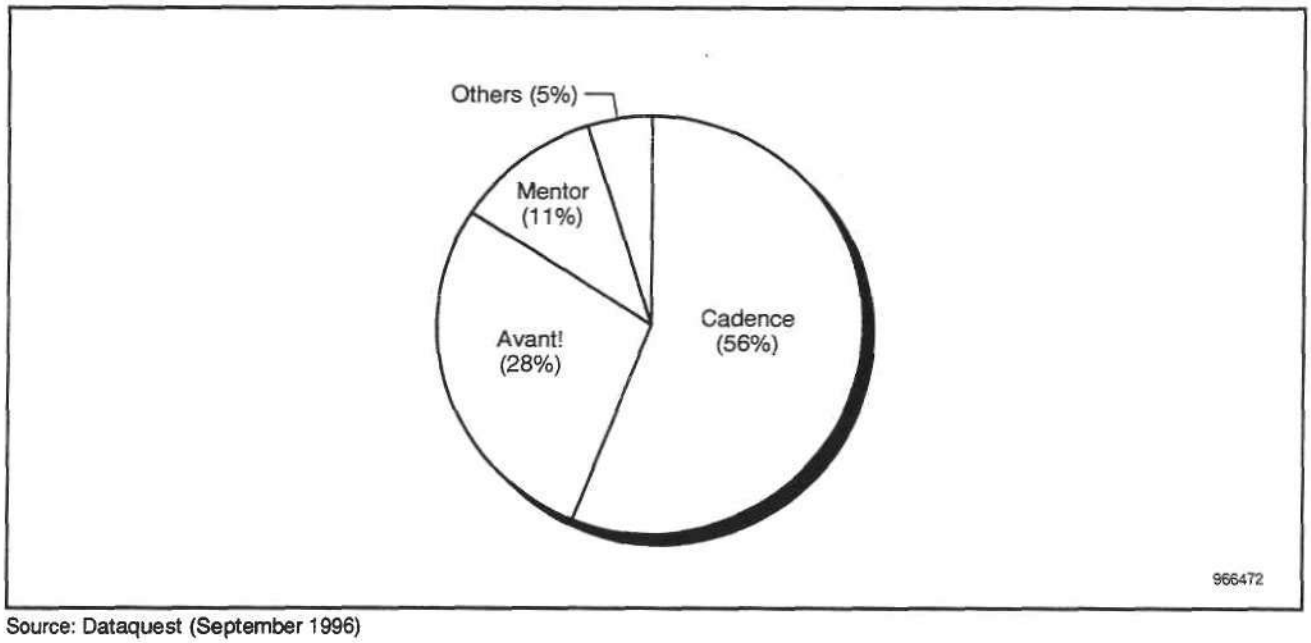
Mentor jumped back into the game with Calibre in 1996, and SVR licensed Bell Labs Clover DRC tool. Then Avant! bought Anagram and Meta-Software, going after a market Epic had been quietly cultivating. Epic countered by buying Cida, a DRC start-up. This market is the new physical verification subapplication. This subapplication is based on the twin pillars of SPICE (or SPICE-like) and extraction (whether it is 2-D, 2 1/2-D, or 3-D is anybody's guess). The tool suite layered on top of these pillars will be the traditional DRC tool set, plus timing analysis, power analysis, signal-integrity analysis, EMI analysis, metal migration analysis, and possibly thermal analysis. Dataquest believes that these tools will be sold as a suite not as point tools—which is why the present merger and acquisition mania is so important to tomorrow's market position. We forecast this area to be one of the strongest growth areas in EDA with a CAGR of 31 percent (see Figure 5-2).

Floor Planning

Floor planning continued its strong growth in 1995, growing more than 42 percent. Compass is being pushed hard by High Level Design Systems, which jumped over Cadence for second place and pushed Mentor off the major player list (see Figure 5-3).

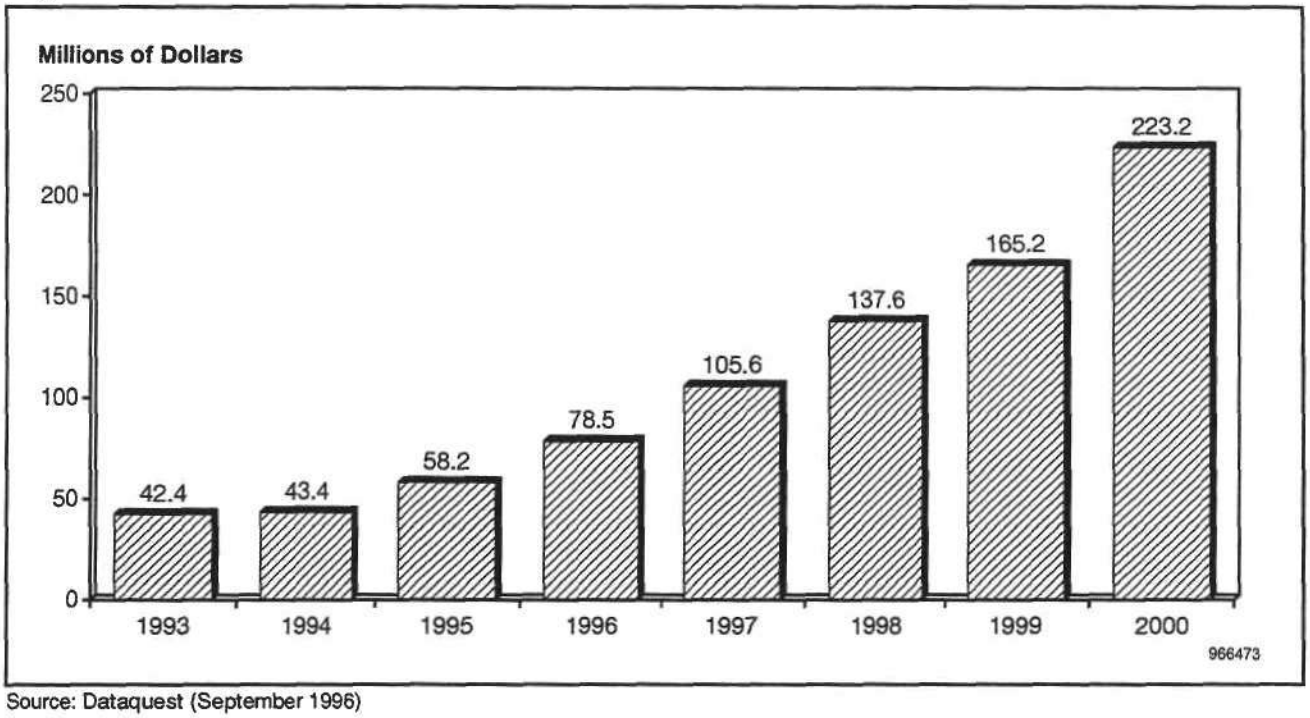
Mentor countered by signing up to be an OEM for the HLDS Floor Planner. Avant! has now introduced Planit and SVR has given greater visibility to its floor planner, FloorPlacer. This will be a strong market with a CAGR of 22 percent (see Figure 5-4).

Figure 5-1
1995 Physical Verification Market Share



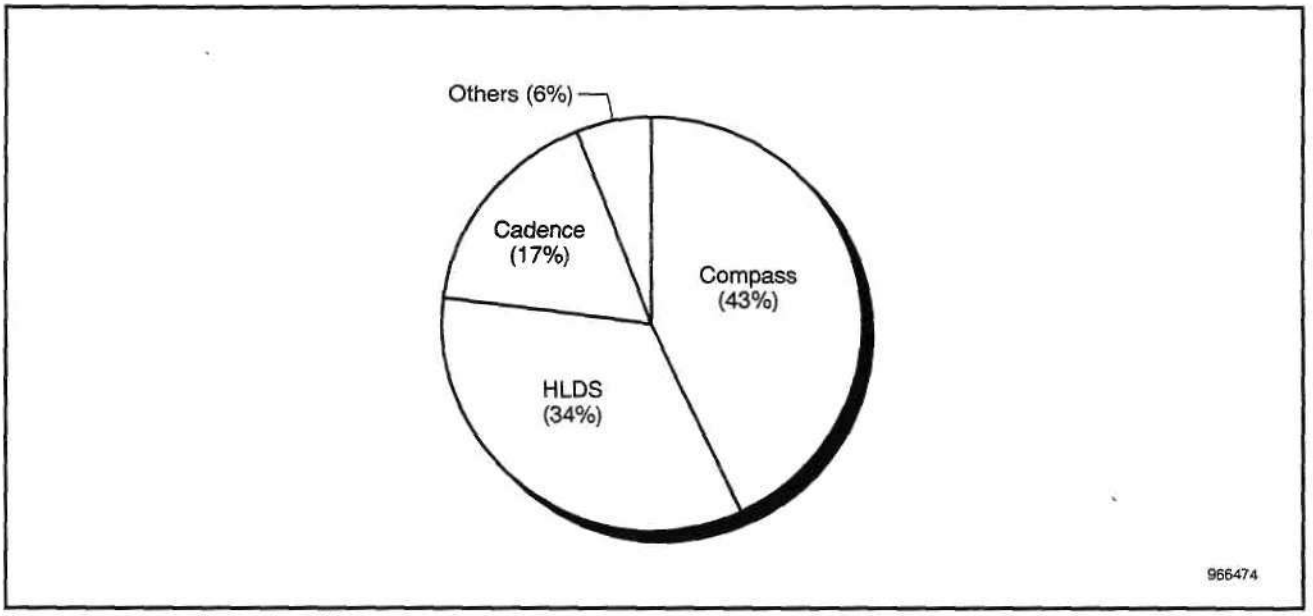
Source: Dataquest (September 1996)

Figure 5-2
Physical Verification Forecast



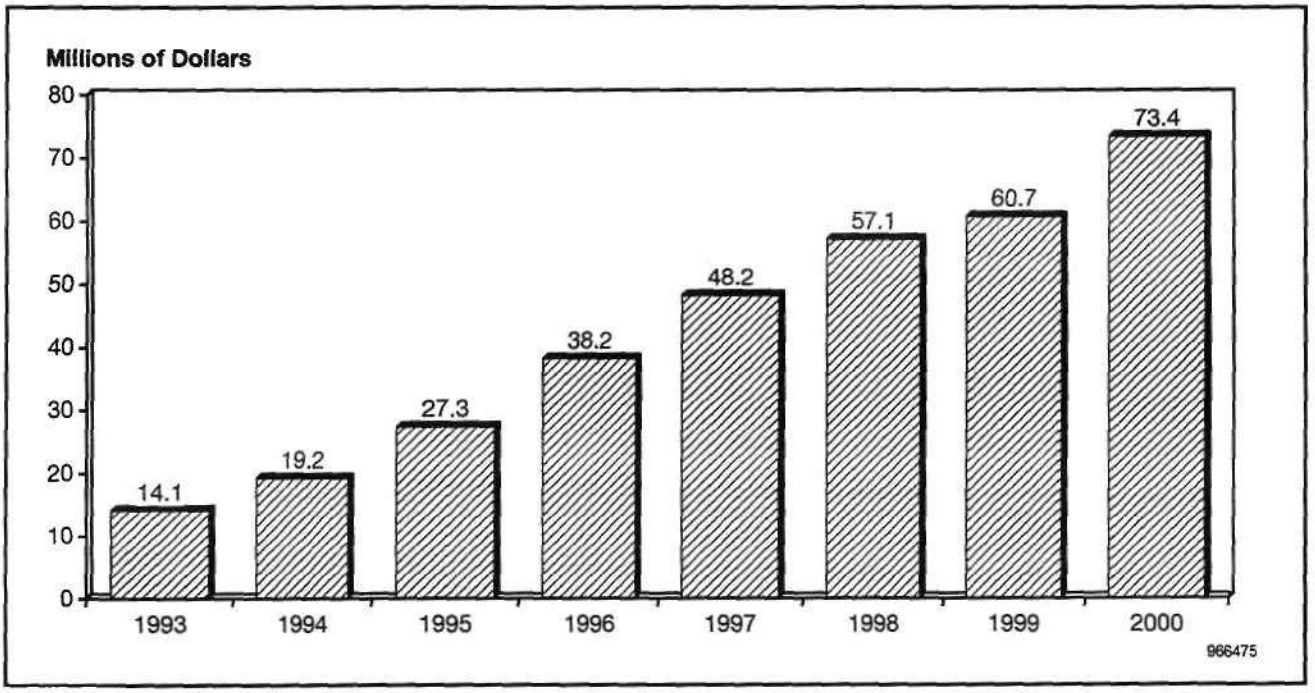
Source: Dataquest (September 1996)

Figure 5-3
1995 Floor Planner Market Share



Source: Dataquest (September 1996)

Figure 5-4
Floor Planner Forecast

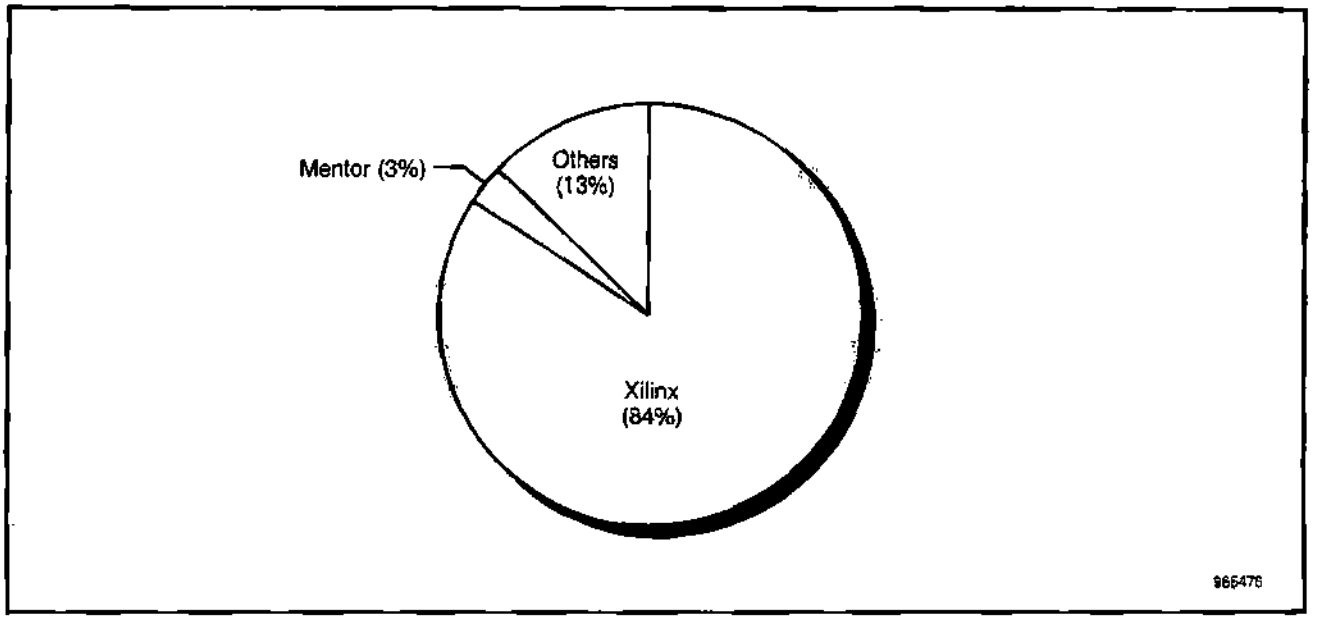


Source: Dataquest (September 1996)

FPGA/CPLD Place and Route

This may be a market that just never materializes. In talking to the EDA vendors, most do not believe that developing place and route tools and fitters for the ever-expanding number of architectures is a profitable business. Xilinx bought NeoCAD, taking the major third party vendor off the market. This scared the rest of the FPGA/CPLD community enough that all but AMD brought in their CAD tools in-house. Of course, they had little choice (see Figure 5-5).

Figure 5-5
1995 FPGA/CPLD Place and Route Market Share



Source: Dataquest (September 1996)

We are predicting a shrinking market as the FPGA/CPLD vendors are forced into giving these tools away free, as they increasingly do now (see Figure 5-6).

IC Place and Route

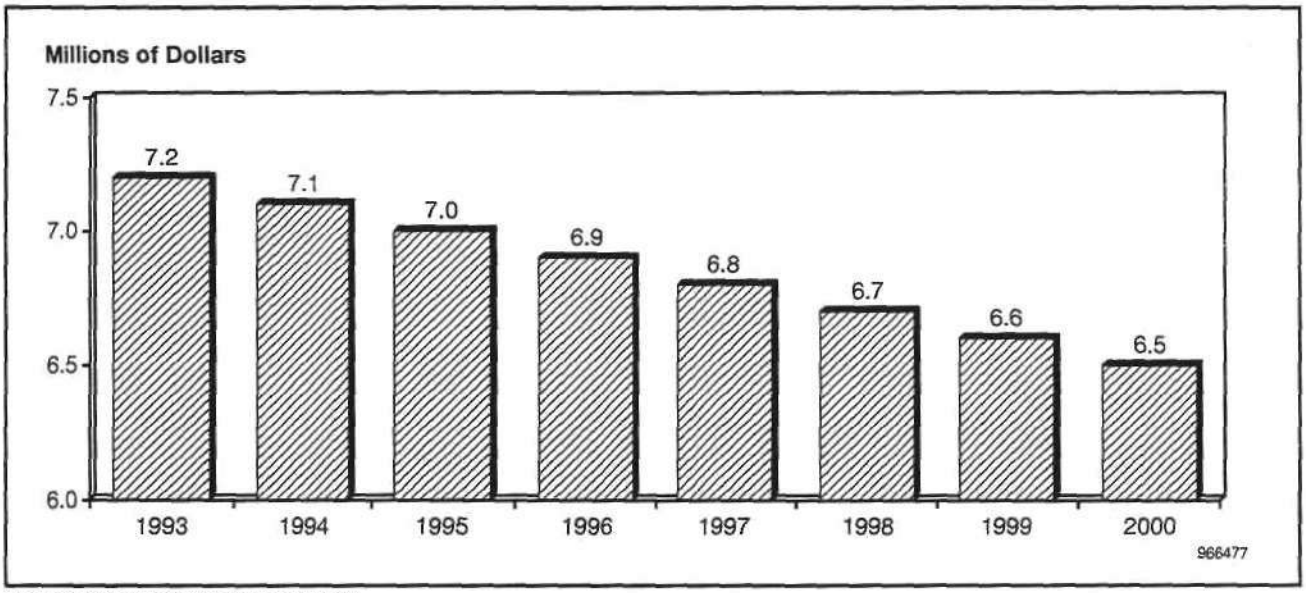
The dynamics of this subapplication (with its three sub-subapplications) is fascinating. As expected, we have had to boost our forecast primarily because of the CBIC tools. We were thankfully able to clean up the custom layout sub-subapplication and have eliminated a lot of false entries. Number scrubbing is a time-consuming necessity in this business.

Gate Array Place and Route

Cadence exploded in the gate array market gaining 11 percent market share in 1995. SVR held its own and Avant! became a player. Stay tuned for next year (see Figure 5-7).

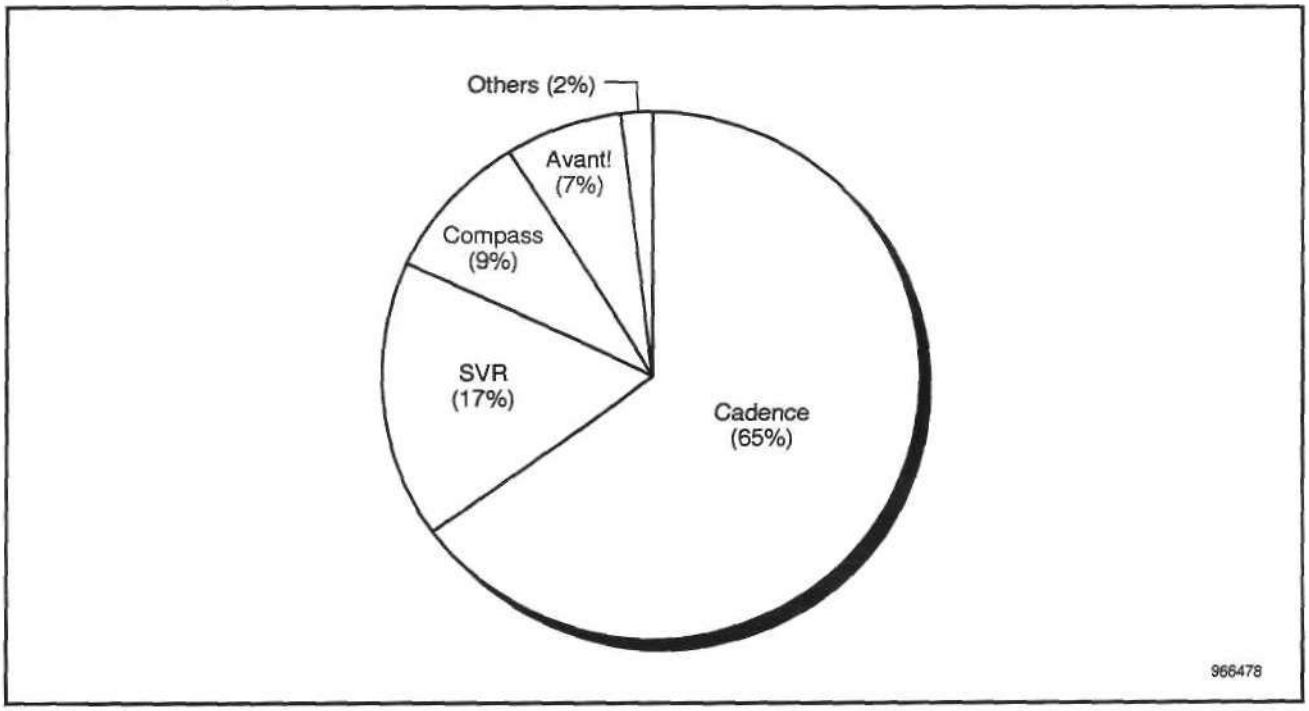
We are holding our forecast at a 19 percent five-year CAGR (see Figure 5-8).

Figure 5-6
FPGA/CPLD Forecast



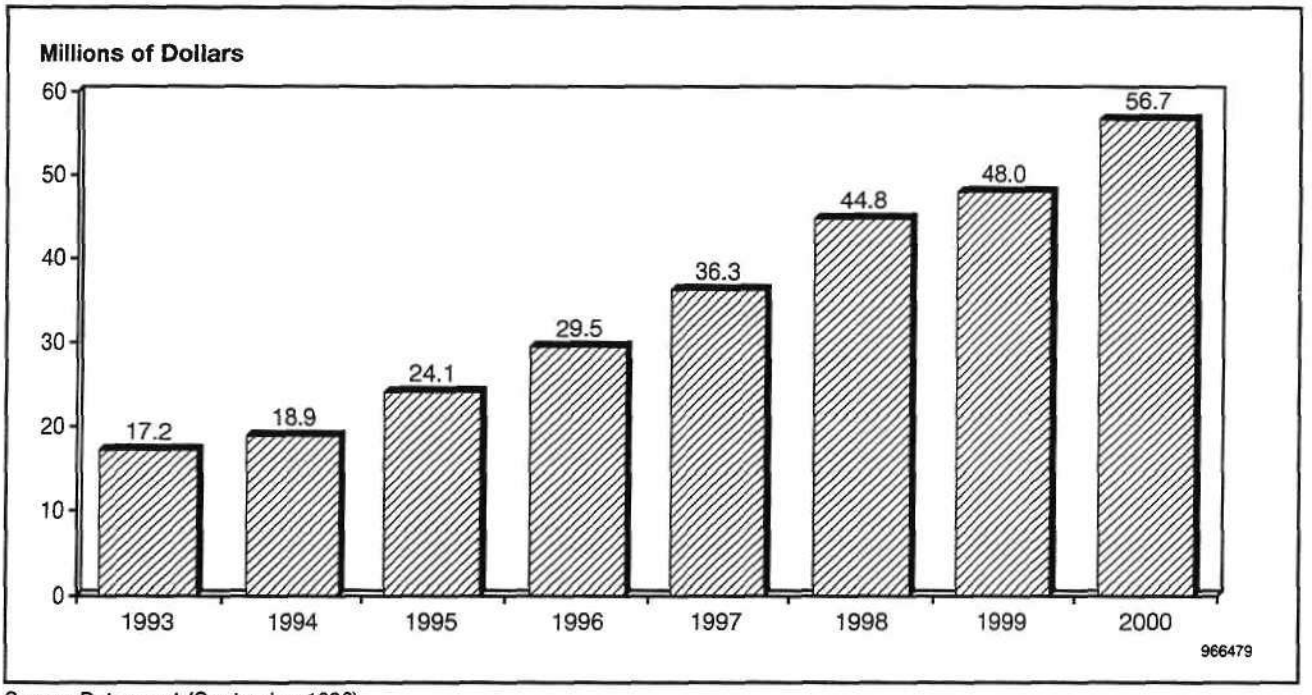
Source: Dataquest (September 1996)

Figure 5-7
1995 Gate Array Place and Route Market Share



Source: Dataquest (September 1996)

Figure 5-8
Gate Array Place and Route Forecast



Source: Dataquest (September 1996)

Cell-Based IC Place and Route

This is where the action is! CBIC place and route grew at a phenomenal 35.5 percent in 1995. Avant! jumped from fourth to second place, crossing swords with Cadence. Cadence didn't stand still either, gaining 4 percent market share (see Figure 5-9).

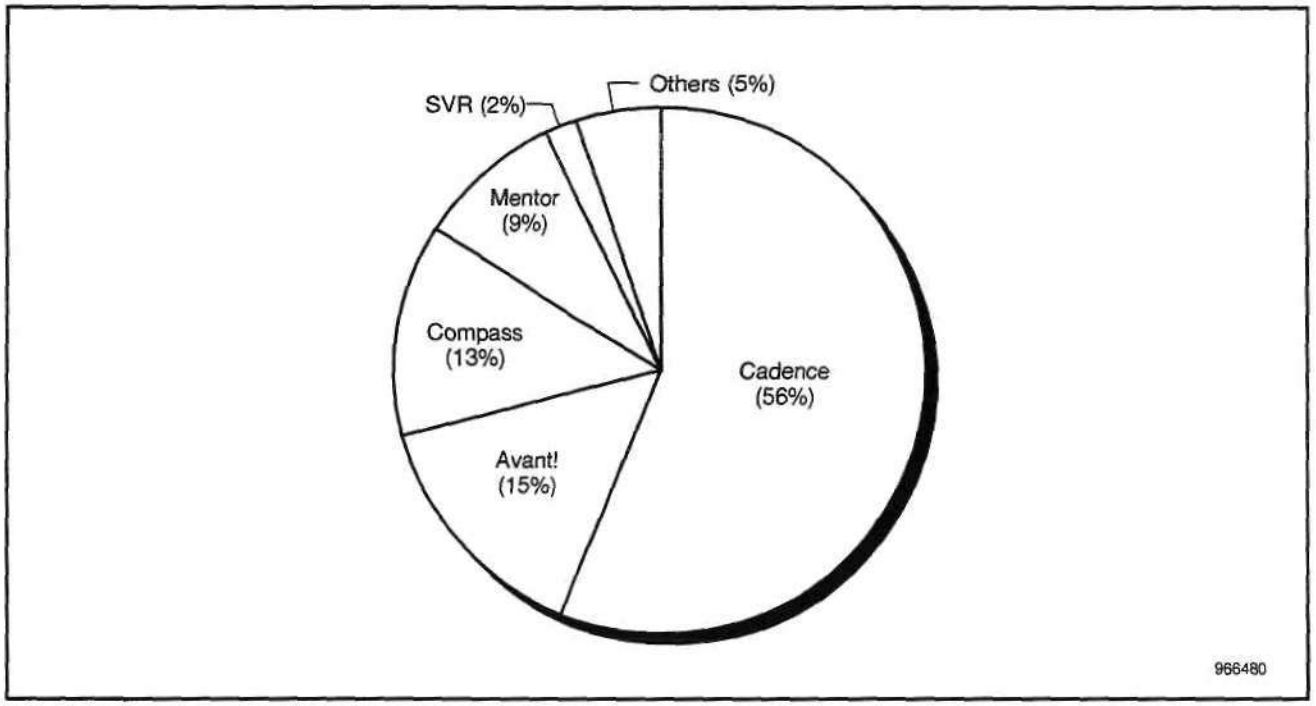
Although turned off by the continuing legal battle, most engineers are in heaven. We haven't seen this pace of technical development in 10 years. Take a customer need, add rapid technical evolution, and you have a very healthy growing market (see Figure 5-10).

Custom Layout

The Custom layout number has been scrubbed. We have taken out more than $26 million from the 1994 number and back out the prior history to reflect reality. A database generally takes three years to stabilize, but with effort we pulled that into two. Shrinking other from 37 percent to 11 percent resulted in the respective increases in market share (see Figure 5-11).

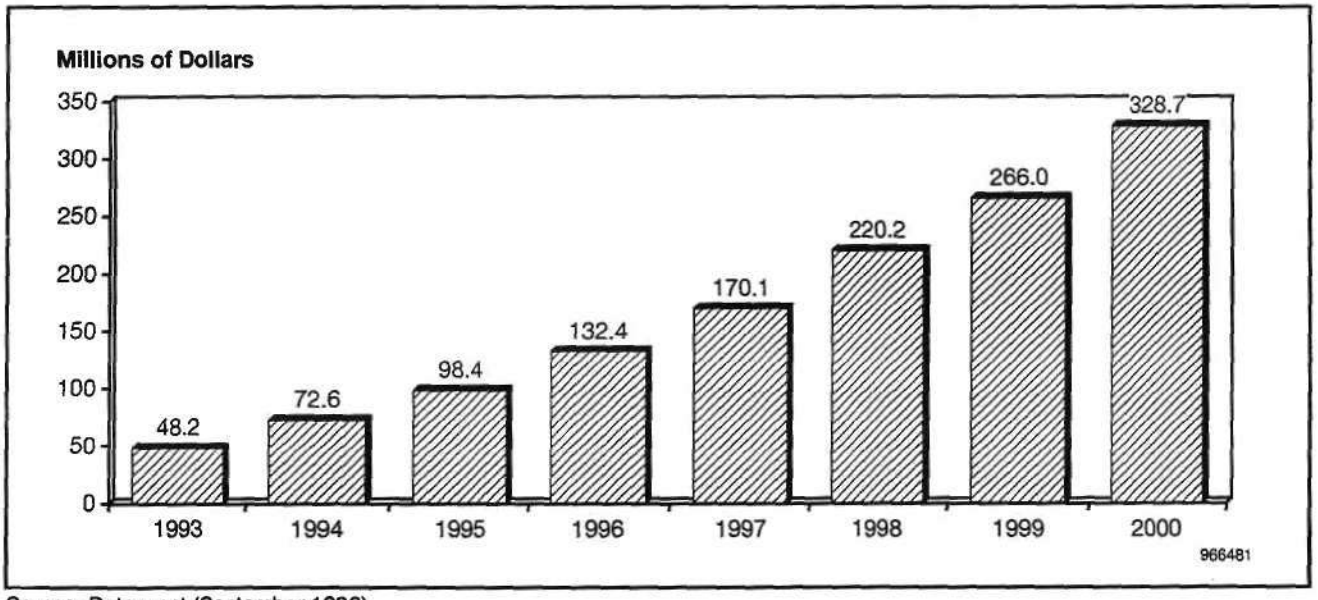
Mentor continues to hold the No. 1 position over Seiko, while Cadence's new FastChip offering takes it past Cascade into the No. 3 spot. The big event of the year was Cooper & Chyan's introduction of IC Craft. IC Craft has gone from a marketing oddity to the most talked about tool in IC CAD within the last year. We expect good growth in this segment, based on the increase popularity of custom macro cell design (see Figure 5-12).

Figure 5-9
1995 CBIC Place and Route Market Share



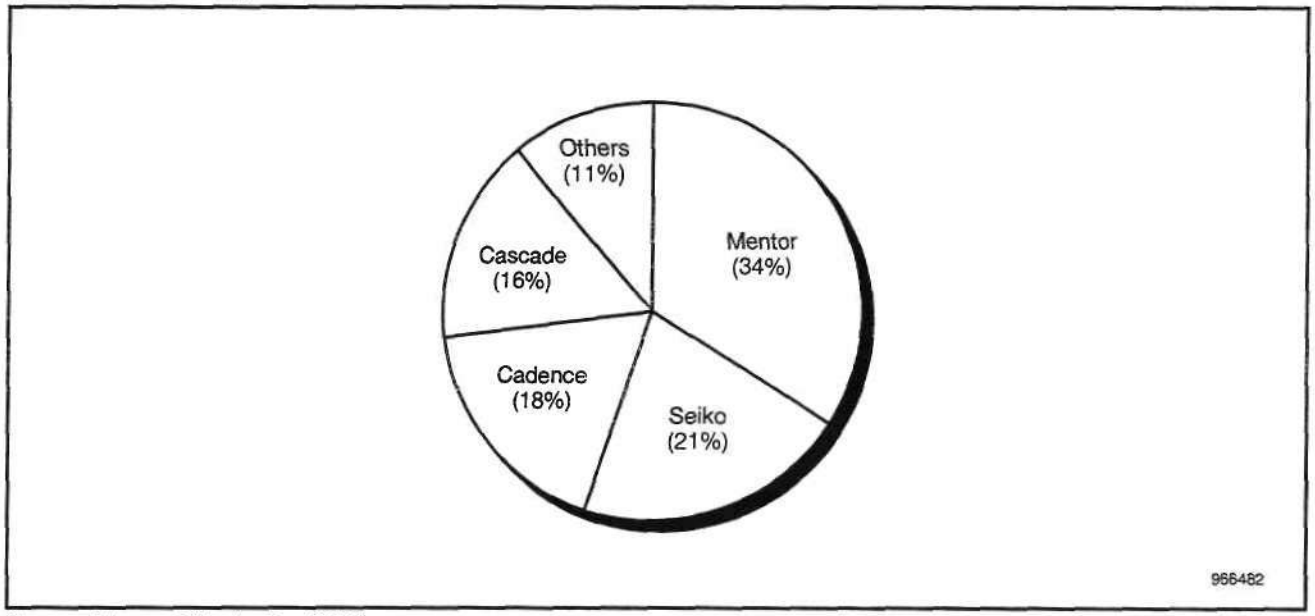
Source: Dataquest (September 1996)

Figure 5-10
CBIC Place and Route Forecast



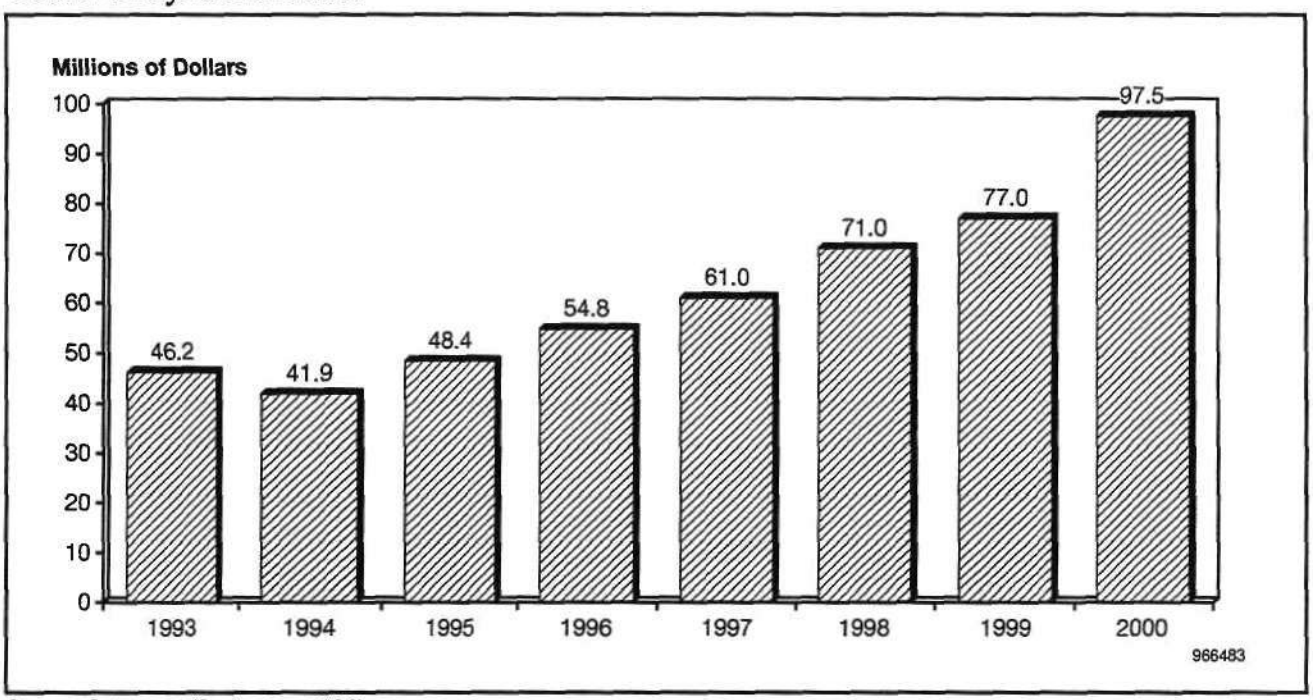
Source: Dataquest (September 1996)

Figure 5-11
1995 Custom Layout Market Share



Source: Dataquest (September 1996)

Figure 5-12
Custom Layout Forecast



Source: Dataquest (September 1996)

Chapter 6
PCB Design

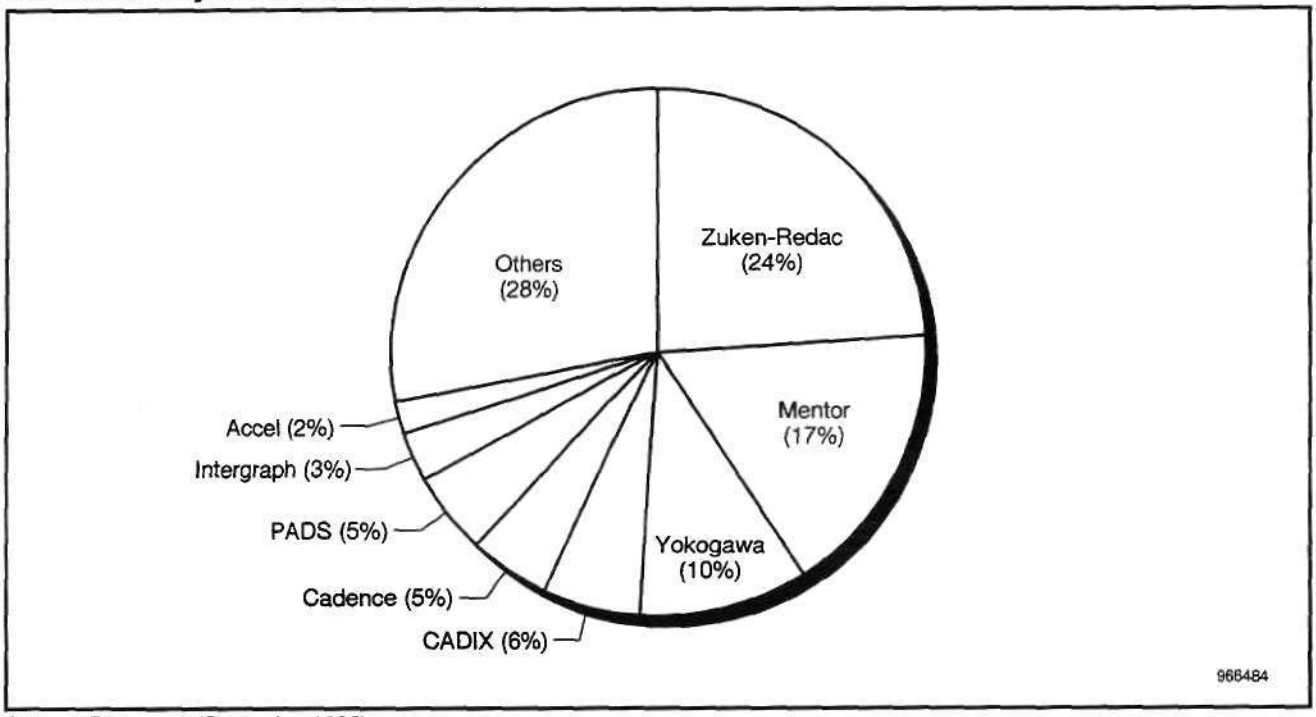
We are predicting that the PCB design application will come out of its slow growth years and exceed 10 percent growth in 1996. This is based on the need for a high-speed solution for PCB design and the first noticeable market appearance of shrink-wrapped tools. The CAGR will be 9.3 percent, over the next five years.

PCB Layout

The top four vendors in the PCB layout subapplication (Zuken-Redac, Mentor, Yokogawa, and CADIX) grew their market share in 1995 (see Figure 6-1).

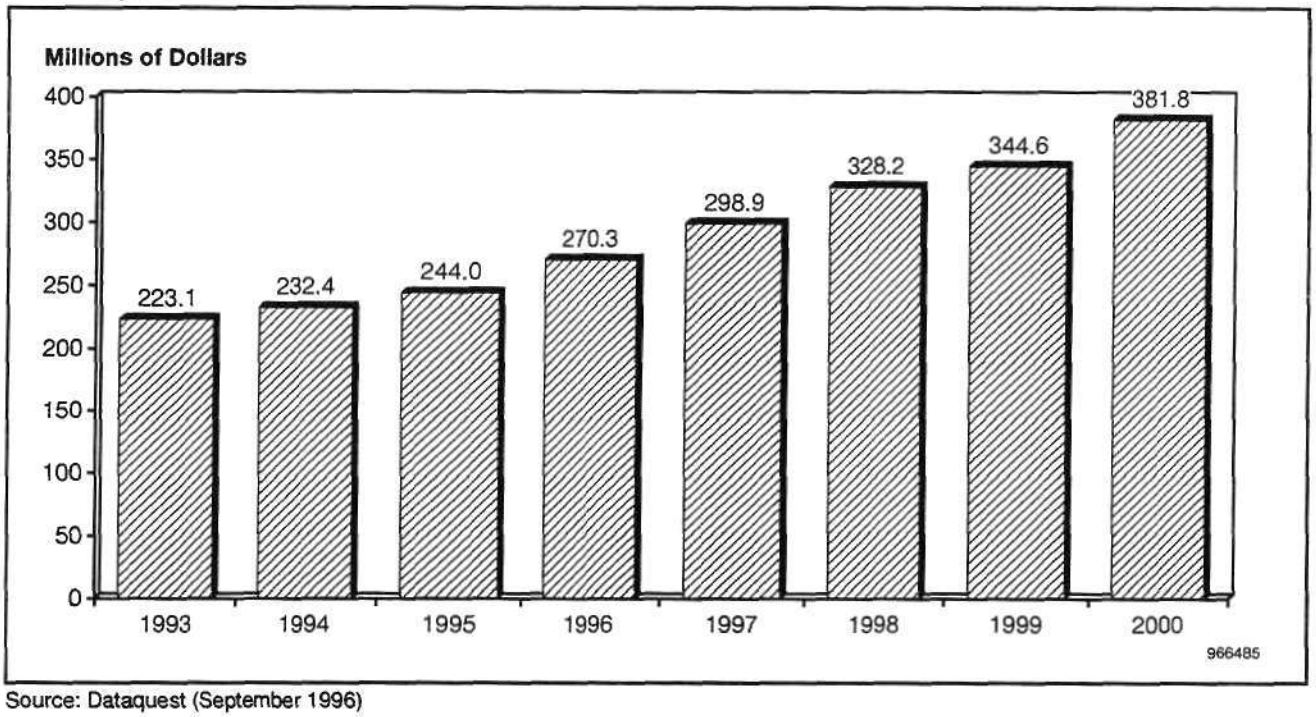
PADS and Intergraph, now known as VeriBest, both grew market share as expected. These two are the leading proponents of the ready-to-use PCB tool sets and they are leading the way in the "NT" world. Dataquest predicts that "NT" will soon become the major world in PCB design. Equally as exciting is Accel's appearance as a major PCB vendor. Accel is the first "shrink-wrapped" company to make an impact in the PCB design world. These two trends, ready-to-use and the NT operating system, plus Windows-based shrink-wrapped PCB tools, are major drivers that will keep this market at a much higher growth rate than the past (see Figure 6-2).

Figure 6-1
1995 PCB Layout Market Trends



Source: Dataquest (September 1996)

Figure 6-2
PCB Layout Forecast



Source: Dataquest (September 1996)

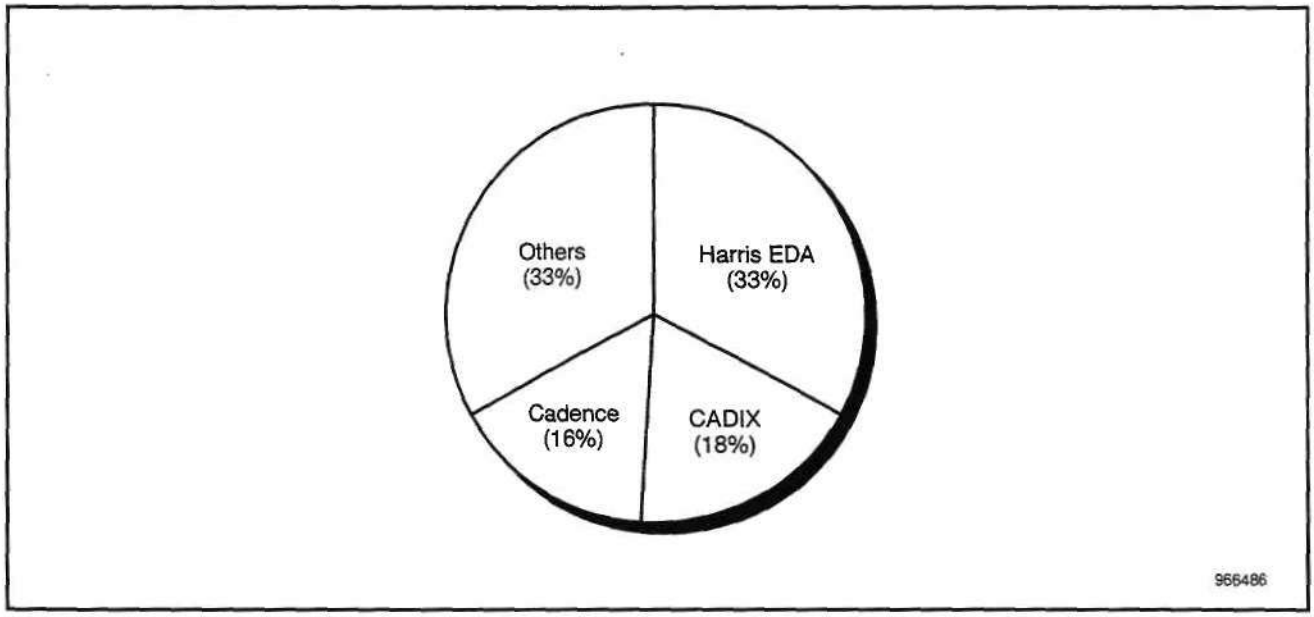
MCM Layout

The Japanese have started to become a factor in the MCM market. Harris EDA lost 3 percent market share and CADIX came from last year's "other" category into the No. 2 spot (see Figure 6-3).

We do not see any major growth in this subapplication until 1998, when it will begin to see growth in excess of 10 percent (see Figure 6-4).

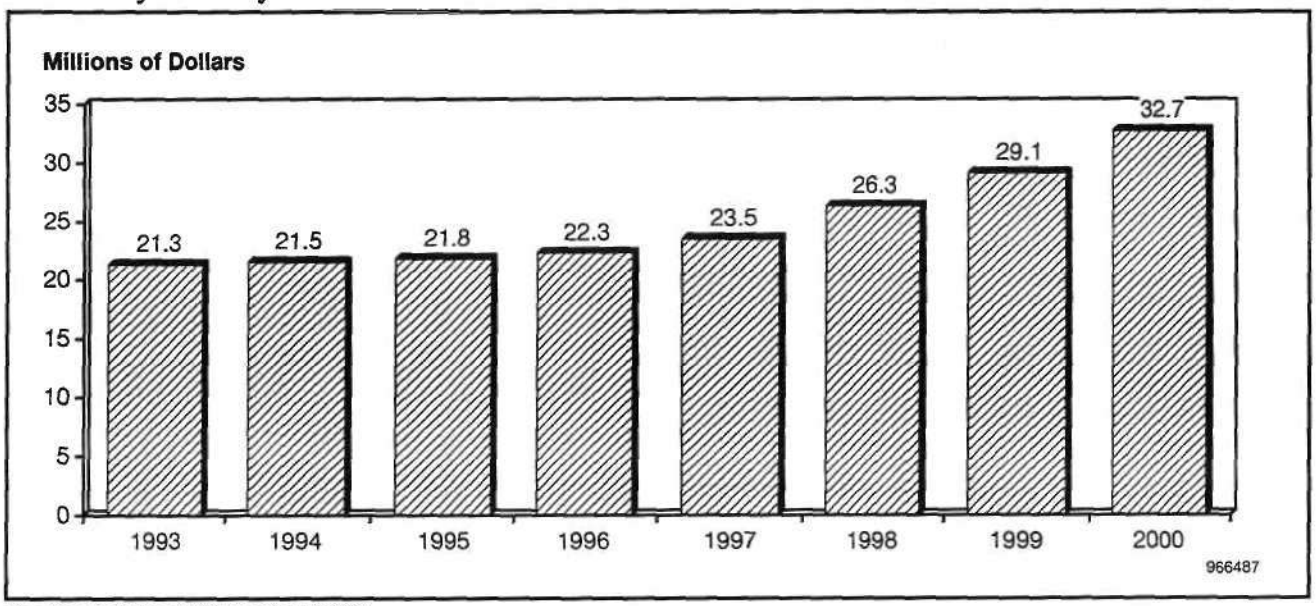
There is another category in CAD, cleverly called "other." Next year Dataquest will start collecting CAM data in this subapplication bucket. With the new physical verification subapplication, we are seeing much more interest in companies such as Technology Modeling Associates (TMA) and Silvaco International—one more interesting area to look at as we continue to expand our coverage of the EDA marketplace.

Figure 6-3
1995 MCM/Hybrid Layout Market Share



Source: Dataquest (September 1996)

Figure 6-4
MCM/Hybrid Layout Forecast



Source: Dataquest (September 1996)

Appendix A
EDA Revenue Forecast by Subapplication

Tables A-1 and A-2 provide historical and forecast numbers on worldwide EDA revenue.

Table A-1
Total EDA Revenue, 1993 to 2000 (Millions of Dollars)

EDA	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
ESL	25.3	36.2	51.1	69.0	86.7	113.7	134.6	168.1	26.9
RTL	220.9	294.4	361.8	427.1	534.6	663.1	749.3	913.6	20.4
Gate Level	262.7	274.1	301.1	337.1	385.4	448.7	473.8	556.8	13.1
Miscellaneous	258.4	256.2	305.9	383.6	448.3	524.1	578.2	680.3	17.3
CAE	767.3	861.0	1,019.9	1,216.8	1,455.0	1,749.6	1,935.9	2,318.8	17.9
IC CAD	175.3	203.1	263.4	340.3	428.0	537.4	623.5	786.0	24.4
PCB Design	244.4	253.9	265.8	292.6	322.4	354.5	373.7	414.5	9.3
Total EDA	1,187.0	1,318.0	1,549.1	1,849.7	2,205.4	2,641.5	2,933.1	3,519.3	17.8

Source: Dataquest (September 1996)

Table A-2
Total EDA Revenue by Subapplication, 1993 to 2000 (Millions of Dollars)

Subapplication	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
ESL									
ESL Design	15.5	21.8	25.9	31.6	38.4	46.5	54.9	67.4	21.1
Behavioral Simulation	7.4	8.7	11.3	13.8	16.8	20.4	24.2	29.6	21.2
Behavioral Synthesis	0.8	2.0	7.2	12.3	16.0	23.6	27.9	35.2	37.2
Formal Verification	1.5	3.7	6.7	11.3	15.5	23.2	27.6	35.9	40.0
Total ESL	25.3	36.2	51.1	69.0	86.7	113.7	134.6	168.1	26.9
RTL									
RTL Design	8.8	13.9	25.6	31.2	36.6	41.0	39.2	43.2	11.0
RTL Simulation	84.1	115.9	133.7	150.2	169.9	199.8	218.4	246.9	13.0
Verilog	35.6	52.7	73.4	83.0	92.1	100.0	107.4	113.2	9.1
VHDL	48.5	63.2	60.4	67.2	77.8	99.8	111.0	133.7	17.2
Synthesis	77.6	111.4	134.8	153.7	197.8	238.0	265.2	315.0	18.5
Target Compiler	2.9	2.1	4.2	7.7	13.0	20.3	23.3	27.3	45.7
Timing Analysis	16.2	15.1	20.4	24.8	30.4	38.1	41.7	53.1	21.0
DFT	30.5	32.9	34.9	39.1	45.0	51.3	55.0	67.0	13.9
RTL Virtual Prototype	0.8	3.2	8.1	20.4	41.9	74.6	106.5	161.1	82.0
Silicon Virtual Prototype	0	0.9	5.5	14.5	32.0	59.8	87.8	133.1	89.4
PCB Virtual Prototype	0.8	2.3	2.6	5.9	9.9	14.8	18.7	28.0	60.7
Total RT Level	220.9	294.4	361.8	427.1	534.6	663.1	749.3	913.6	20.4

(Continued)

Table A-2 (Continued)
Total EDA Revenue by Subapplication, 1993 to 2000 (Millions of Dollars)

Subapplication	1993	1994	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Gate Level									
Schematic Capture	98.9	87.9	87.5	85.0	82.1	79.2	75.6	73.0	-3.5
Simulation	149.5	158.1	172.4	186.9	202.1	220.1	229.6	254.5	8.1
Gate-Level Simulation	50.9	46.1	37.2	30.1	24.4	20.1	15.0	12.4	-19.7
Mixed Signal Simulation	21.8	31.7	39.5	47.8	56.7	67.4	73.1	88.9	17.6
Analog Simulation	55.4	51.0	61.2	71.2	79.8	88.1	95.5	104.0	11.2
SPICE	21.4	29.3	34.5	37.8	41.2	44.5	46.0	49.2	7.3
Analysis Tools	14.3	28.2	41.3	65.2	101.2	149.4	168.6	227.4	40.7
EMI	0.2	6.9	9.9	13.2	17.6	23.1	25.1	32.0	26.4
Power	0.0	6.8	15.4	32.1	57.0	87.6	96.3	123.1	51.6
Thermal	0.8	0.6	0.9	1.3	2.1	3.4	5.5	12.6	68.3
Signal Integrity	13.3	13.9	14.0	15.8	18.2	21.5	23.0	26.7	13.7
Metal Migration	0	0	1.0	2.8	6.3	13.8	18.7	33.0	100.6
Total Gate Level	262.7	274.1	301.1	337.1	385.4	448.7	473.8	554.9	13.0
Miscellaneous									
Accelerators	37.6	33.9	38.8	43.9	48.7	51.6	54.7	57.8	8.3
Emulators	53.0	63.3	77.2	105.6	128.1	155.0	157.8	188.7	19.6
Fault Simulators	14.0	13.3	12.3	11.0	9.7	8.4	7.0	5.6	-14.5
Interoperability Tools	21.1	19.9	19.2	20.1	21.0	22.2	20.1	22.1	2.8
Libraries	73.4	68.3	95.6	133.4	167.0	205.0	246.7	300.2	25.7
FPGA Tool Set	27.4	33.0	40.4	49.6	55.8	62.9	69.9	78.9	14.3
CAE Other	32.0	24.5	22.5	20.0	18.0	19.0	22.0	27.0	3.7
Total Miscellanous	258.4	256.2	305.9	383.6	448.3	524.1	578.2	680.3	17.3
Total CAE	767.3	861.0	1,019.9	1,216.8	1,455.0	1,749.6	1,935.9	2,316.9	17.8
IC CAD									
DRC	42.4	43.4	58.2	78.5	105.6	137.6	165.2	223.2	31
Floor Planner	14.1	19.2	27.3	38.2	48.2	57.1	60.7	73.4	22
FPGA P&R	7.2	7.1	7.0	6.9	6.8	6.7	6.6	6.5	-1
IC P&R	111.6	133.4	170.9	216.7	267.4	336.0	391.0	482.9	
Gate Array	17.2	18.9	24.1	29.5	36.3	44.8	48.0	56.7	19
CBIC	48.2	72.6	98.4	132.4	170.1	220.2	266.0	328.7	27
Custom	46.2	41.9	48.4	54.8	61.0	71.0	77.0	97.5	15
Total IC CAD	175.3	203.1	263.4	340.3	428.0	537.4	623.5	786.0	24.4
PCB Design									
PCB	223.1	232.4	244	270.3	298.9	328.2	344.6	381.8	9.4
Hybrid and MCM	21.3	21.5	21.8	22.3	23.5	26.3	29.1	32.7	8.4
Total PCB Design	244.4	253.9	265.8	292.6	322.4	354.5	373.7	414.5	9.3

Source: Dataquest (September 1996)

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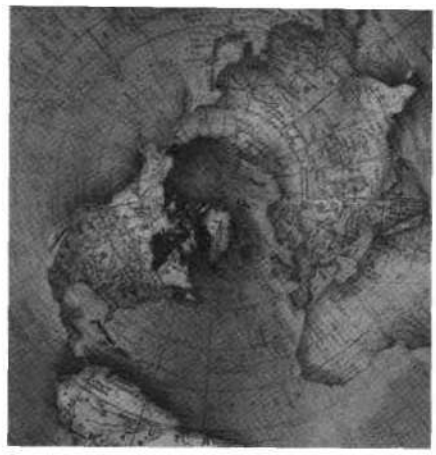

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The Design Verification Problem Accelerates with Clock Speed

User Wants and Needs

Program: Electronic Design Automation Worldwide
Product Code: CEDA-WW-UW-9601
Publication Date: September 23, 1996
Filing: Reports

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Chapter 1
Executive Summary

Electronic Design Automation (EDA) is one of the most dynamic segments of the CAD/CAM/CAE industry. For EDA companies to be successful, they must have a thorough understanding of their target customer base. Each year, Dataquest's Electronic Design Automation Worldwide program performs extensive surveys of designers of electronic products and reports on their shifting priorities, desires, and demands. The purpose behind Dataquest's User Wants and Needs studies is to provide our clients with the most in-depth, up-to-date information on the electronic design community.

Study Objectives

This study provides an in-depth look at the users of EDA tools in North America. The information presented here is the result of a telephone survey of 215 hardware designers in North America.

The objectives of this study were as follows:

- To understand what trends are taking place in the electronic design industry
- To investigate the design environment in which users work
- To examine end-user satisfaction with EDA software
- To underscore some of the changes that will take place in the EDA industry in the future

Key Findings

Our research of EDA end users provides us with an insightful look into their preferences and consumption patterns. Results from our survey indicate the following:

- The title of ASIC designer is no longer meaningful. The ASIC designer is now one of (or in some cases all of) the system design engineering team.
- We are seeing a dramatic shift from the "Other UNIX" category to Sun UNIX and Solaris.
- The time between prototype and production is stretching out in all design disciplines. Design verification has become a critical area in the time it takes to get to the market with a new product. Emulation's importance in design verification is growing.
- Clock speeds continue to increase in all design disciplines except PCB design. We expect the new high-speed buses to bring those higher speeds to the board next year.

- The good news is that fewer respondents reported the development of new tools in-house. The bad news is that the satisfaction with commercial EDA tools has decreased. Improvement in integration and compliance to industry standards brought in a higher Tool Quality rating this year. However, tying directly to the lack of satisfaction, there was a dramatic increase in dissatisfaction because of software bugs.

Dataquest Perspective

The duel challenges of high speed and ever-increasing complexity are driving the demand for EDA tools. As fewer and fewer companies develop tools in-house, the importance of the EDA industry grows. The across-the-board increase in the time it takes to get a prototype into volume production points a finger directly at the verification crisis. Emulation is the only clear direction, in this year's survey. We believe the development of the register transfer level (RTL) virtual prototype—bringing the verification problem back to the design team—is the answer.

The Survey

In an ever-increasing effort to profile the entire design population, we have attempted to balance our survey between markets, applications, and type of design. Unfortunately, once again, we have looked at the resources needed to surveying outside of North America and found that the demand is still insufficient to carry the cost. Other shortfalls this year include the consumer market, which could be expected in a North America-only survey. We could not find a statistically significant sample. We were able to get statistically significant samples in all design disciplines, with the exception of IC design. Although we fell seven short of our needed sample, the information was much better than last year. We therefore have included it in our report. As always, any requests to improve this year's survey will be appreciated.

The Structure of the Report

The remainder of this report is organized as follows:

- Chapter 2, "The Environment" looks at the size of the designer's company, the type of design being done, and the workstation and operating system (OS) being used.
- Chapter 3, "IC Design" looks at the survey from the perspective of an IC designer.
- Chapter 4 "Gate Array and Cell-Based Design" looks at the survey from the perspective of a gate array/cell-based IC (CBIC) designer.
- Chapter 5 "FPGA/CPLD Design" looks at the survey from the perspective of a field-programmable gate array (FPGA)/complex programmable logic device (CPLD) designer.
- Chapter 6 "Printed Circuit Board Design" looks at the survey from the perspective of a printed circuit board (PCB) designer.
- Chapter 7 "System Design" looks at the survey from the perspective of a system designer.

- Chapter 8 "The EDA Tools" looks at how the design challenge is met by today's EDA tools.
- Appendix A, "Survey Methodology," explains how the survey was designed and executed.

Project Team

The project team consisted of the following individuals:

Gary Smith, Director and Principal Analyst, Dataquest's Electronic Design Automation Worldwide program

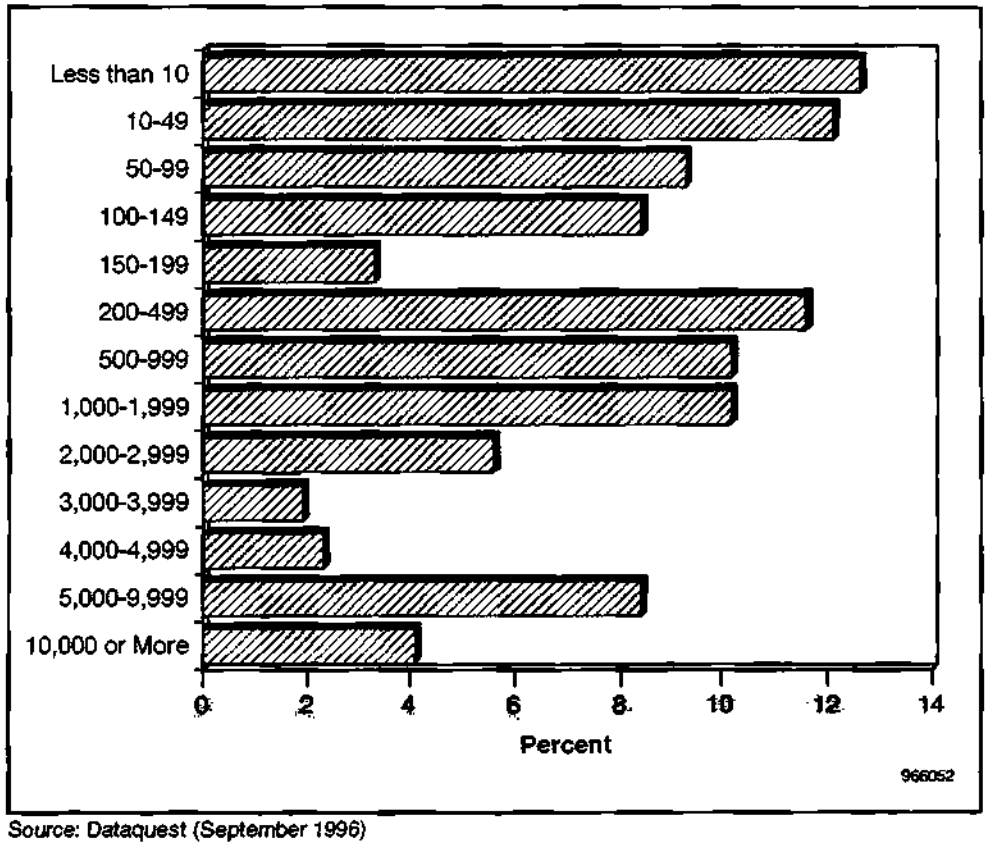
Mark Rogers, Senior Research Analyst, Dataquest's Worldwide Research Operations

Cathy Eckstein, Lead Interviewer, Dataquest's Worldwide Research Operations

Chapter 2
The Environment

This year more than 24 percent of the engineers surveyed worked for companies with fewer than 50 employees. As last year, the next largest group came from companies with 200 to 2,000 employees. This distribution shows almost 9 percent more engineers working for smaller companies (see Figure 2-1).

Figure 2-1
Size of Company or Division

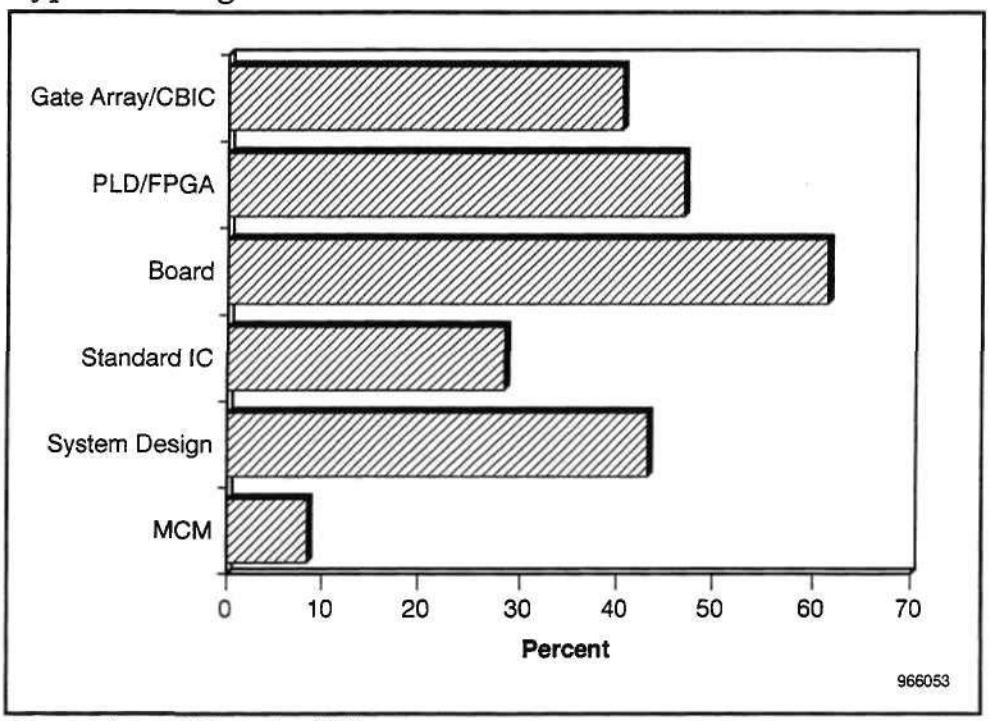


Source: Dataquest (September 1996)

Last year we found a close correlation between the board designer and the FPGA/CPLD. The correlation continued, although somewhat lower than last year, with more than 40 percent of the designers doing both board and FPGA/CPLD design. This year Dataquest also saw a correlation between gate array/CBIC design and system design. The old category of ASIC designer is all but dead in the real world (see Figure 2-2).

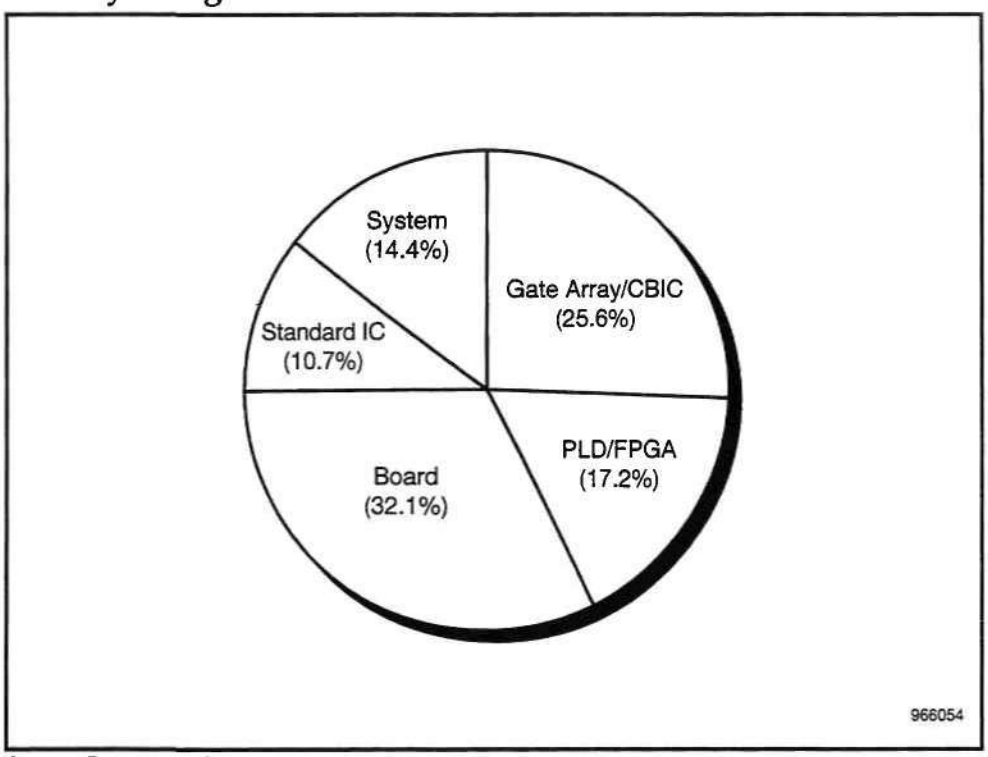
This year the largest primary design task was the same as 1995, the board designer. Gate array/CBIC design came in a strong second. IC designers were once again the hardest category to find and we came seven short of our goal (see Figure 2-3).

Figure 2-2
Types of Designs



Source: Dataquest (September 1996)

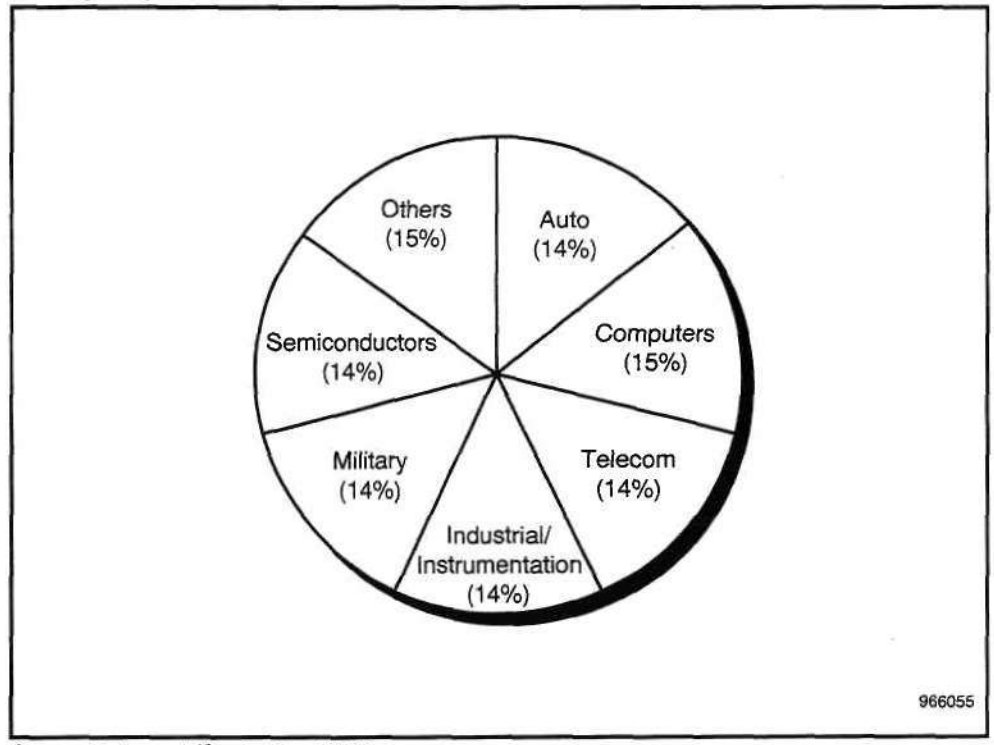
Figure 2-3
Primary Design Task



Source: Dataquest (September 1996)

The data for design by market came in surprisingly equal (see Figure 2-4). The only market we were unable to get a full sample was Consumer. The Automotive market came in fairly easily this year.

Figure 2-4
Design by Market



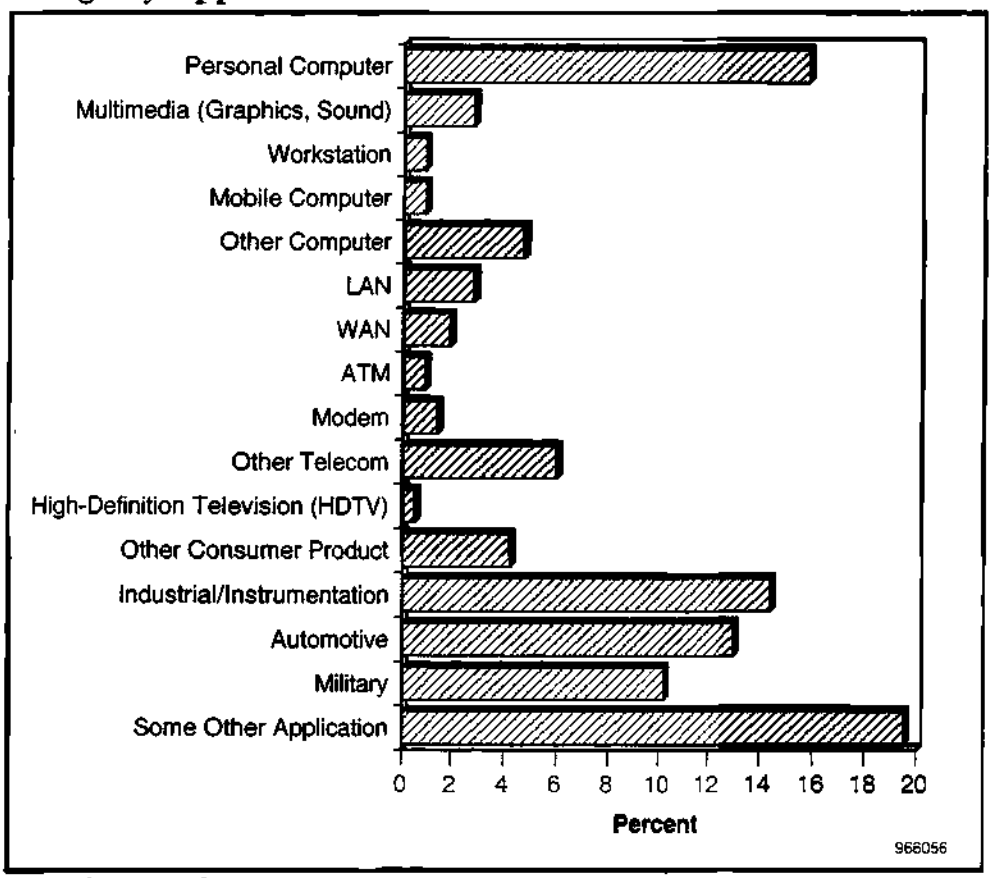
Source: Dataquest (September 1996)

This year we added four new categories to the question concerning design by application: WAN, Modem, HDTV, and Others. It looks like we have still more to add, as the largest category was Others at 19.5 percent (see Figure 2-5). Any suggestions would be welcomed.

There has been a small movement from workstation to PC this year. What we have found is confusion about what is a PC and what is a workstation. We will have to split out workstation "NT" and workstation "UNIX" next year (see Figure 2-6).

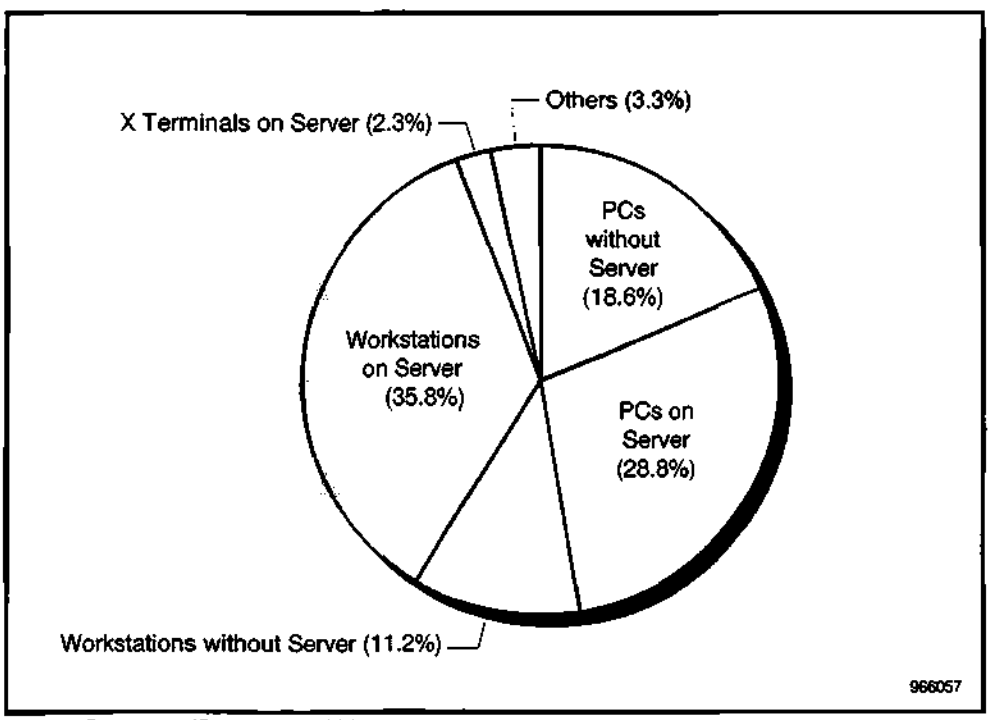
As predicted, we are seeing a dramatic shift to the NT environment (see Figure 2-7). Dataquest believes that most mainstream engineering departments will shift to NT in the next three years. We are seeing the shift from Sun UNIX to its Solaris UNIX OS. What is really surprising is that large group of designers that intend to drop non-Sun-supported UNIX. After achieving major penetration in the EDA compute-intensive server market, Hewlett-Packard seems to be dropping out of contention. The interoperability issues did not allow HP to grab a position on the desktop. Batching a simulation off to your compute server is one thing, having a mixed UNIX desktop environment is another. Once again, the lack of UNIX standards is working in NT's favor. As we have said before, if the 64-bit UNIX environment develops as the 32-bit UNIX environment did, 64-bit NT will be the OS of choice in the high-end EDA world in the next century.

Figure 2-5
Design by Application



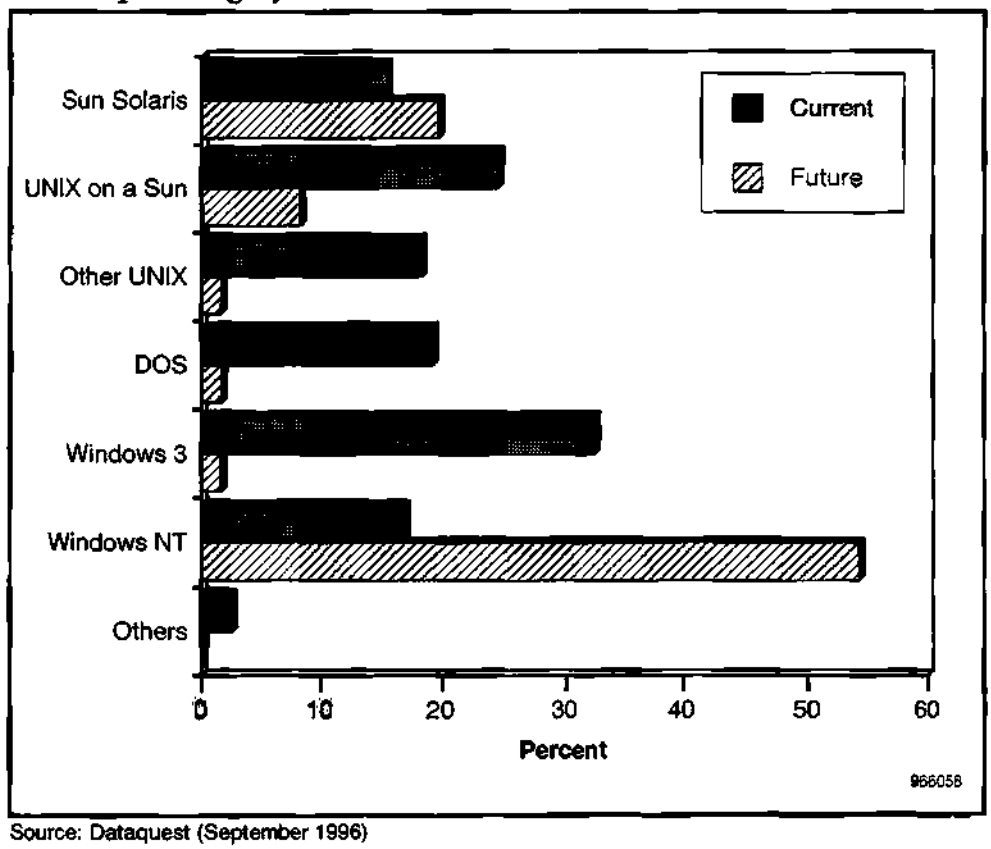
Source: Dataquest (September 1996)

Figure 2-6
Platform Used



Source: Dataquest (September 1996)

Figure 2-7
EDA Operating System Used

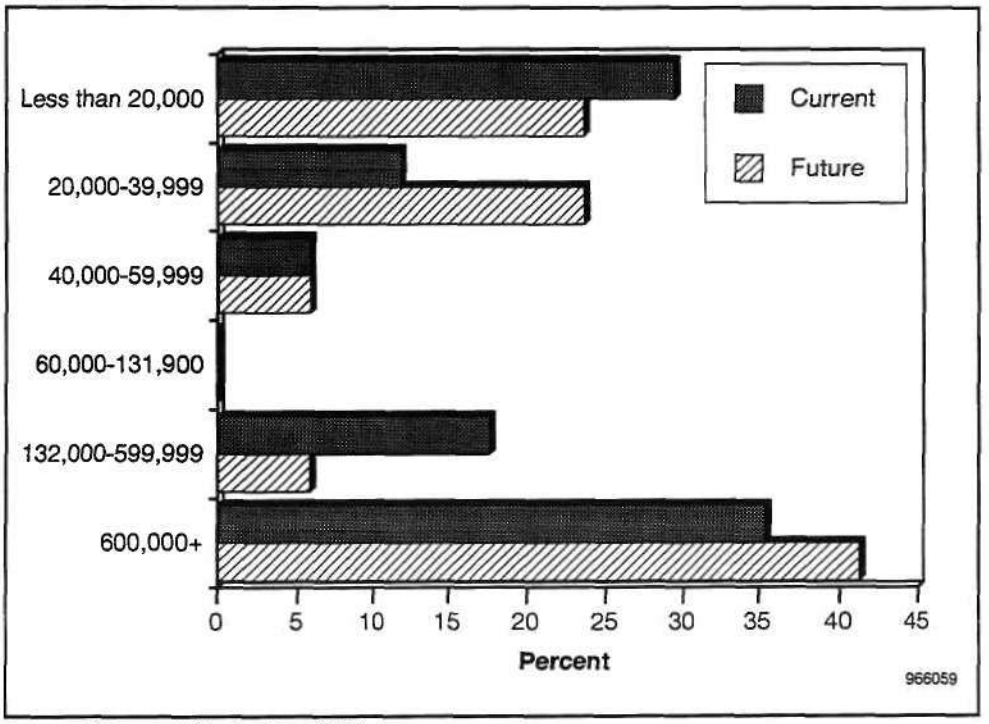


Source: Dataquest (September 1996)

As we said before, we got really good information, but we fell seven respondents short of a statistical sample. So keep this in mind when looking at the data.

One of the more obvious conclusions, throughout this report, is that we will have to increase the size of design category next year. The largest category of the number of transistors used in IC design was more than 600,000. The next was under 20,000 transistors. However, the indication is that the next design will grow into the 20,000 to 39,000 transistor count (see Figure 3-1).

Figure 3-1
IC Transistor Count

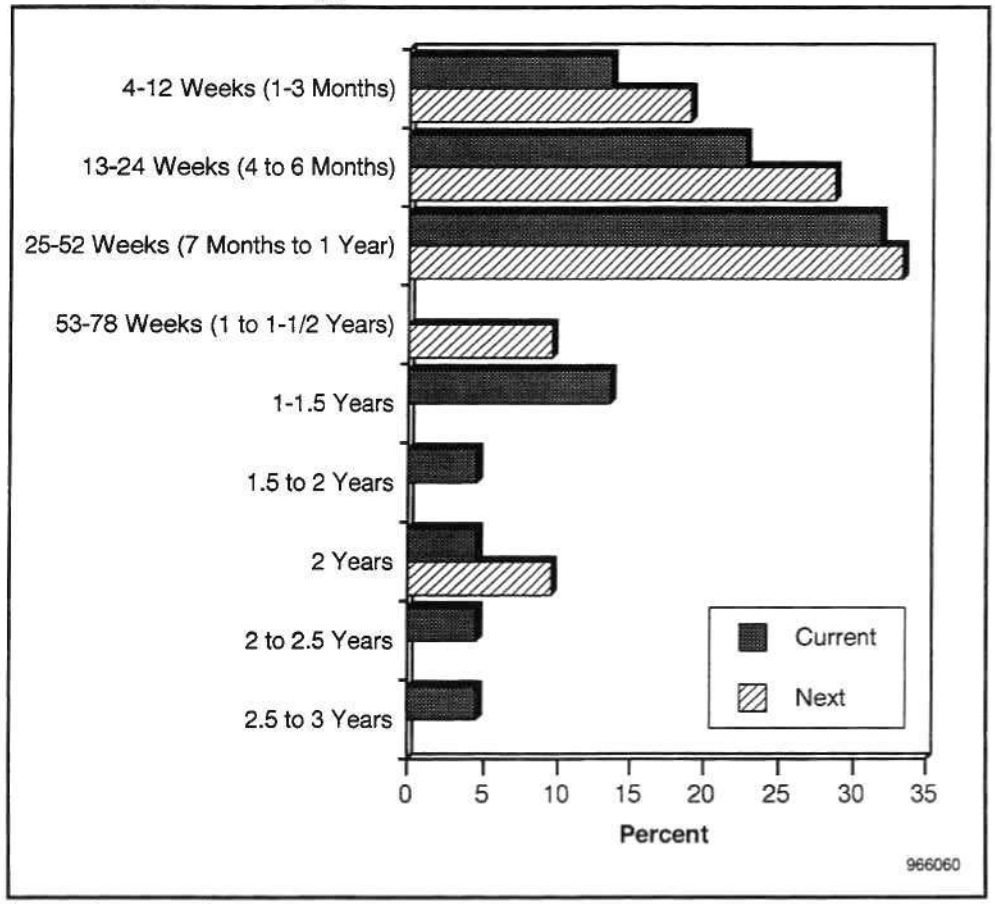


Source: Dataquest (September 1996)

The survey indicates that all designs that presently take under a year will take longer on the next design. On the other hand, the desire is to pull all designs that presently take over a year into the year-and-a-half to two-year time frame (see Figure 3-2).

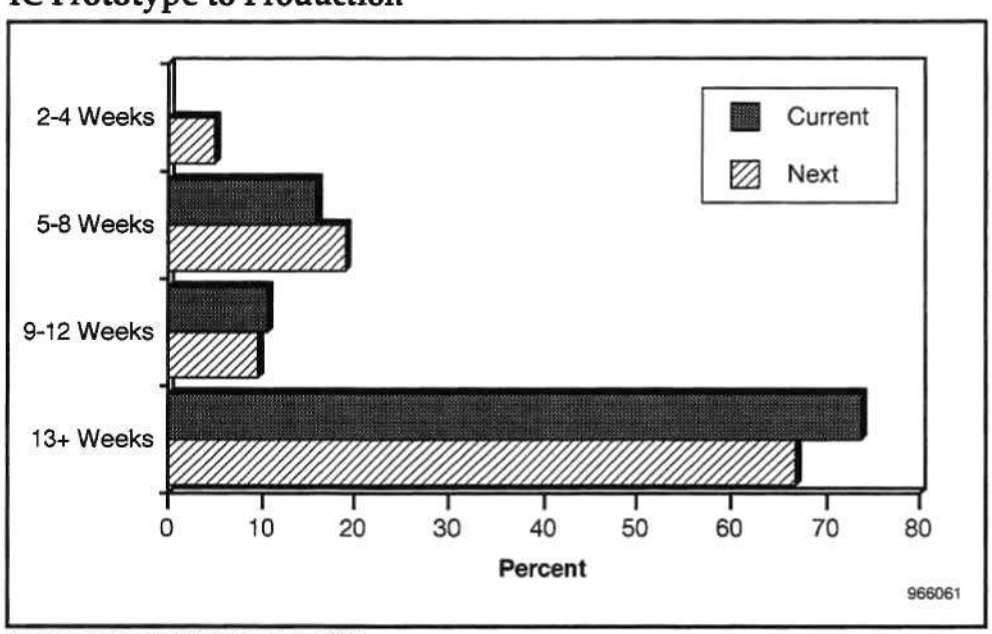
The period of time between prototype and production is far longer in ICs than any other discipline. The old days, when anything that yielded over 10 percent was an IC, are over. Extensive testing and verification have moved the point of introduction out to six months. This is another area we will need to open up in next year's survey (see Figure 3-3).

Figure 3-2
IC Concept to Prototype



Source: Dataquest (September 1996)

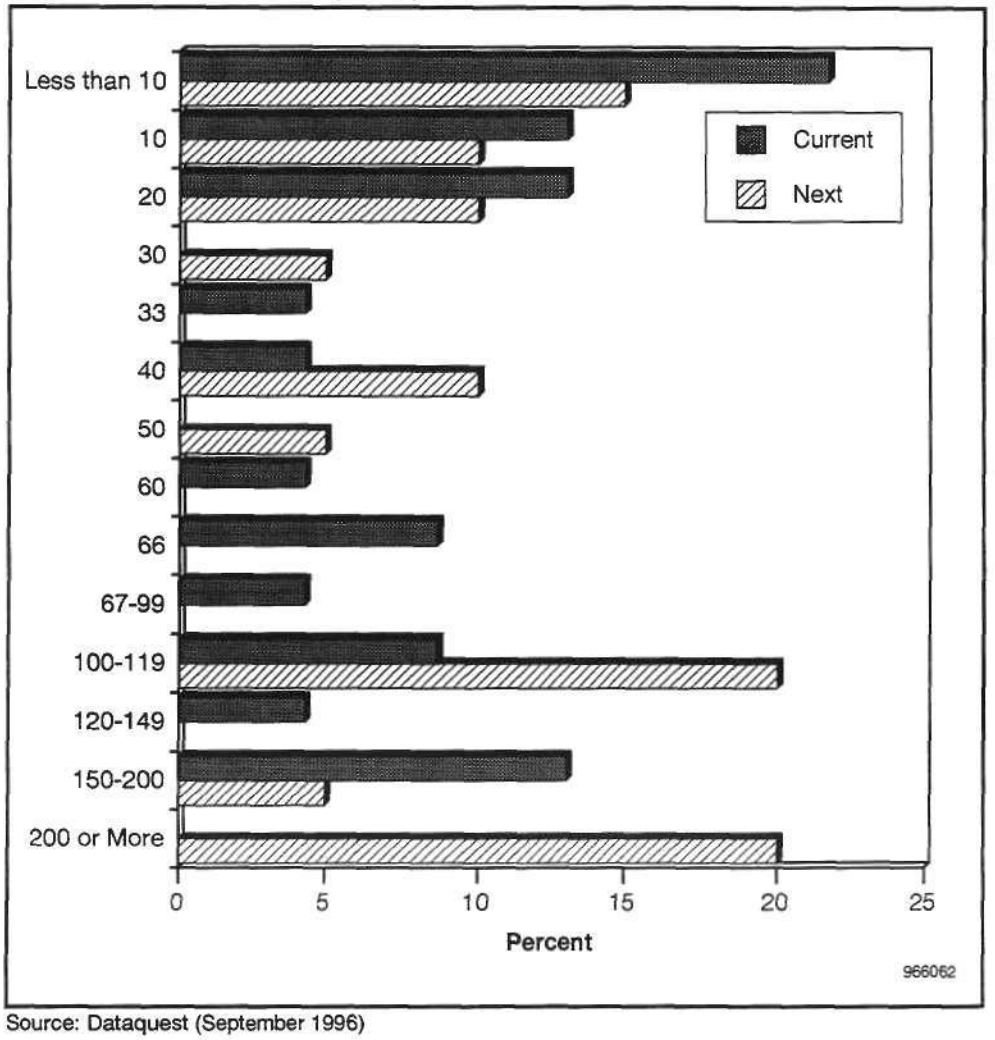
Figure 3-3
IC Prototype to Production



Source: Dataquest (September 1996)

The highest IC clock frequency was an interesting question. The highest frequency reported for the present design was just under 200 MHz. However, 20 percent of the respondents said they would exceed 200 MHz in their next design. This is a dramatic jump in frequency. A possible reason is the 100-MHz PCI bus along with firewire and other 100-MHz-plus standards that are now emerging (see Figure 3-4).

Figure 3-4
Highest IC Clock Frequency

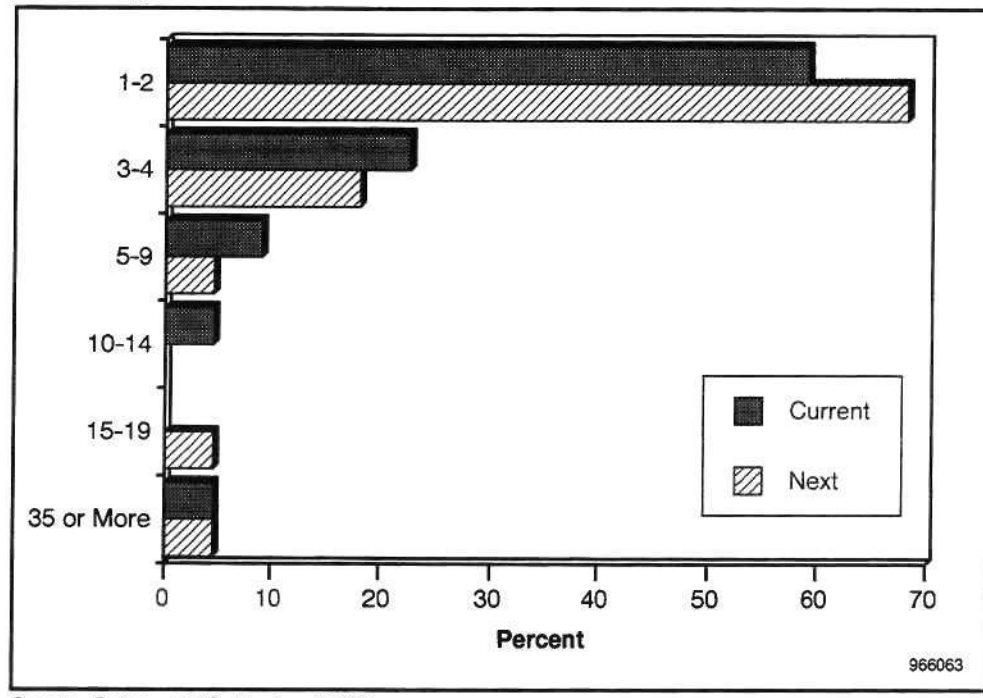


Source: Dataquest (September 1996)

The design iterations needed to resolve timing issues are surprisingly low. It will be interesting to see how next year's response corresponds to this year's expectations (see Figure 3-5).

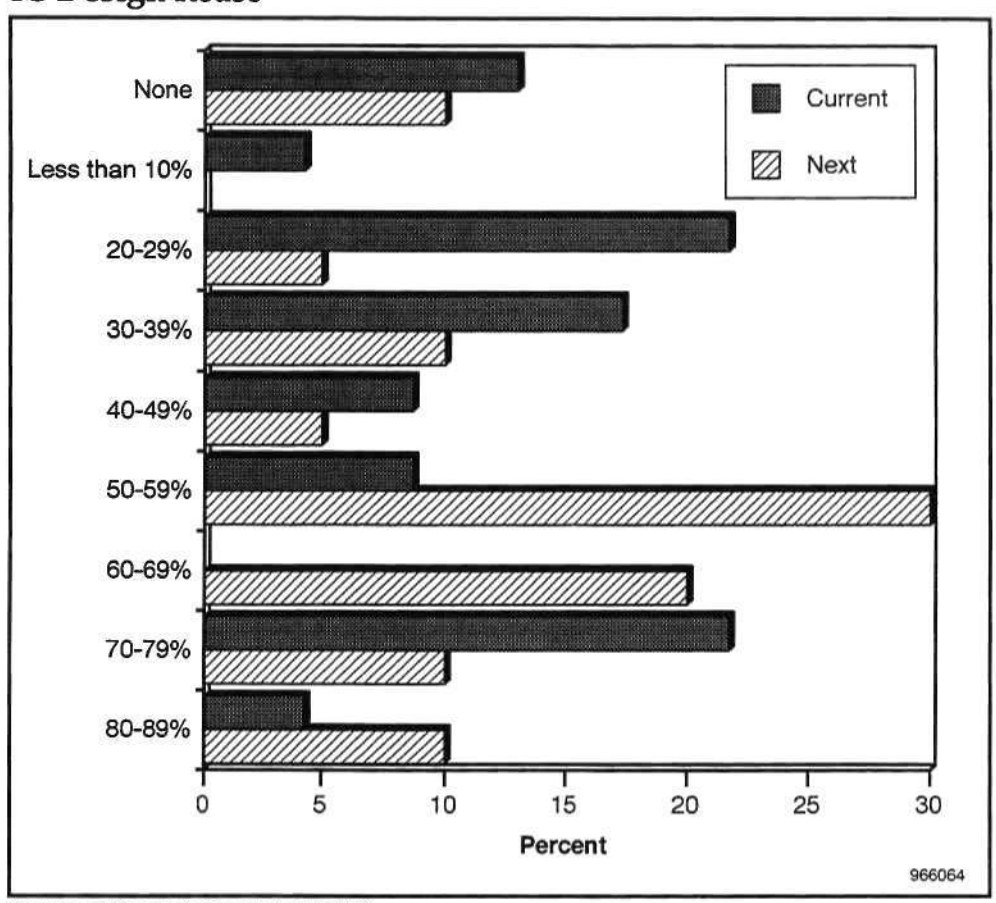
The design reuse picture is fairly mixed. This is an area where a high percentage of reuse is possible. Of the designers surveyed, 10 percent expect to use in excess of 80 percent of their present designs in their next designs (see Figure 3-6).

Figure 3-5
IC Design Iterations



Source: Dataquest (September 1996)

Figure 3-6
IC Design Reuse

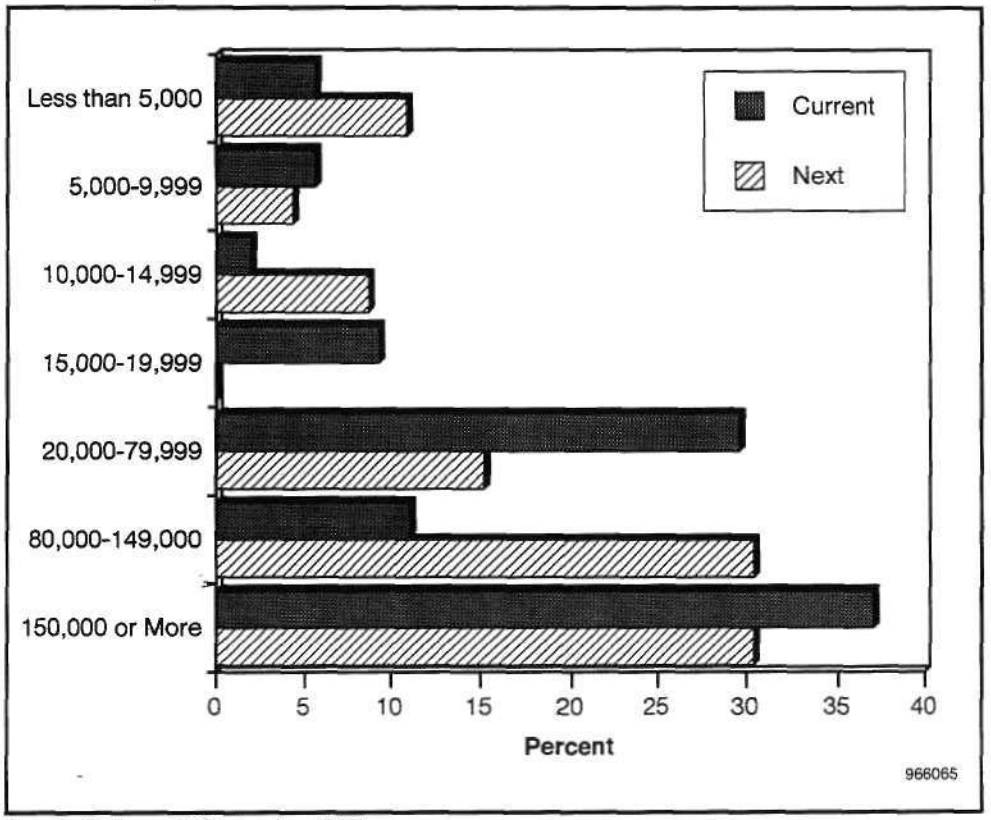


Source: Dataquest (September 1996)

Chapter 4
Gate Array and Cell-Based Design

We received a good response from gate array/CBIC designers. Some of the results however, were puzzling. More than 6 percent of the respondents doing large designs said that their next design would be smaller. This was in sharp contrast to last year's results. Possibly the pain of doing large designs is catching up to the design community (see Figure 4-1).

Figure 4-1
Gate Array/CBIC Gate Count



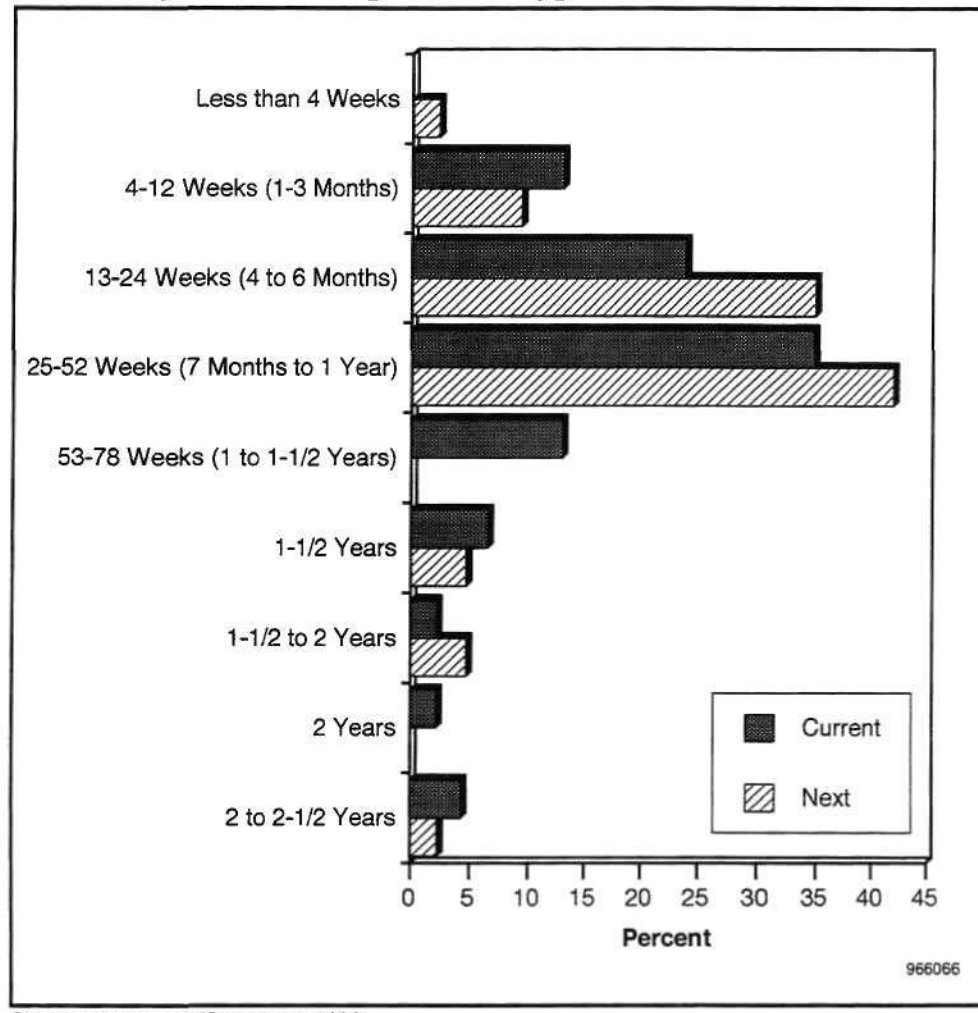
Source: Dataquest (September 1996)

Reality also has set in regarding the design cycle. Last year's optimism has been replaced with the realization that design times are going out. We are still targeting the one-year design cycle (see Figure 4-2).

This also applies to the prototype-to-production cycle. More than 67 percent of respondents said they expect to exceed 13 weeks on their next design. We will need to open up this category next year (see Figure 4-3).

Clock frequencies continue their upward climb. Where 21 percent of last years' respondents had clocks higher than 120 MHz, this year it was 27 percent. More than 12 percent of the respondents expect to exceed 200 MHz in their next design. This follows what we are seeing in IC design (see Figure 4-4).

Figure 4-2
Gate Array/CBIC Concept to Prototype



Source: Dataquest (September 1996)

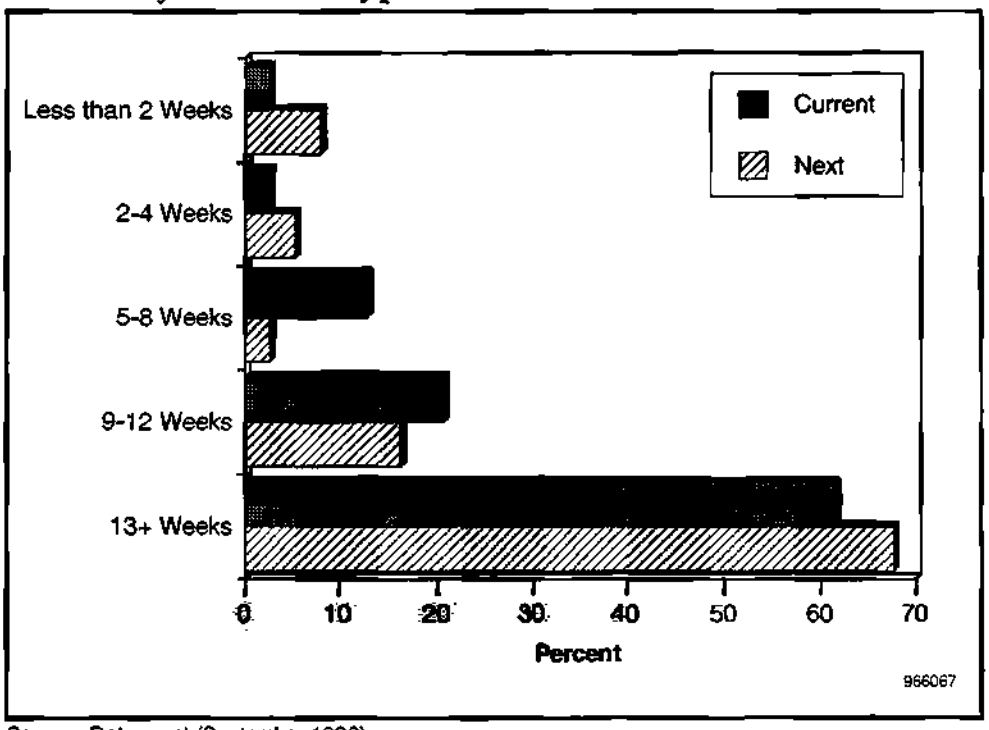
Design iterations are also creeping up. Last year the number of respondents that reported in the one-to-two iteration category was about 80 percent. This year it was about 55 percent, but in their normal optimistic mode, respondents expected that to be 60 percent with their next design (see Figure 4-5). Does the term "fat chance" come to mind?

Circuit reuse, as expected, is going up. The group that used less than 10 percent of their last design declined by more than 20 percent. We have broken this down into finer categories to be able to better judge this trend next year (see Figure 4-6).

Today, the engineers that use macros is 50 percent of the design population. That's a 5 percent increase over last year (see Figure 4-7).

And the size of the macros is increasing. The number of designers using macros in excess of 10,000 gates doubled this year. We will have to take a look at what constitutes a system-level macro (SLM) and see if we can get a better look at this emerging technology next year (see Figure 4-8).

Figure 4-3
Gate Array/CBIC Prototype to Production

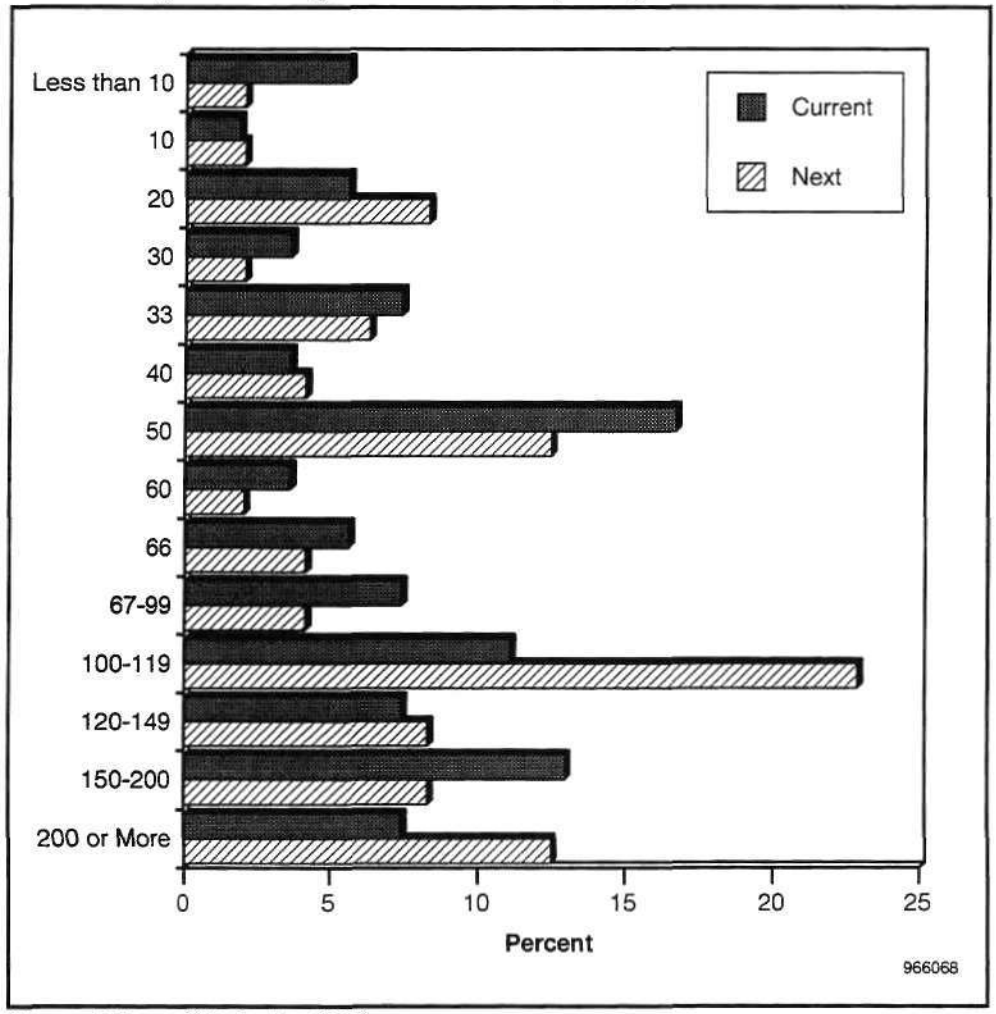


Source: Dataquest (September 1996)

As we are now seeing multiple macros being used on most designs, we had to rephrase our question of In-House versus Purchased Macros. We found that 23 percent of the designs used a mixture of both. Still, this year, the predominant source of macros is in-house design. This is an indication that the mainstream companies are starting to understand the advantage of productizing, or possible macroizing, their intellectual property (see Figure 4-9).

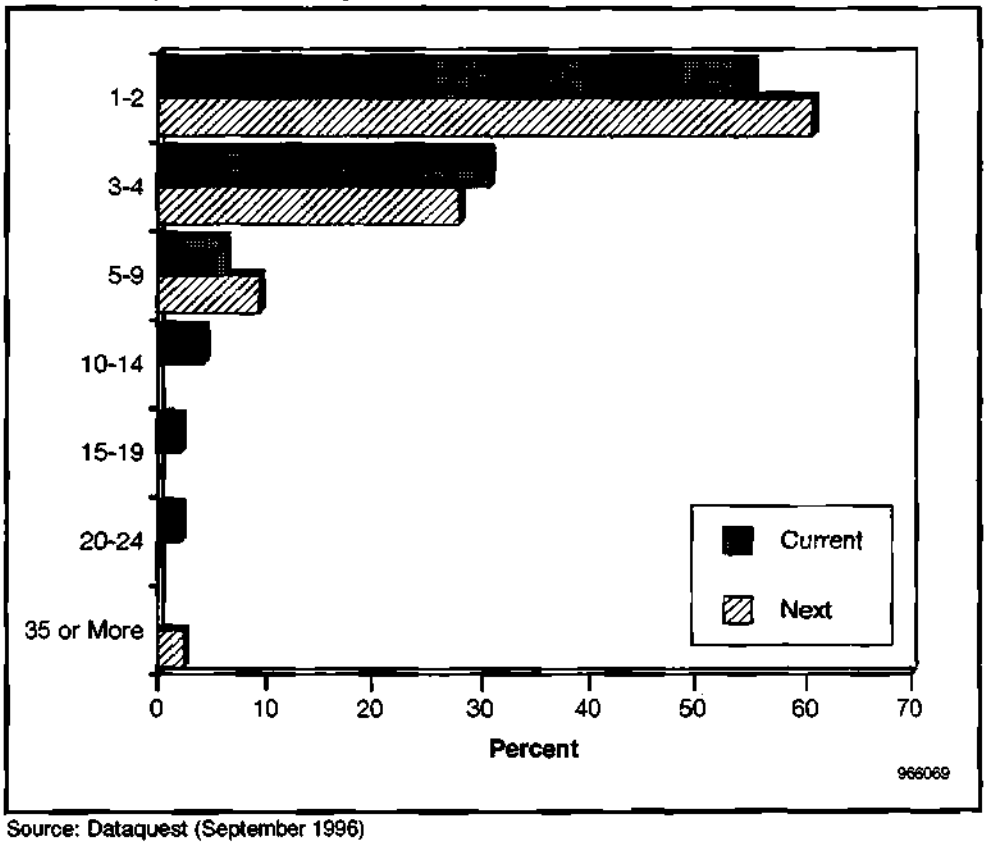
Again, as we see multiple macros being used in a design, we have had to modify our questionnaire. What is clear is that hard macros (macros that have a fixed silicon implementation) are continuing to gain popularity (see Figure 4-10).

Figure 4-4
Gate Array/CBIC Highest Clock Frequency



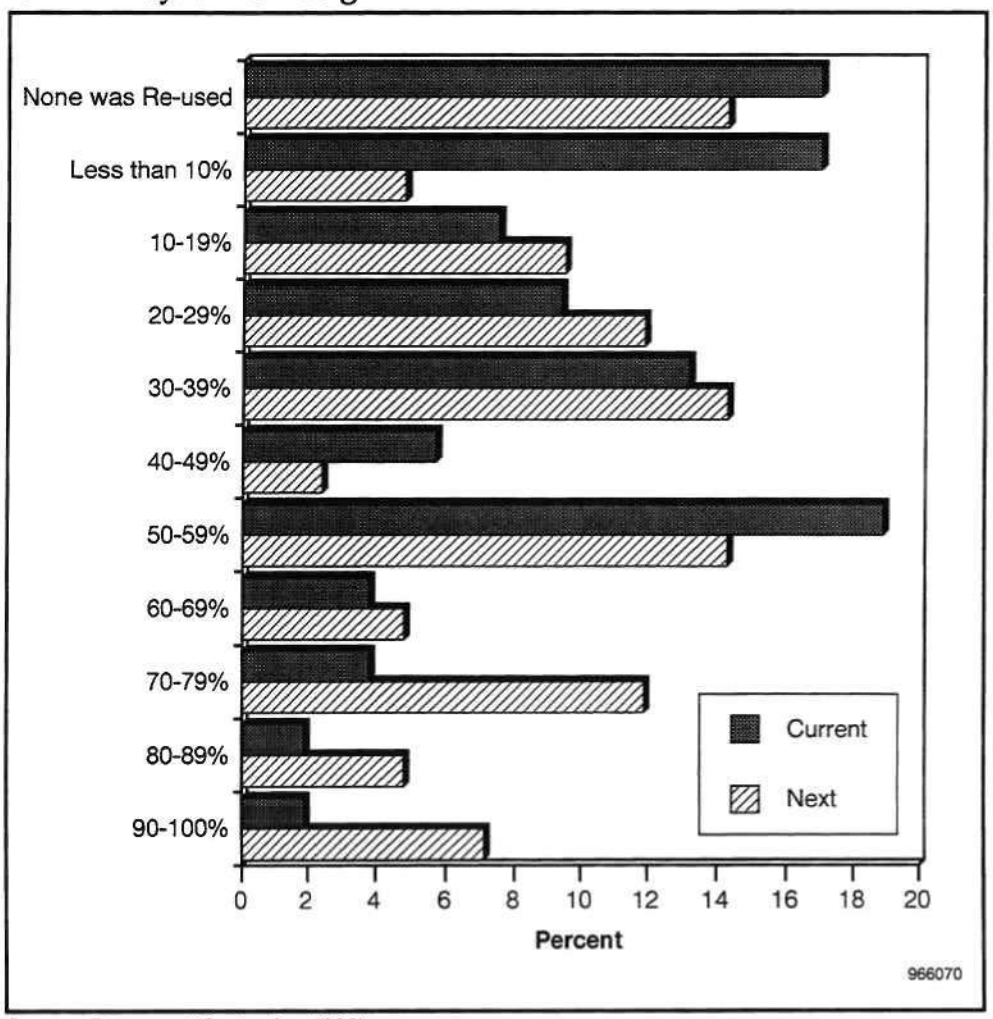
Source: Dataquest (September 1996)

Figure 4-5
Gate Array/CBIC Design Iterations



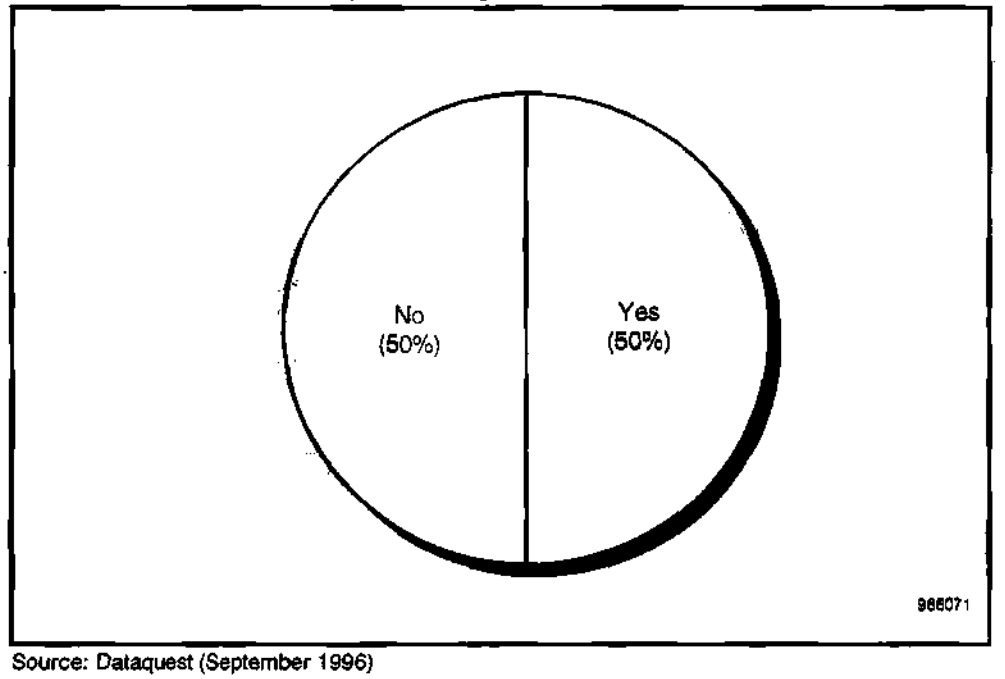
Source: Dataquest (September 1996)

Figure 4-6
Gate Array/CBIC Design Reuse



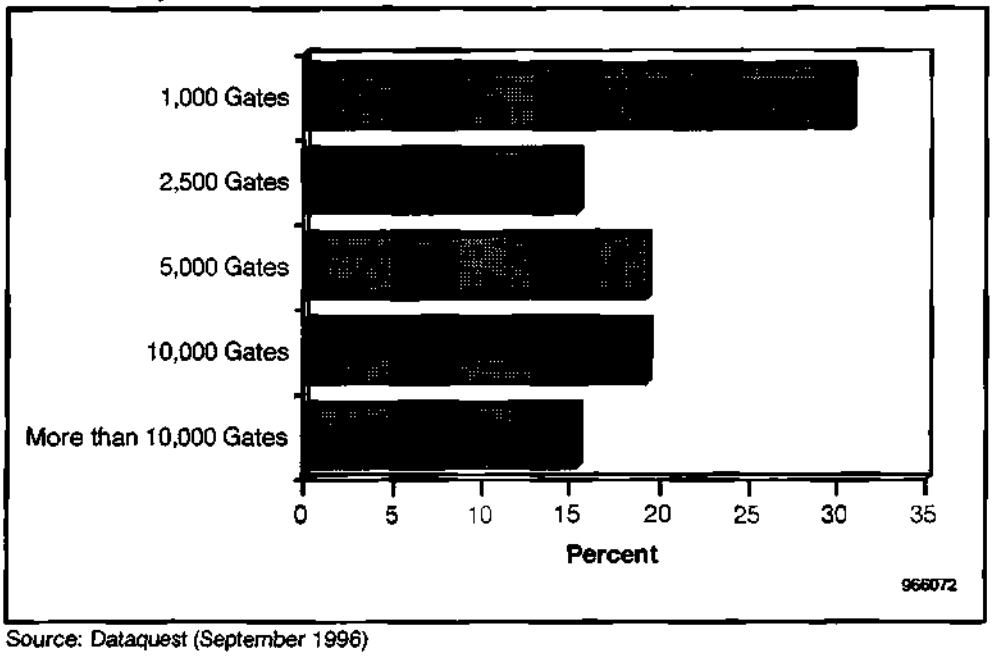
Source: Dataquest (September 1996)

Figure 4-7
Gate Array/CBIC Designs Using Macros



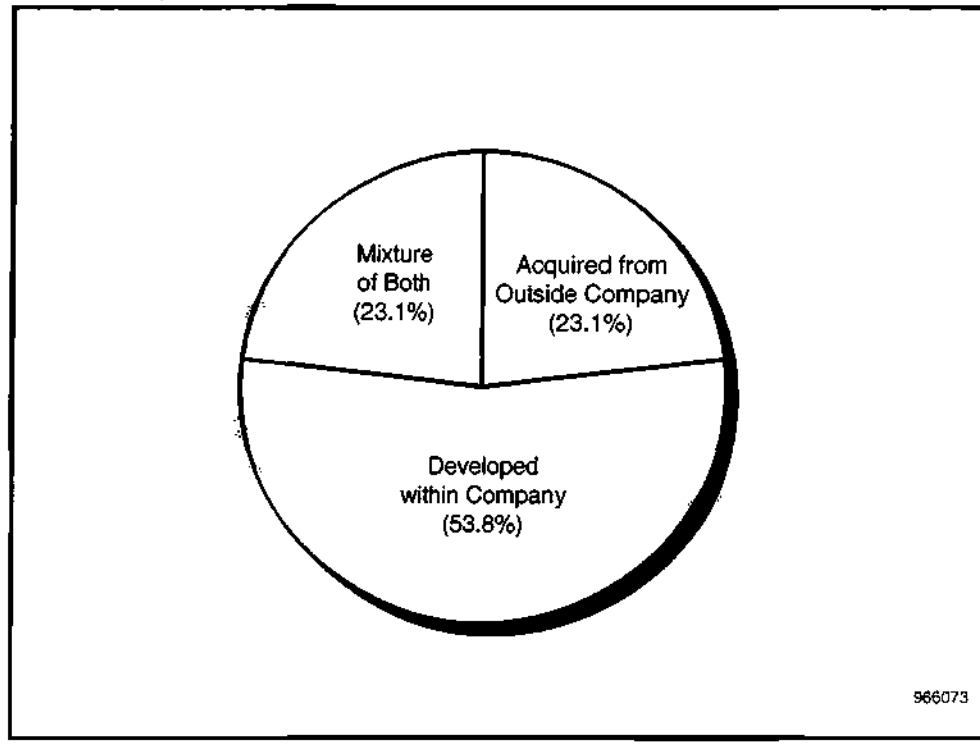
Source: Dataquest (September 1996)

Figure 4-8
Gate Array/CBIC Size of Macros



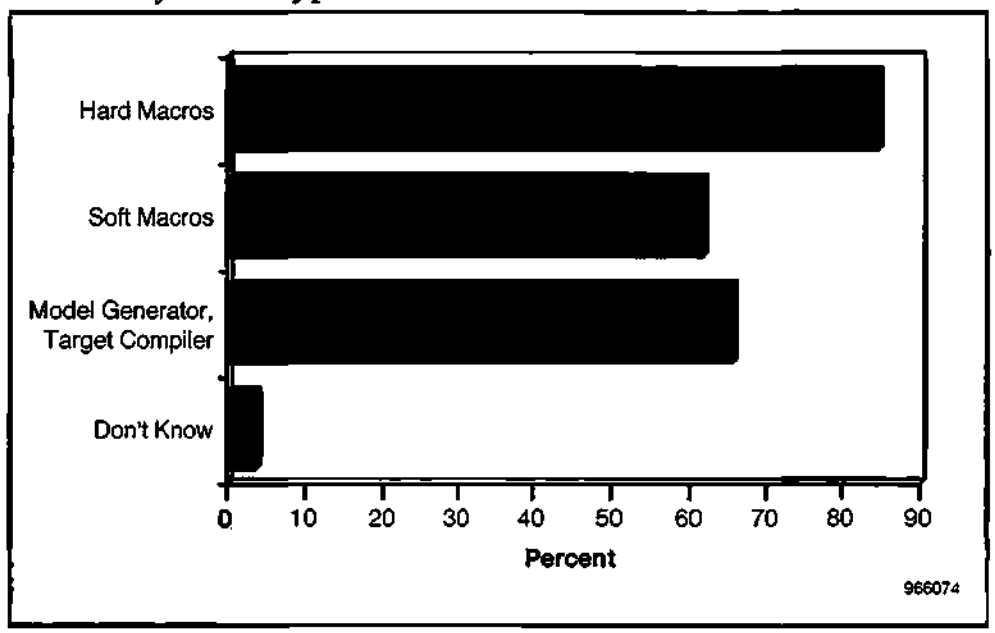
Source: Dataquest (September 1996)

Figure 4-9
Gate Array/CBIC Source of Macros



Source: Dataquest (September 1996)

Figure 4-10
Gate Array/CBIC Type of Macro

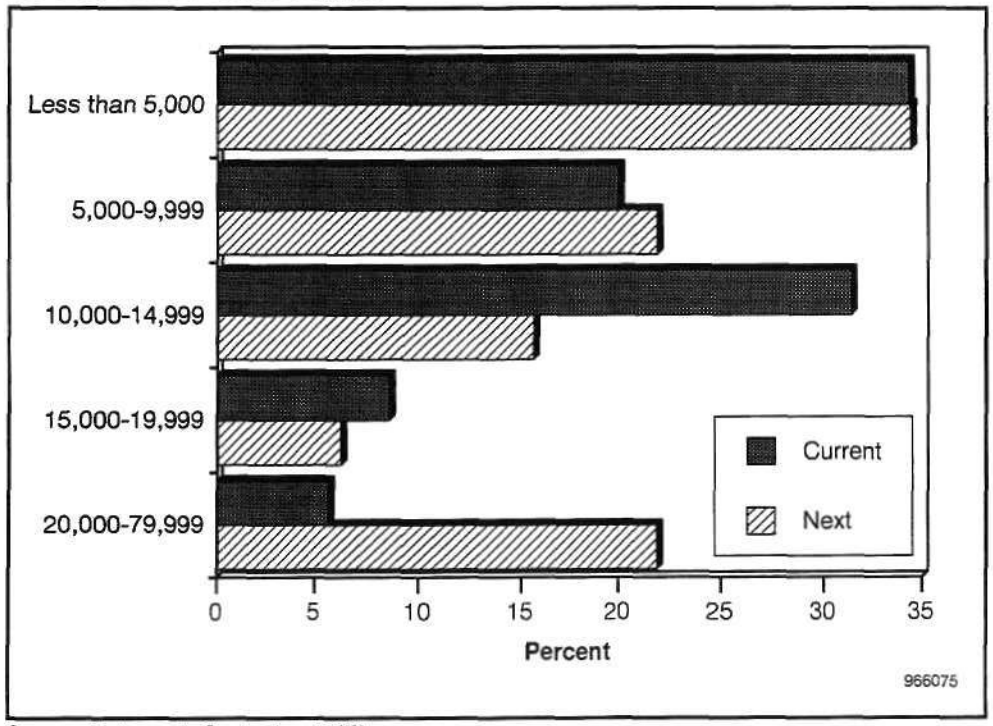


Source: Dataquest (September 1996)

Chapter 5
FPGA/CPLD Design

FPGA/CPLD designers continue to be somewhat difficult to survey. Getting answers to track year by year is hard. Last year 15 percent of the respondents said their designs were over 20,000 gates, an answer that seemed high, considering the devices available at that time. They then said that 14 percent of the next designs would be in that category, a small but unusual drop. This year only 5 percent of respondents did designs over 20,000 but almost 22 percent said that their next design would be in this category (see Figure 5-1).

Figure 5-1
FPGA/CPLD Gate Count



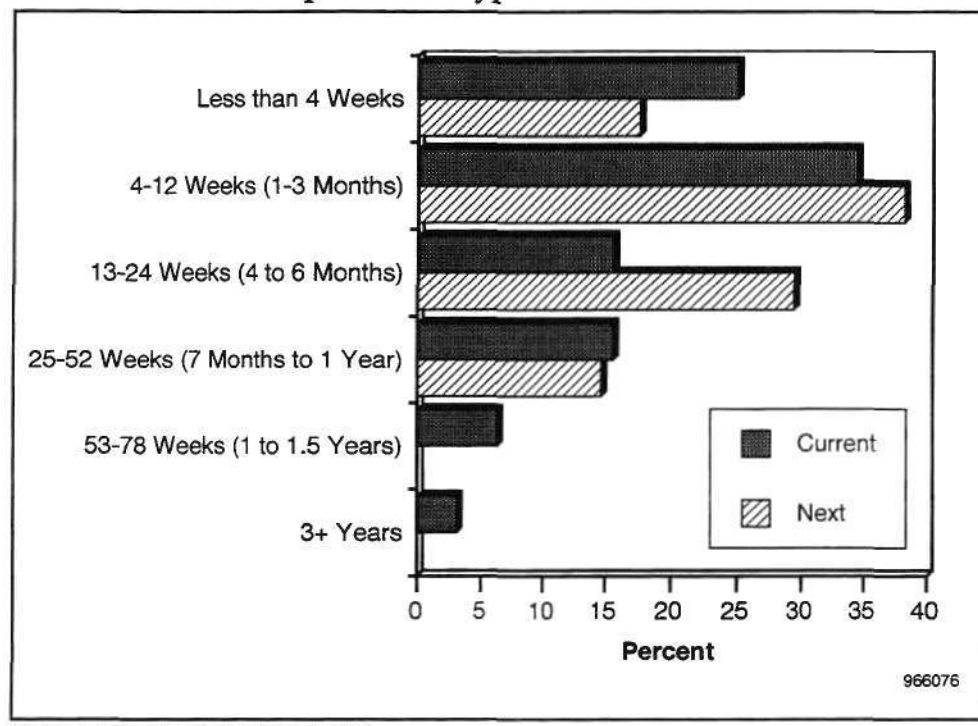
Source: Dataquest (September 1996)

As expected, the design cycle is about one-fourth that of the gate array/CBIC designer. Most designs come in under three months (see Figure 5-2).

The prototype-to-production cycle, however, looks very similar to the gate array/CBIC prototype-to-production cycle. These designs are getting large enough that the similarities are becoming more pronounced than the differences (see Figure 5-3).

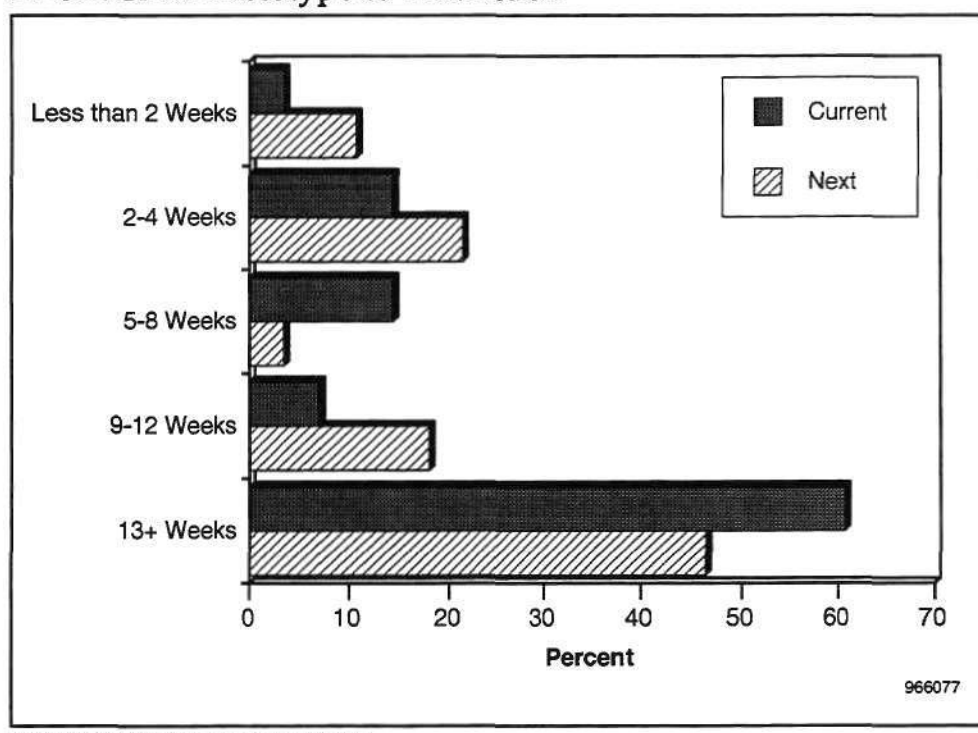
In last year's report we discussed that 8 percent to 12 percent of respondents tend to be "different." Our only explanation of the higher clock frequencies reported for FPGA/CPLD designs would be this group. We have seen fast designs, using QuickLogic and AT&T (now Lucent) devices, but we still would have to see any of today's FPGA/CPLDs running in excess of 100 MHz to believe it (see Figure 5-4).

Figure 5-2
FPGA/CPLD Concept to Prototype



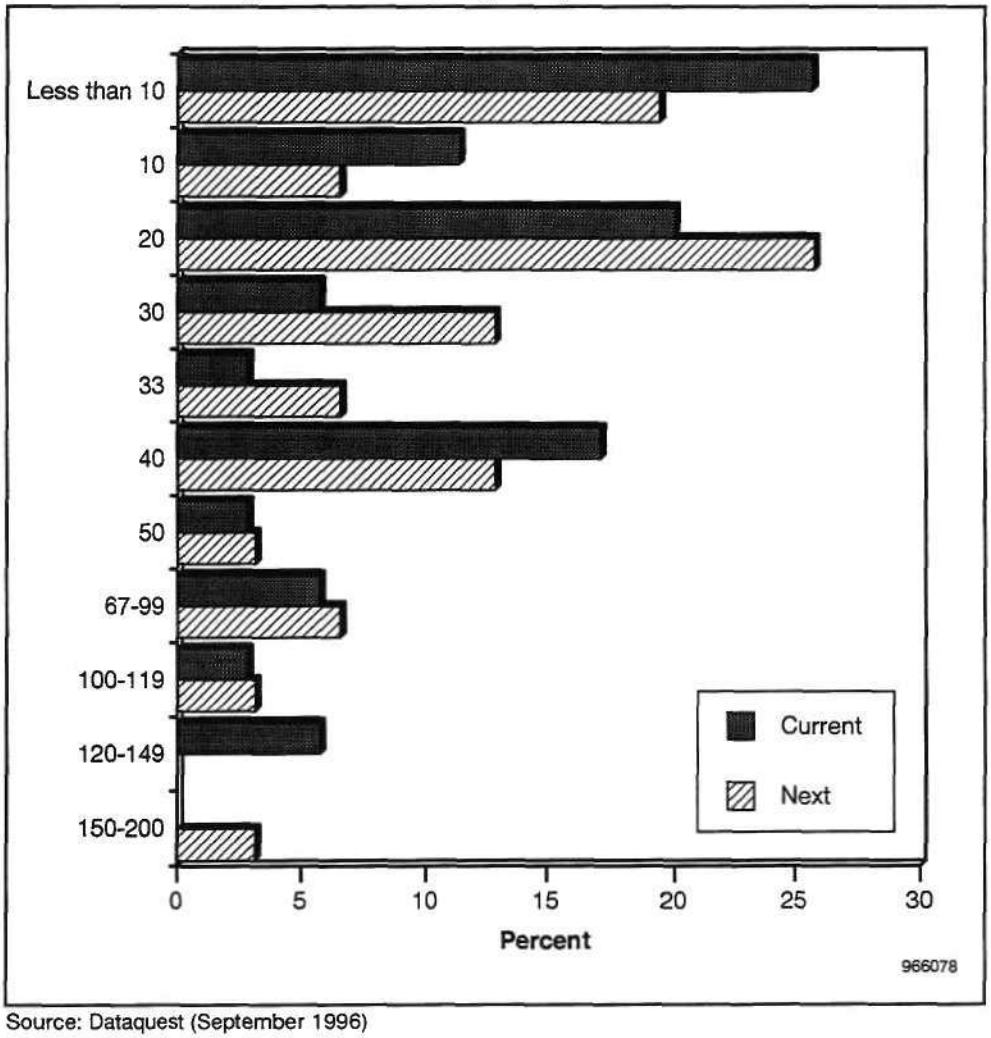
Source: Dataquest (September 1996)

Figure 5-3
FPGA/CPLD Prototype to Production



Source: Dataquest (September 1996)

Figure 5-4
FPGA/CPLD Highest Clock Frequency



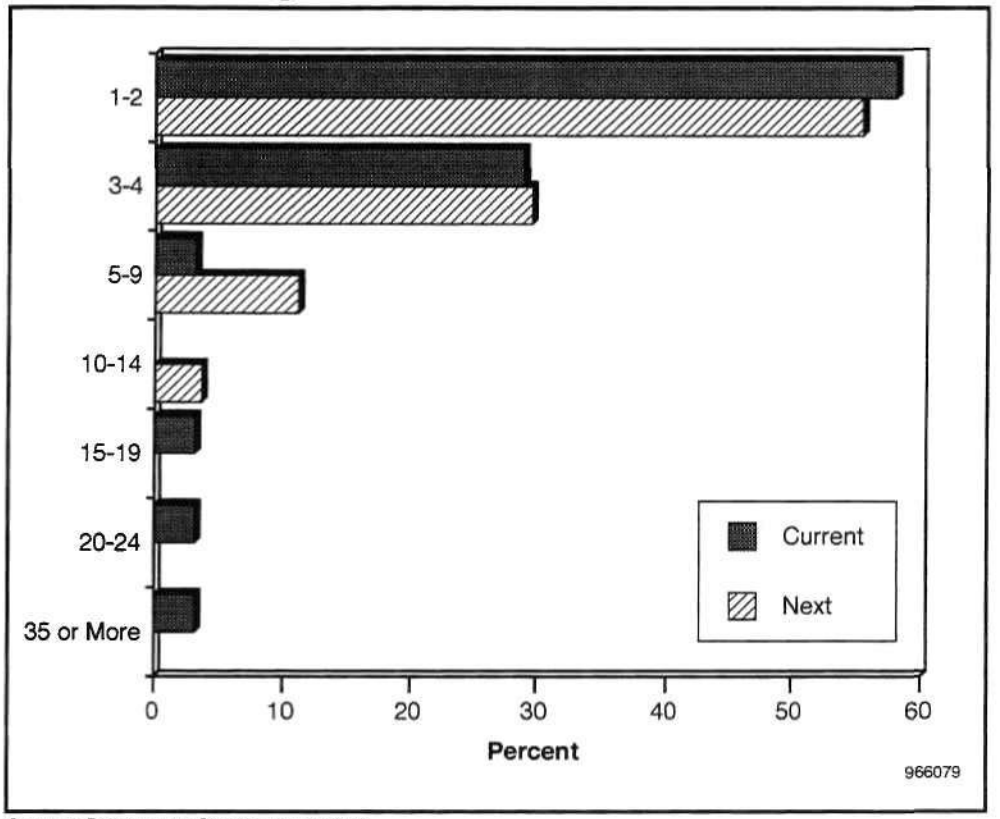
Source: Dataquest (September 1996)

As could be expected, FPGA/CPLD designers are not having that much trouble resolving timing issues. FPGA/CPLD architectures have come a long way in the past six years. As long as frequencies are below 50 MHz, these designs are relatively easy to turn out (see Figure 5-5).

Design reuse, on the other hand, turned out to be a surprise. The assumption that designs under 20,000 gates are just glue logic doesn't seem to be true. There is quite a bit of design reuse going on in FPGA/CPLD design (see Figure 5-6).

Which brings us to the topic of macro use in FPGA/CPLDs. The FPGA/CPLD vendors were far faster in catching on to the power of macro design than were the mainstream gate array vendors. In fact, today the top FPGA/CPLD vendors have far more sophisticated macro programs than all but the top-of-the-line gate array/CBIC vendor. They have become a major driving force in the macro revolution (see Figure 5-7).

Figure 5-5
FPGA/CPLD Design Iterations



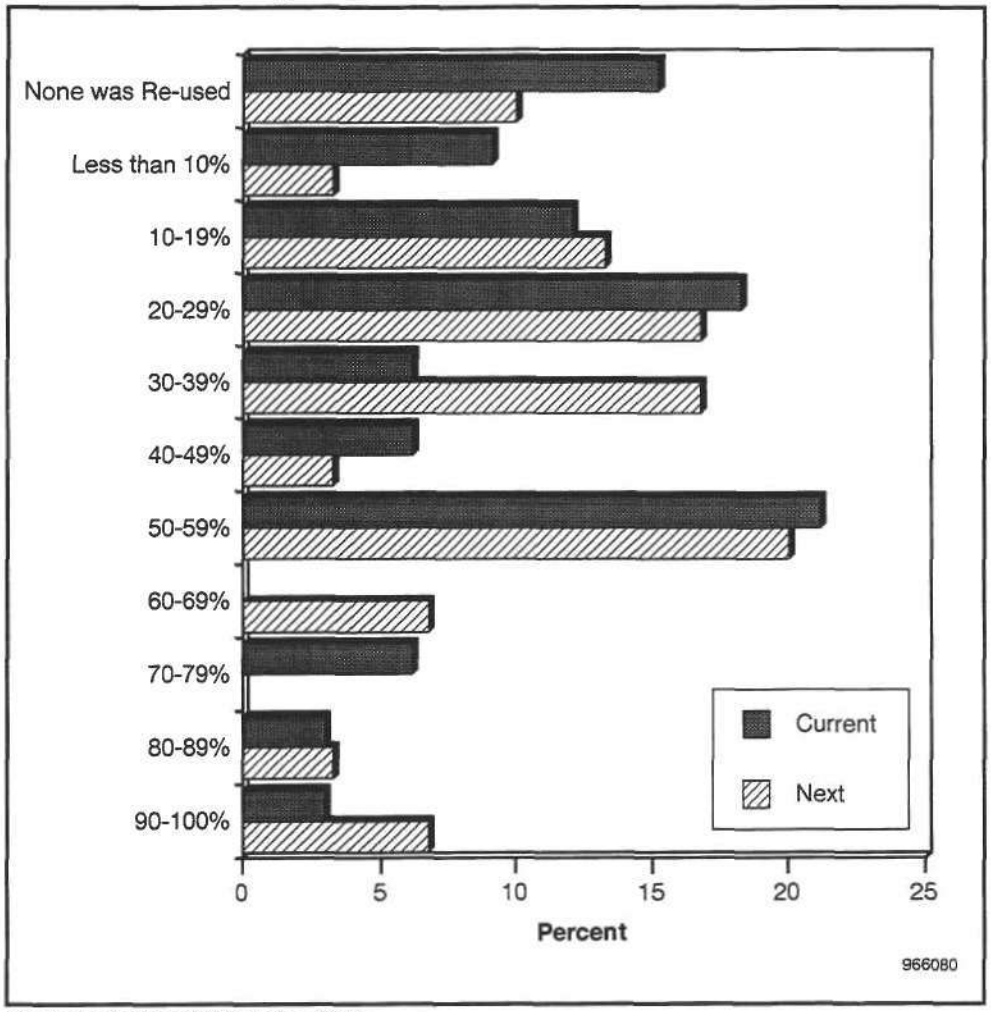
Source: Dataquest (September 1996)

They have also jumped right into the large SLMs. Most macros being used today are in excess of 10,000 gates (see Figure 5-8).

A majority of the macros are being purchased from the outside. There are two reasons for this. First, is that the use of macros in FPGA/CPLD designs is new. There just isn't that much in-house intellectual property lying around loose for these types of designs. The second reason is the outstanding job the FPGA/CPLD vendors are doing developing macro libraries for their customer base. These vendors are to be commended (see Figure 5-9).

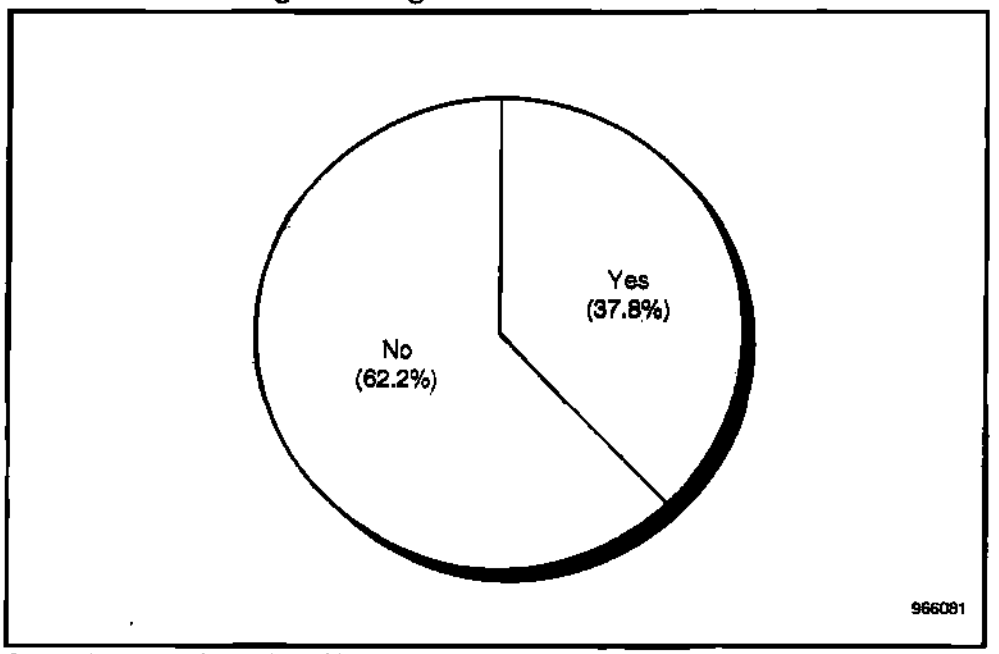
The difference between a soft macro and a hard macro, in the FPGA/CPLD world, is often one of just loading a design into your FPGA/CPLD. This is one of the beauties of FPGA/CPLD design—implementation takes little time. After you check out your timing, you now have a proven hard macro. On the other hand, the use of target compilers is new to the world of the FPGA/CPLD designer. As these devices get larger, expect the popularity of the target compiler to grow (see Figure 5-10).

Figure 5-6
FPGA/CPLD Design Reuse



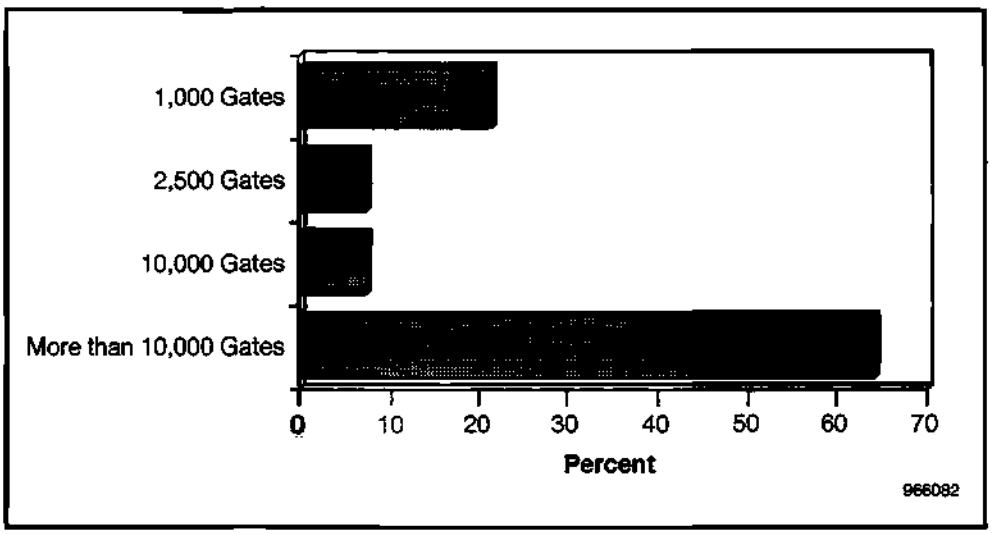
Source: Dataquest (September 1996)

Figure 5-7
FPGA/CPLD Designs Using Macros



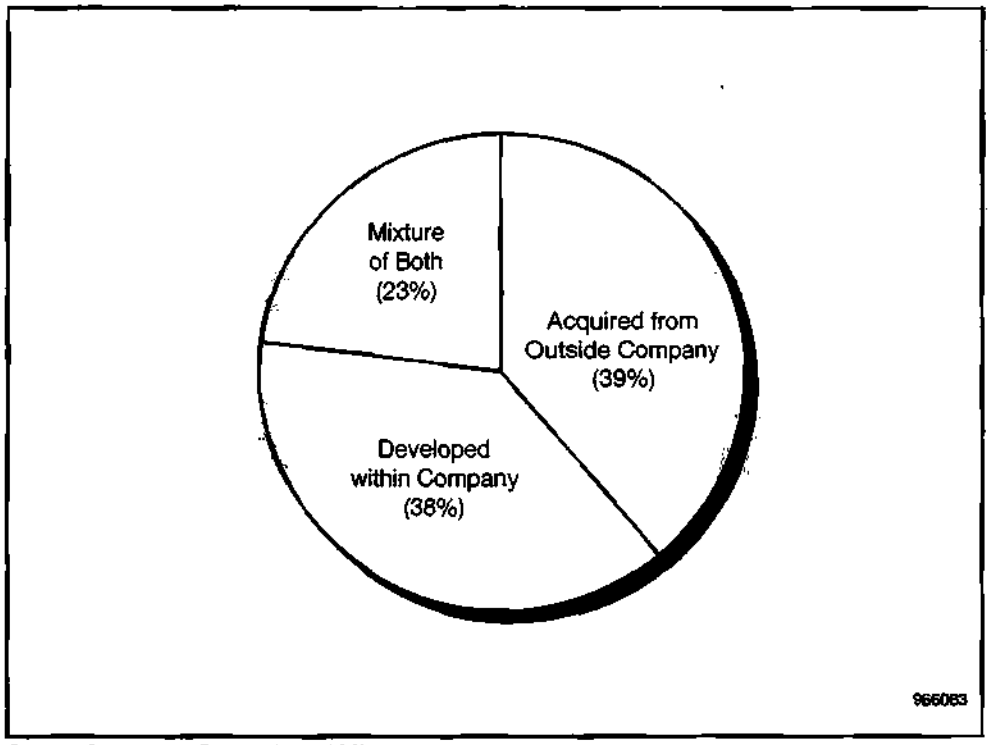
Source: Dataquest (September 1996)

Figure 5-8
FPGA/CPLD Size of Macros



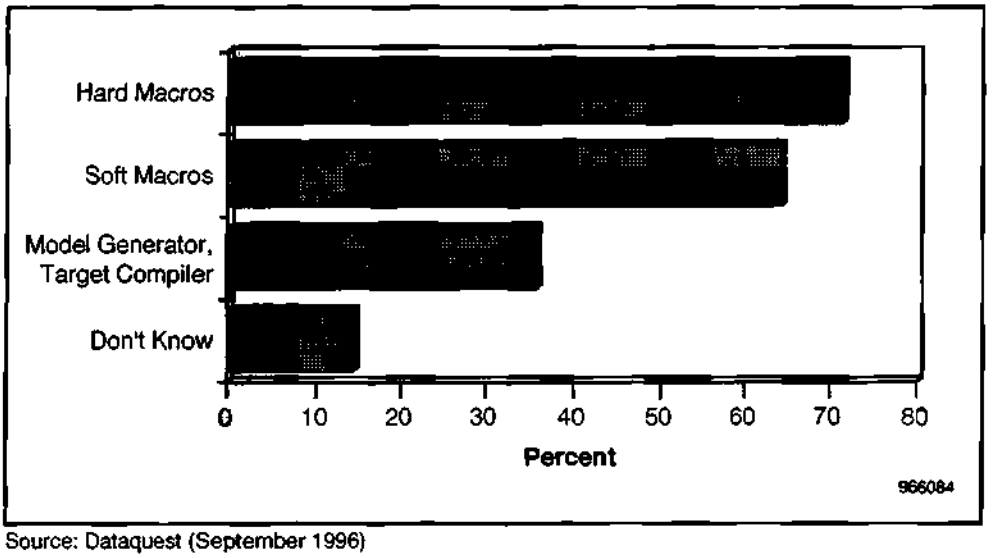
Source: Dataquest (September 1996)

Figure 5-9
FPGA/CPLD Source of Macros



Source: Dataquest (September 1996)

Figure 5-10
FPGA/CPLD Type of Macro

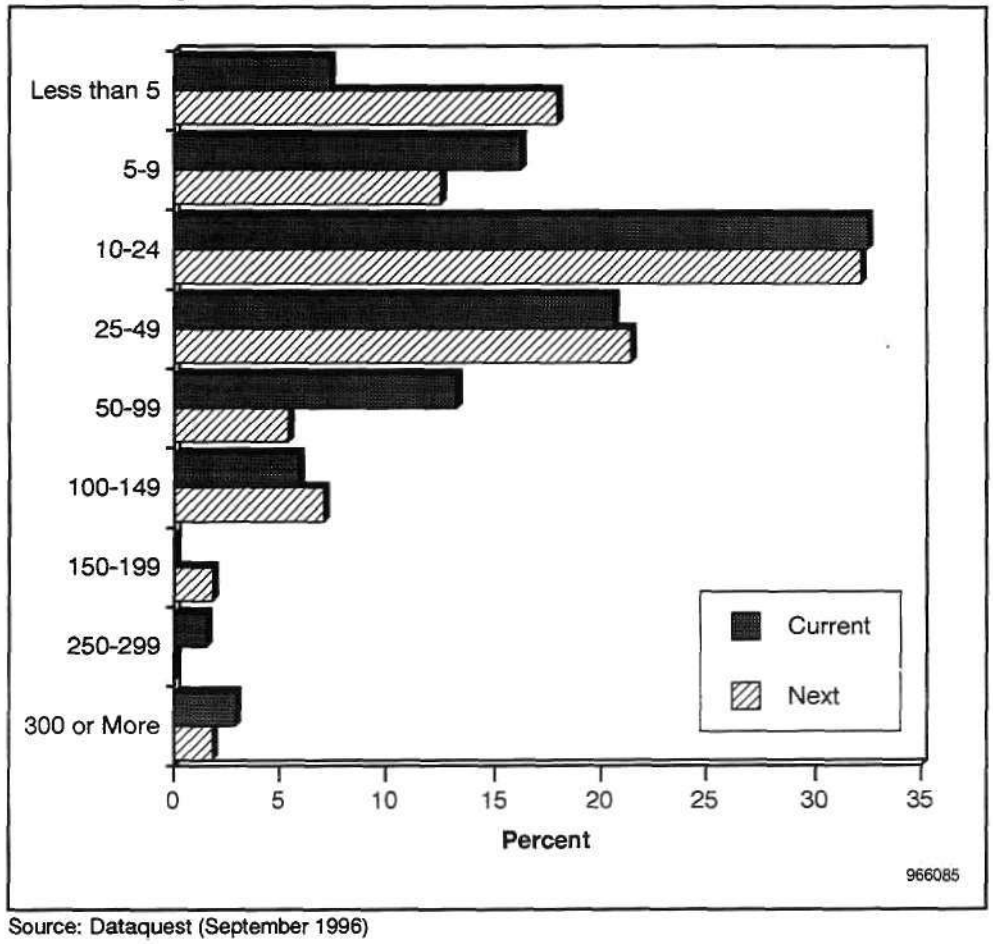


Source: Dataquest (September 1996)

Chapter 6
Printed Circuit Board Design

PCB design continues to fight the challenges of high-speed design. The IC count, on a board, seems to be holding close to even with last year. We have increased the categories to give us a better view of the movement in IC package count (see Figure 6-1).

Figure 6-1
PCB Package Count



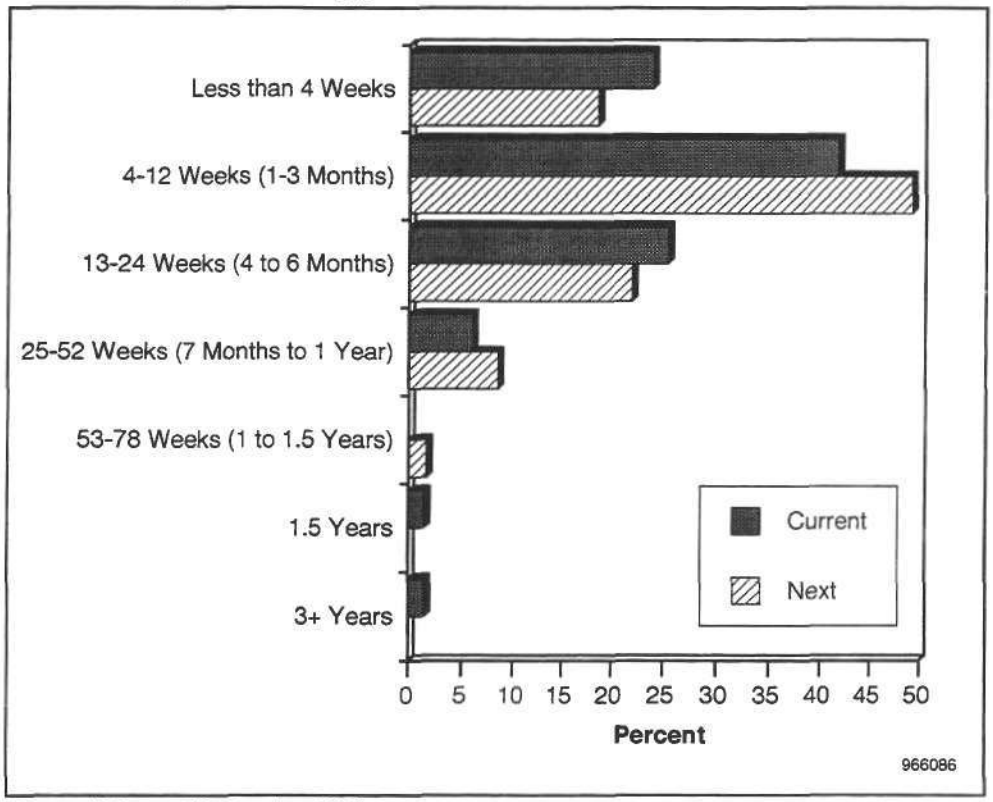
Source: Dataquest (September 1996)

The design cycle, Concept to Prototype, seems to be pulling in. Most boards are designed in the four-to-12-week area (see Figure 6-2).

Again, the Prototype to Production question needs opening up. Five percent more respondents than last year reported prototype-to-production times in excess of 13 weeks (see Figure 6-3).

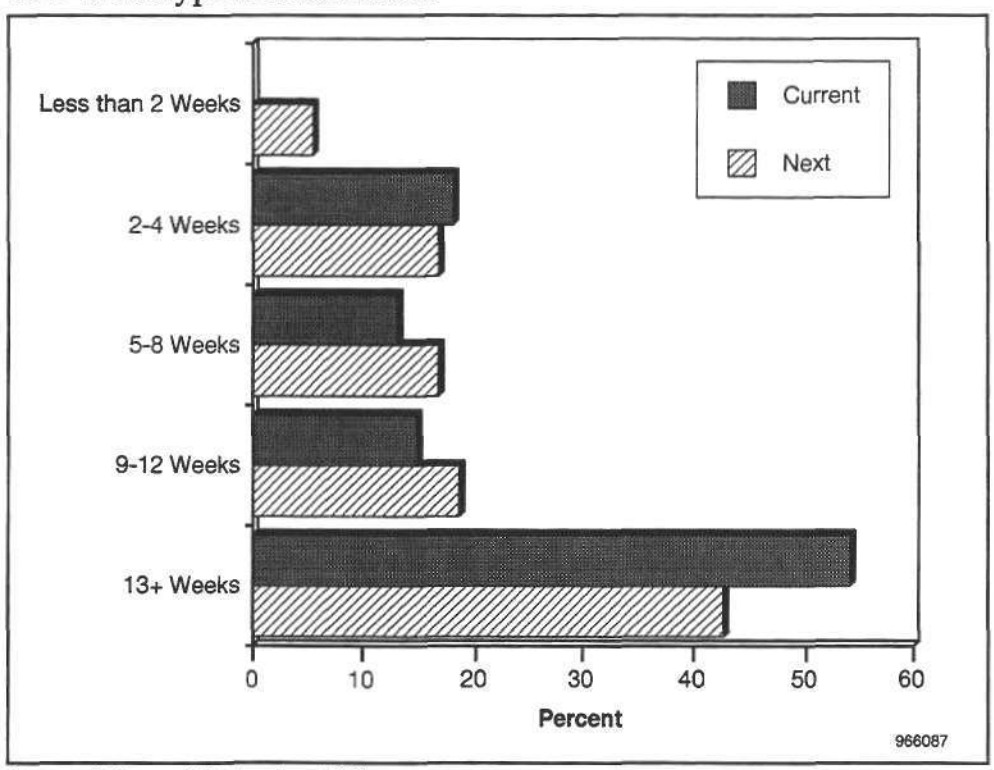
Only 30 percent of the respondents reported frequencies of more than 50 MHz. This was 15 percent less than last year. We do not see this as a trend, but as a sample issue. There are more than 10 times the number of board designers than gate array/CBIC designers. It is therefore far easier to skew a sample toward a segment of the board market (see Figure 6-4).

Figure 6-2
PCB Concept to Prototype



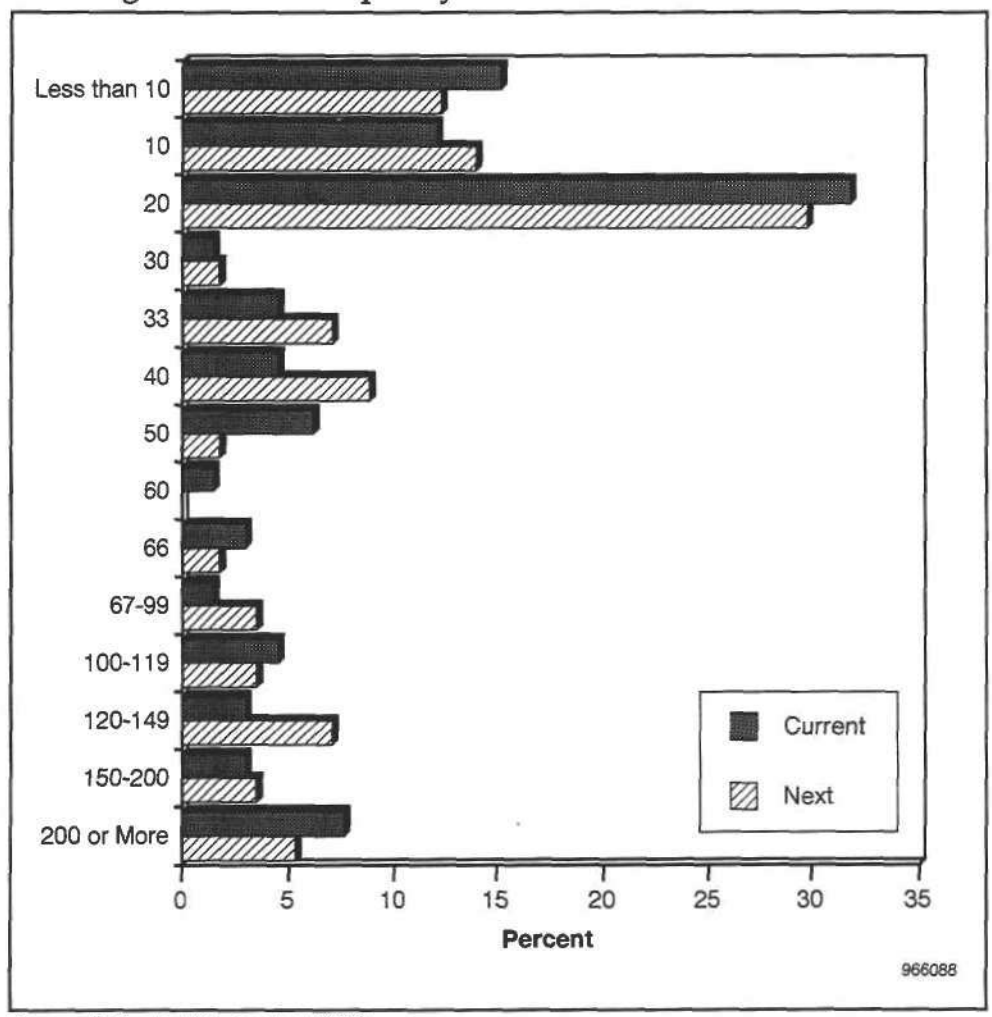
Source: Dataquest (September 1996)

Figure 6-3
PCB Prototype to Production



Source: Dataquest (September 1996)

Figure 6-4
PCB Highest Clock Frequency

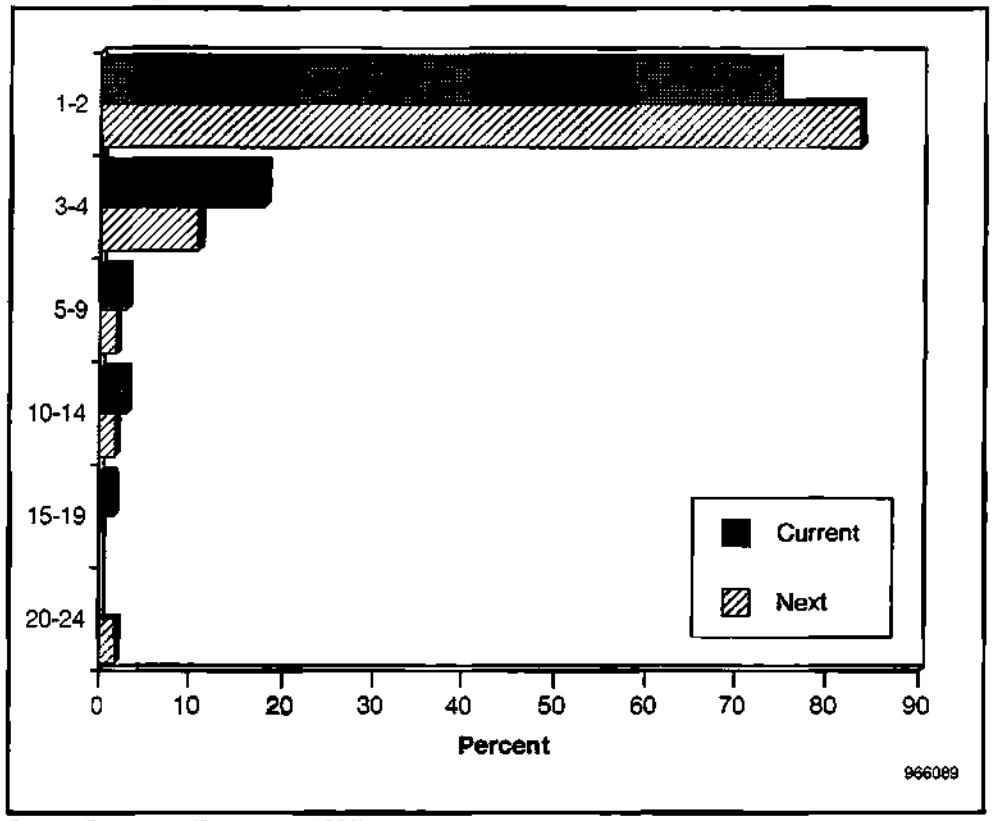


Source: Dataquest (September 1996)

Board design iterations, as could be expected, is fairly low. This again is tied to the lower clock frequencies (see Figure 6-5).

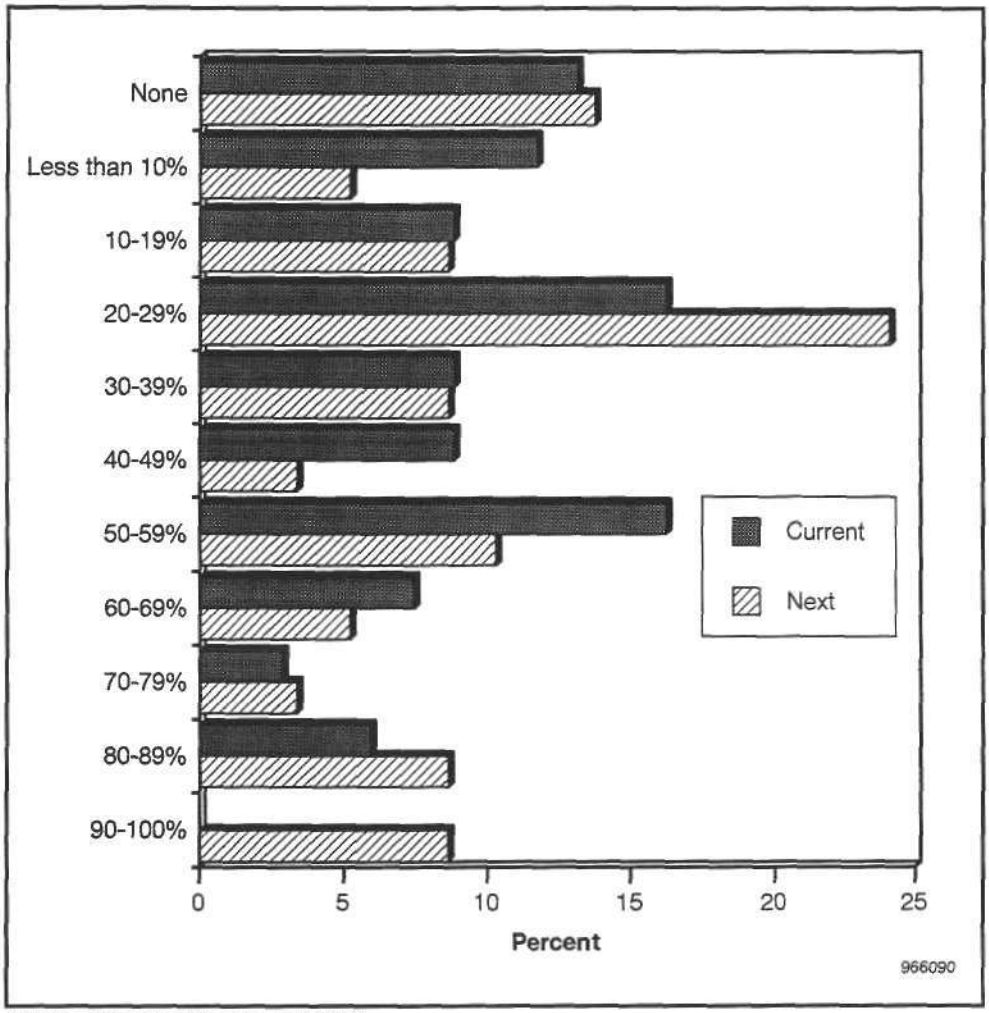
Design reuse is creeping up in the PCB world. Zuken-Redac introduced an interesting product that allows a designer to freeze part of a board design and then use it as a hard macro. This approach will become increasingly popular, especially as more and more boards feature RF (radio frequency) sections (see Figure 6-6).

Figure 6-5
PCB Design Iterations



Source: Dataquest (September 1996)

Figure 6-6
PCB Design Reuse



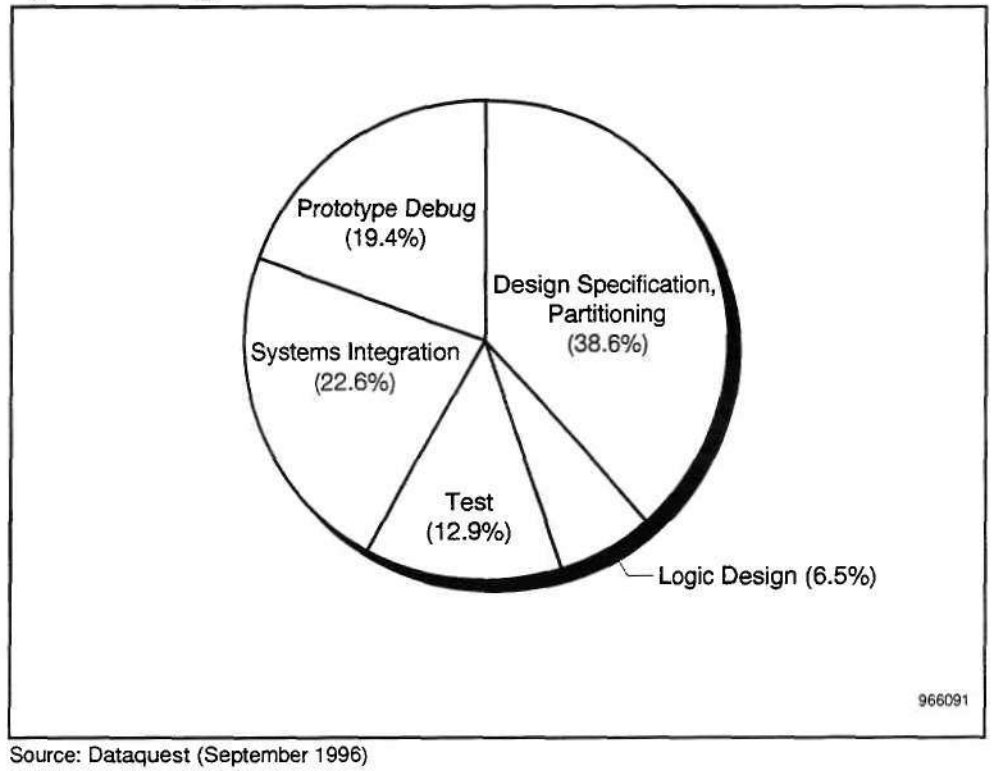
Source: Dataquest (September 1996)

Chapter 7
System Design

This year we have added a section on system design. Keep in mind that PCB design is *not* system design. Today's system designer needs to have a skill set far above the normal designer. He or she must face system partitioning issues, hardware/software co-design issues, and an increasingly more complex set of EDA tools, while coordinating the work of the silicon designer and the PCB designer. A recent organizational trend is to put both the hardware team and the software team in the same organization, preferably in close proximity with one another.

System specification and partitioning are becoming an ever-increasing portion of the design cycle. This is obviously great news for the electronic-system level vendor. What is somewhat puzzling has been the reluctance of today's system designer to adopt electronic-system level tools. With specification and partitioning time growing 5 percent over last year, they soon will be forced into upgrading their toolsets (see Figure 7-1).

Figure 7-1
System Design Time



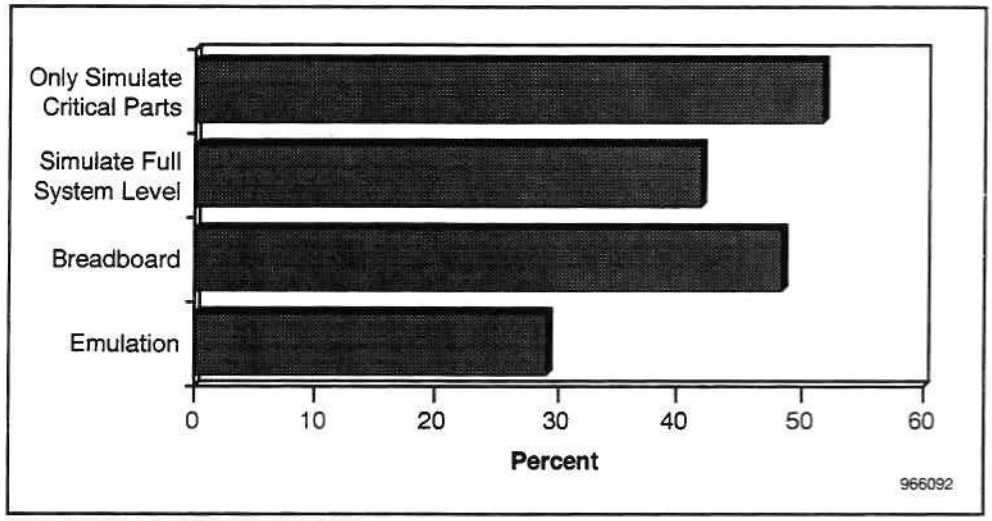
Source: Dataquest (September 1996)

Design verification has become a mishmash of design techniques. Only emulation has grown over last year's survey. Design verification will continue to be in a state of chaos until the use of an RTL virtual prototype becomes standard in the industry (see Figure 7-2).

A surprising number of system designs come in under six months. These are the designs where there are no new gate array/CBICs being designed.

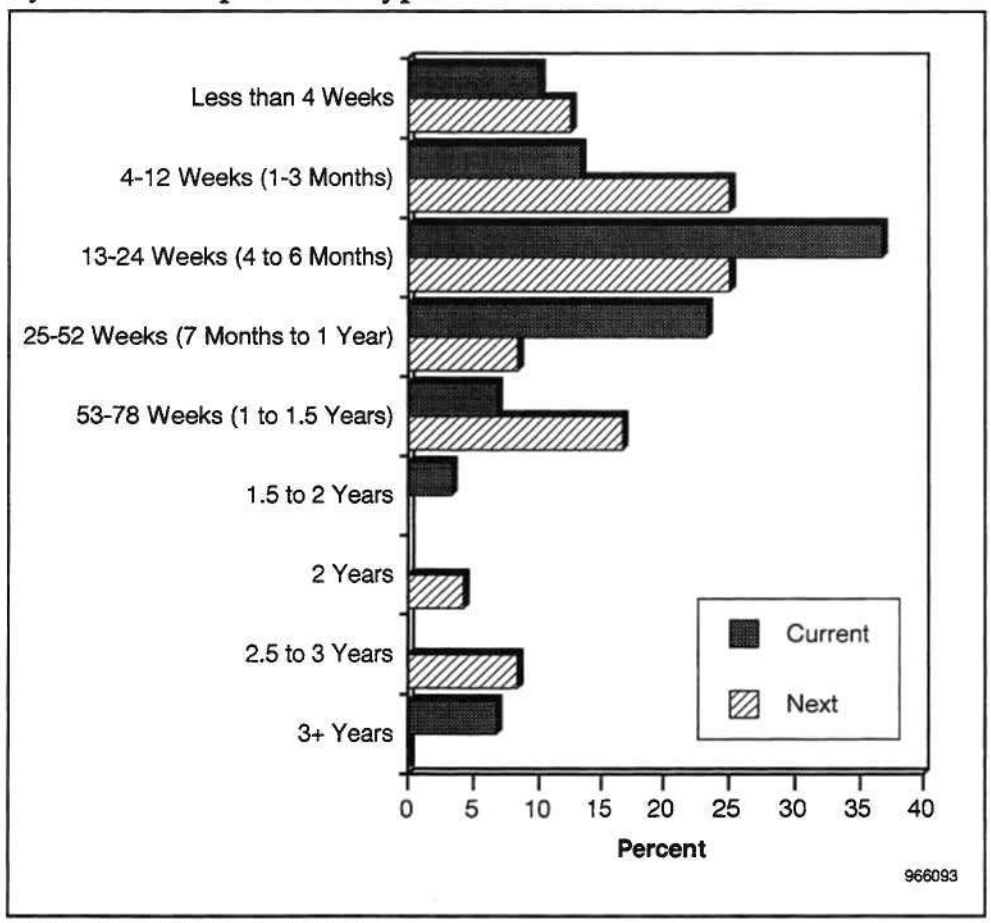
It is common practice to take a past design and modify it using FPGA/CPLDs (see Figure 7-3).

Figure 7-2
System Verification Methods



Source: Dataquest (September 1996)

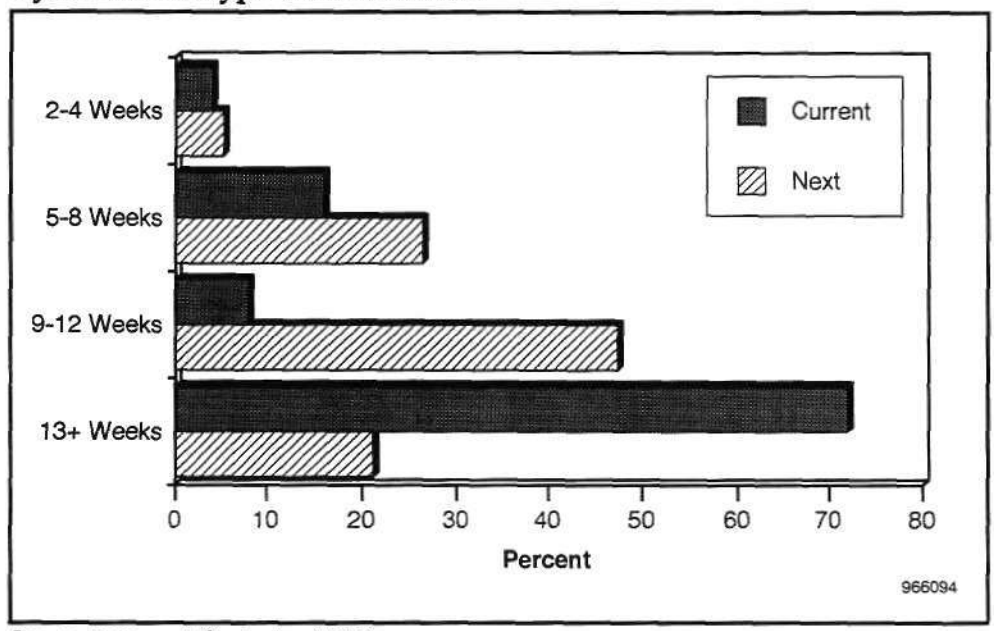
Figure 7-3
System Concept to Prototype



Source: Dataquest (September 1996)

But again, our 13-week-plus category was unable to capture the true extent of the stretch out in time that it takes prototypes going into production (see Figure 7-4).

Figure 7-4
System Prototype to Production



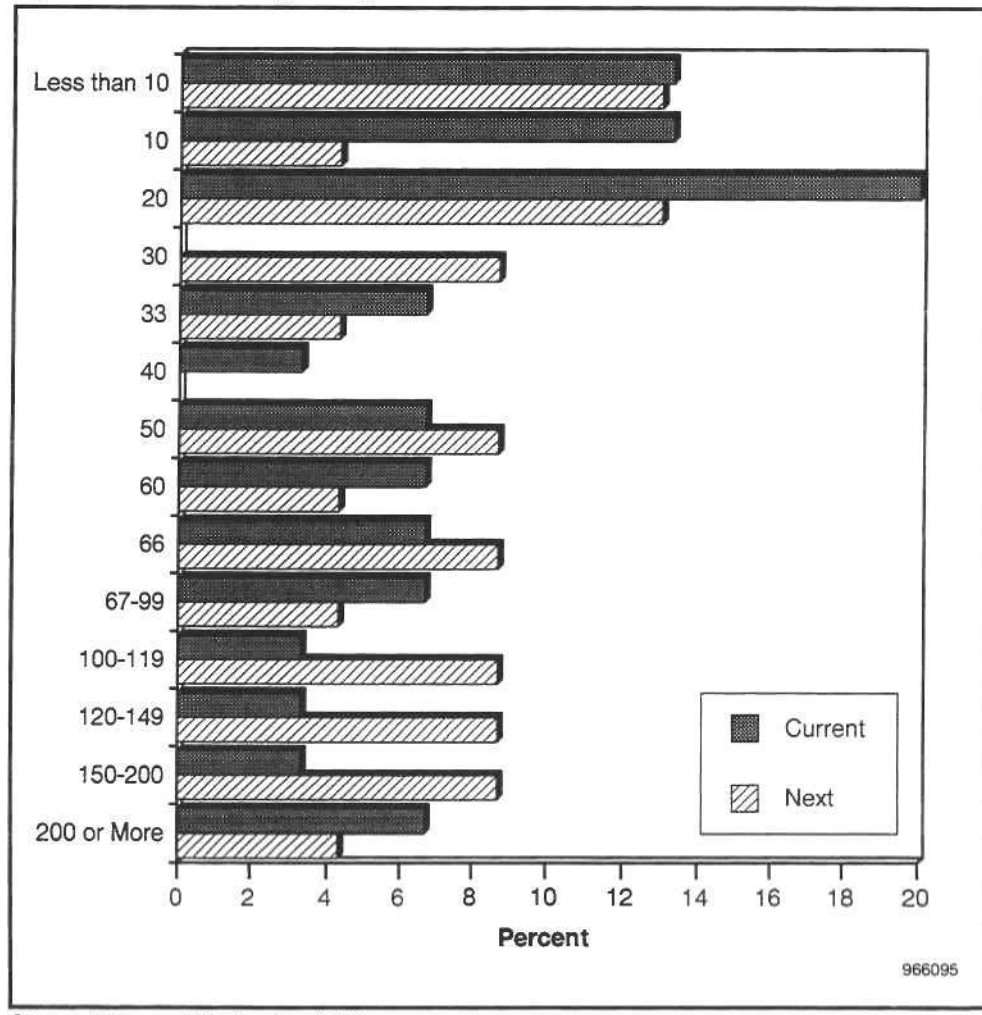
Source: Dataquest (September 1996)

There is a fairly equal distribution of clock frequencies. Still, 50 percent of them fall under 33 MHz. On the next design, however, 50 percent fall over 50 MHz. This leads us to believe that the PCB designers were not facing reality when predicting the clock frequency of their next design (see Figure 7-5).

System design iterations remained low, as could be expected with the lower clock frequencies. It also is an indication of how systems are put together. Most timing issues are resolved prior to system implementation. It would be interesting to ask this question based on the integration of the software with the hardware (see Figure 7-6).

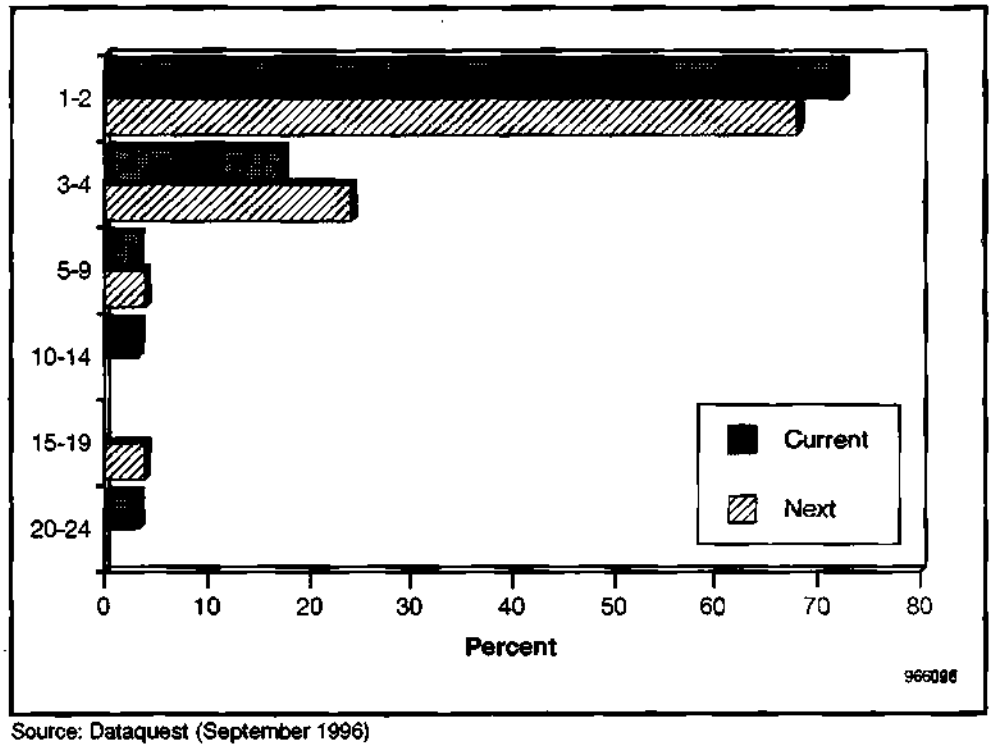
Design reuse is a mainstay in system design. Systems more often than not evolve rather than they are invented. Less than 10 percent of the system designs were developed from scratch (see Figure 7-7).

Figure 7-5
System Clock Frequency



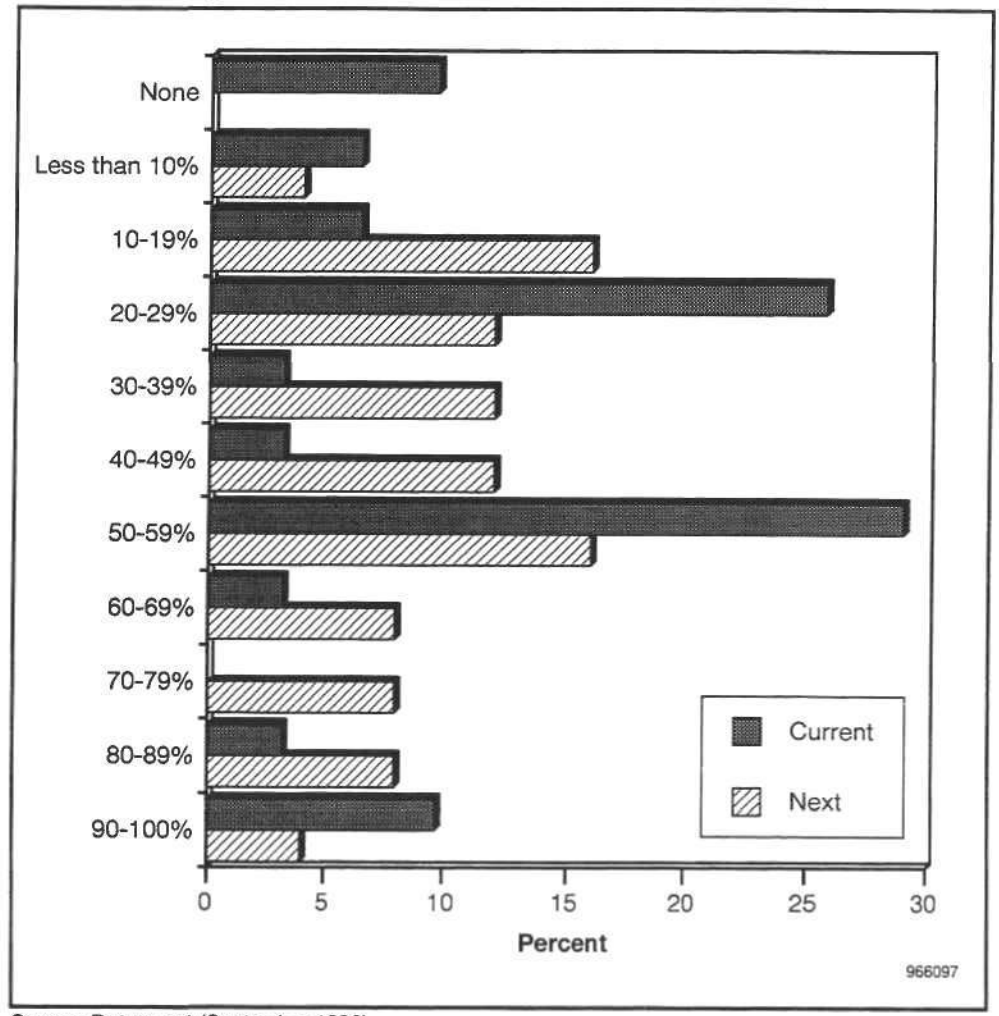
Source: Dataquest (September 1996)

Figure 7-6
System Design Iterations



Source: Dataquest (September 1996)

Figure 7-7
System Design Reuse



Source: Dataquest (September 1996)

Chapter 8
The EDA Tools

There is still a lot of room for growth in the EDA market. This year's respondents seem to have more SPICE simulators (it's still hard to believe everyone doesn't have at least one copy lying around loose) than last year. They sure do not have many Design-For-Test (DFT) or analysis tools. Only 50 percent have logic simulators. The one response that needs correcting next year is system-level tools. It appears the respondents didn't have a clear idea what that category meant (see Figure 8-1).

On the downside, 6 percent fewer engineers reported that they were going to buy new tools than last year. Dataquest does not believe that the present semiconductor recession will negatively impact the EDA industry for three more years. These recessions seem to start off a round of new designs that actually increase the purchase of EDA tools. There seems to be a three-year offset in the EDA cycle as compared to the semiconductor cycle (see Figure 8-2).

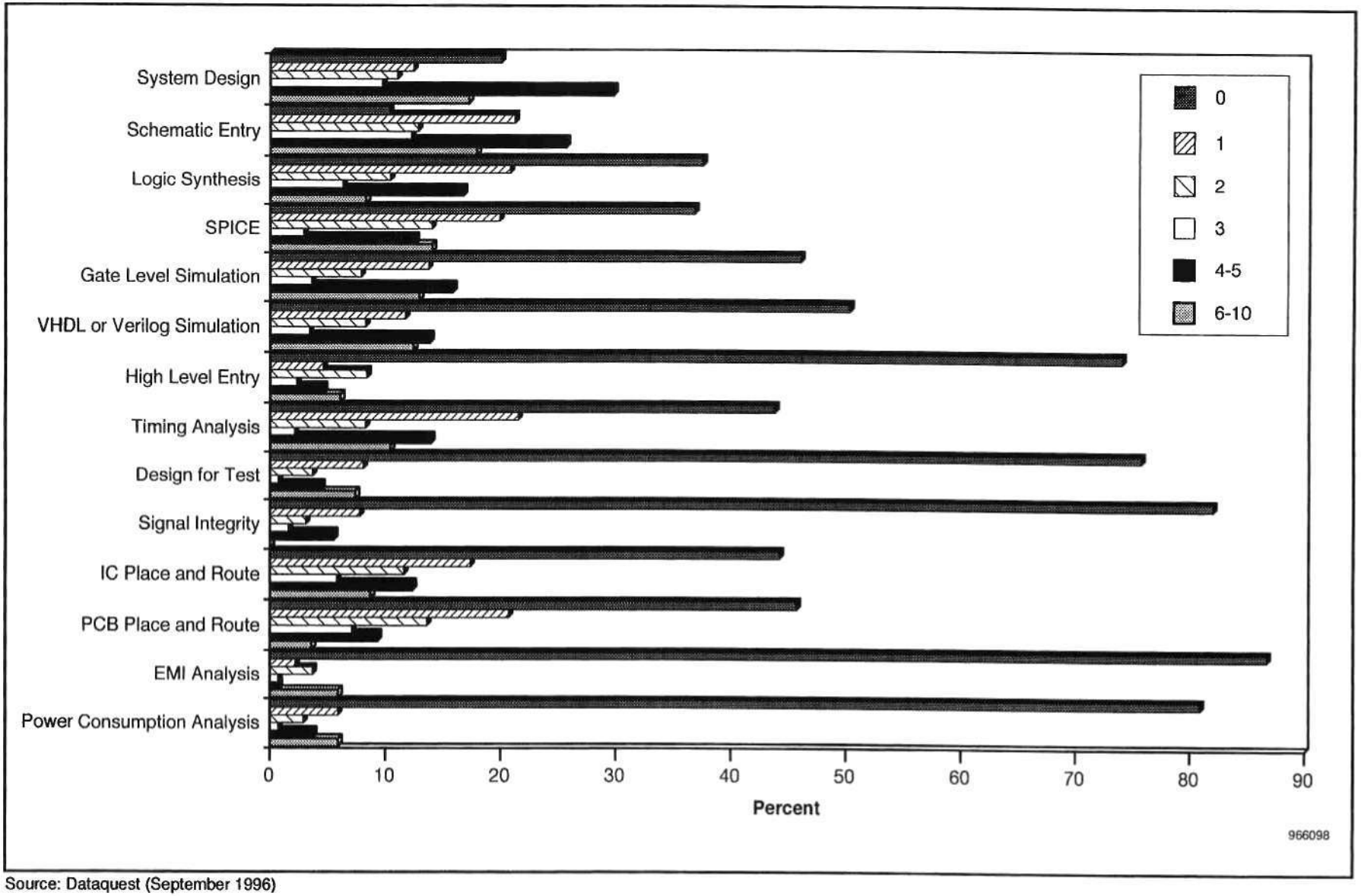
Five percent fewer tools were reported designed in-house than last year. We are now down to 12 percent of the respondents. We would expect that percentage to level out, holding between 8 percent and 12 percent (see Figure 8-3).

It is interesting to watch the shift in the type of tools being developed. This year the hot item is timing. The SPICE category is an indication of the need to use "SPICE-like" simulators to do timing and power analysis. This is a major area of opportunity for the EDA community (see Figure 8-4).

The importance/satisfaction comparison for EDA tools is starting to go the wrong way again. The delta grew by 0.05 this year. And the winner (or loser as the case may be) were DFT tools. This could be considered good news. As these tools become more popular, they are attracting more attention. One surprise was the general low score on power analysis tools. They may be the wave of the future, but they do not seem to be that popular today (see Figure 8-5).

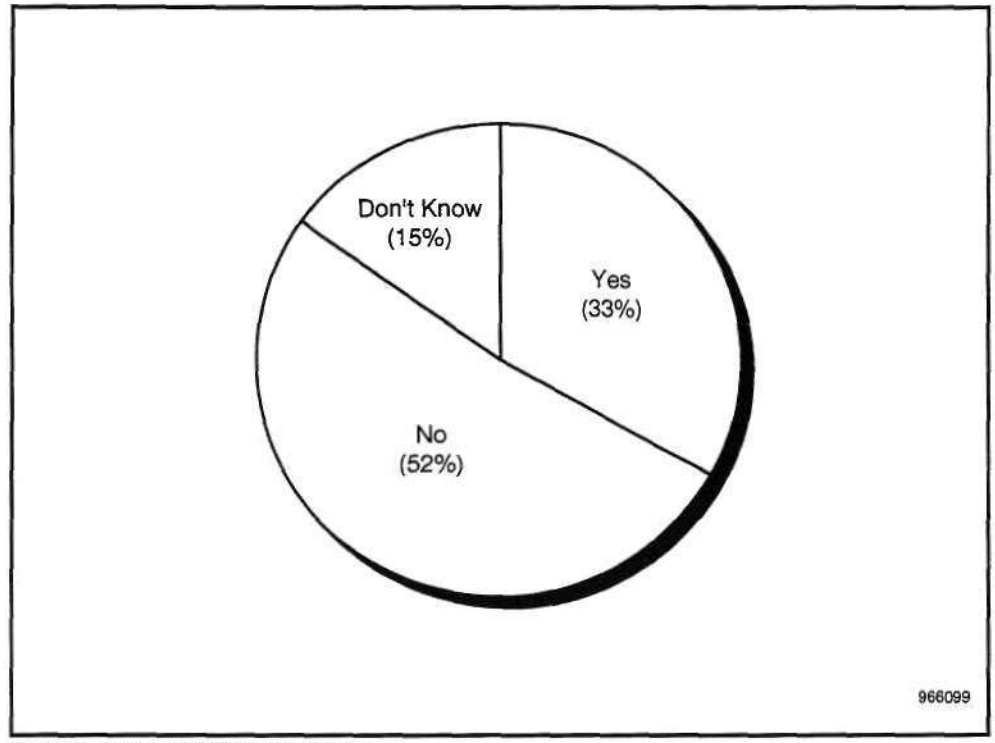
On the other hand, the quality of tools seems to be improving. The average delta went down 0.04 this year. Most of the improvement fell in the Integration and Compliance to Industry Standards category. The work by the Industry Council is doing some good. The category that went south on us was Lack of Bugs. It was considered the most important, by our respondents, and had by far the worst rating (see Figure 8-6).

Figure 8-1
Present EDA Tool Licenses



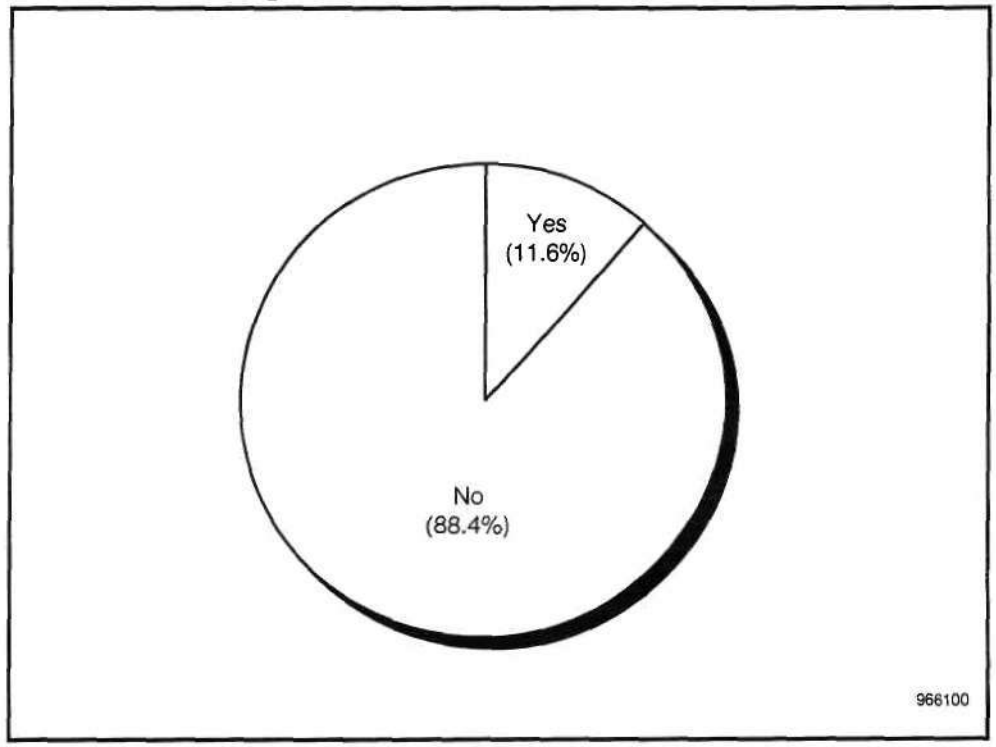
Source: Dataquest (September 1996)

Figure 8-2
New Licenses Purchases



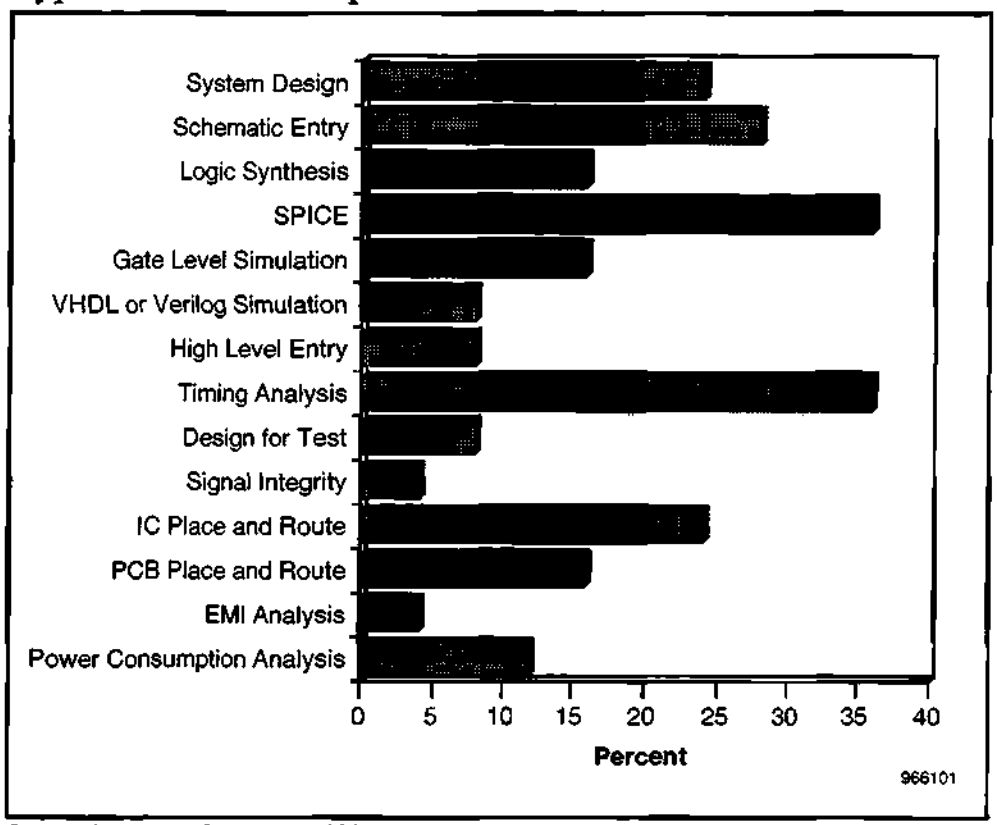
Source: Dataquest (September 1996)

Figure 8-3
In-House Developed Tools



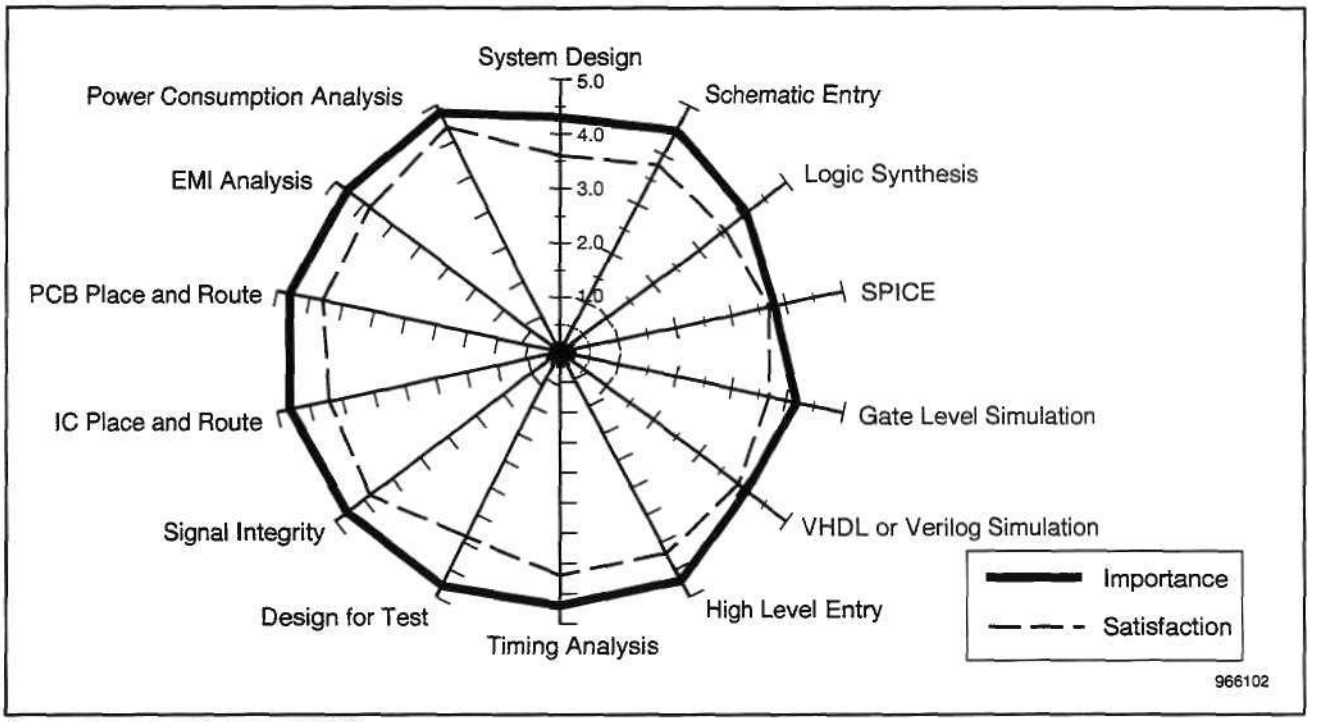
Source: Dataquest (September 1996)

Figure 8-4
Types of Tools Developed



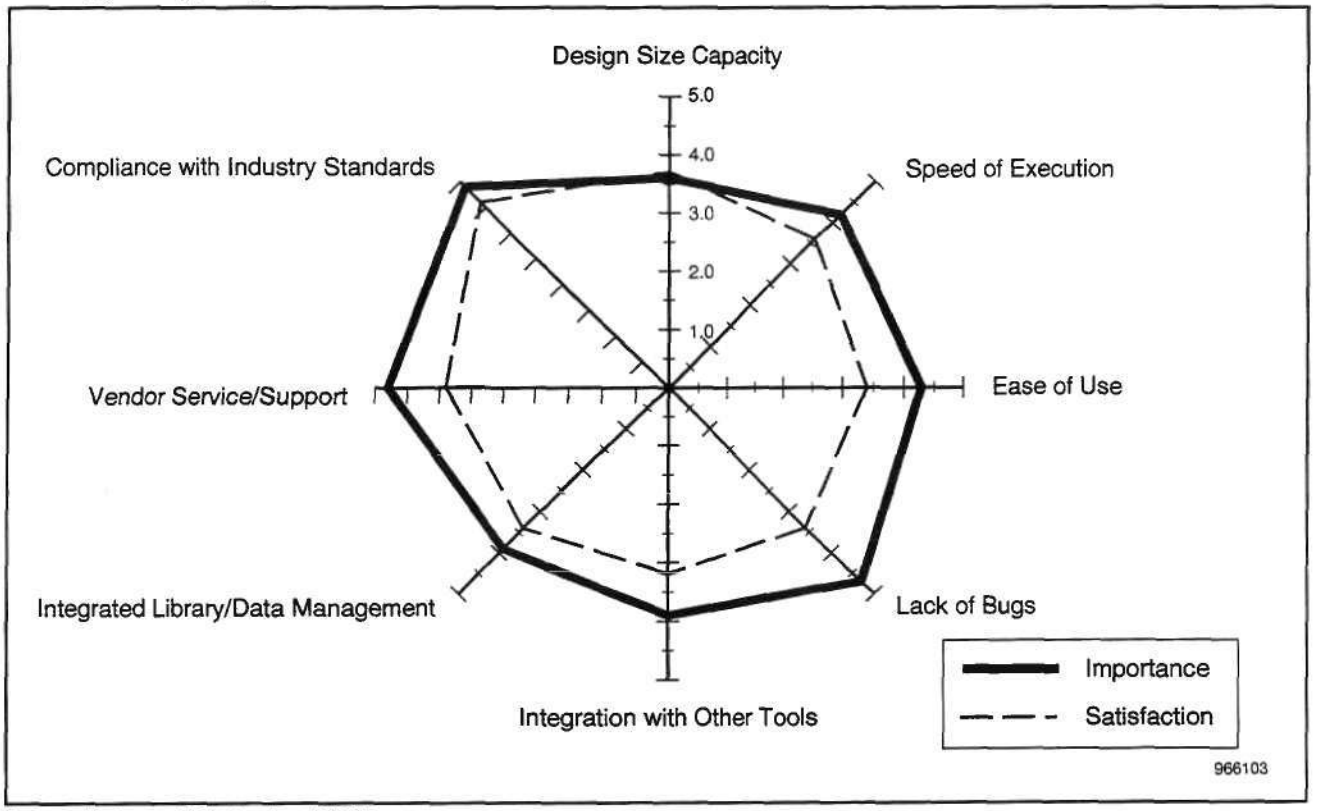
Source: Dataquest (September 1996)

Figure 8-5
EDA Tools, Importance/Satisfaction



Source: Dataquest (September 1996)

Figure 8-6
Tool Quality, Importance/Satisfaction



Source: Dataquest (September 1996)

Appendix A
Survey Methodology

Dataquest end-user data was gathered using an online computer-aided telephone interviewing system. End users were identified through a variety of means, including magazine subscriber lists, databases of past survey resplendence, and corporate intelligence databases. The surveys were conducted by telephone, allowing for better screening of prospective resplendence, during the third quarter of 1996. The results of this survey were then entered in a statistical analysis package for analysis of the data.

This survey was designed and executed using resources form several Dataquest groups, as follows:

- The survey questionnaire was developed by analysts from Dataquest's Electronic Design Automation Worldwide program and comprised a total of 143 questions. On the average, a respondent was asked to answer about 96 of the questions because not all respondents qualified for all questions (for example, if a designer did board design, he or she was not asked an expanded set of questions applying only to FPGA/CPLD design).
- The 15- to 20-minute telephone survey was conducted by trained interviewers from Dataquest's Field Interviewing staff dialing from a centrally located and monitored WATTS facility at Dataquest in San Jose, California. Respondents' answers were entered into an online survey program that allowed immediate access to survey results.
- All results were checked, validated, and tabulated by analysts from Dataquest's Research Operations group.
- An analyst from the EDA Worldwide service analyzed the data and prepared the final written analysis.

The Survey Sample

The survey sample comprised respondents who identified their group's primary end product as belonging in one of six industry sectors as follows:

- Industrial/instrumentation
- Semiconductors
- Telecommunications and data communications
- Computers and computer peripherals
- Automotive
- Military and aerospace electronics

We targeted these areas to get the broadest sampling of electronic design methodologies. We did not limit the size of companies with a minimum number of employees, annual revenue, or other metrics.

The survey list was selected from a subscriber list from *Integrated System Design Magazine*. From this database, we selected about 4,000 subscribers

who stated that their primary job function was design and development engineering and that the design activity in which they were involved was either systems, circuit, or component design.

To participate in the survey, the person interviewed had to be knowledgeable about the EDA tools used by the company. Dataquest made a total of 2,876 calls. The sample disposition is as follows:

- 215—Completed interviews
- 212—Bad numbers/disconnected numbers
- 2,021—Unable to reach person
- 428—Refused interview or did not qualify to participate in the study

We tabulated the data by the entire survey group to provide cross-tabulations by the respondents' self-identified primary design activity and primary end product of their group.

The survey results are presented in this report for the aggregate group. Any data point collected in the survey can form the basis of a cross-tabulation. Special cuts of the data (for example, by company size or computer platform used) are available to Dataquest's EDA service clients by special requests. However, the identities of the end users surveyed are strictly confidential.

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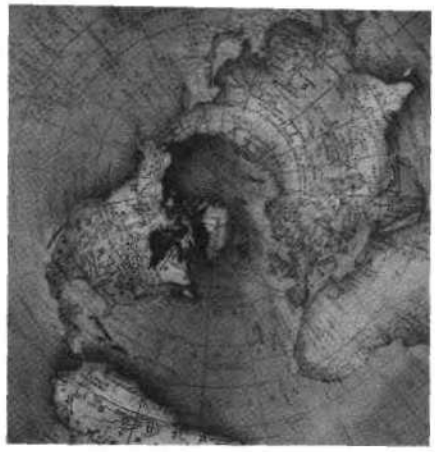

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EDA Applications in North America

User Wants and Needs

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EDA Applications in North America

User Wants and Needs

Program: Electronic Design Automation Worldwide
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Chapter 1
Executive Summary

Electronic design automation (EDA) is one of the most dynamic segments of the CAD/CAM/CAE industry. For EDA companies to be successful, they must have a thorough understanding of their target customer base. Each year, Dataquest's Electronic Design Automation Worldwide service extensively surveys designers of electronic products and reports on their shifting priorities, desires, and demands. The purpose behind Dataquest's User Wants and Needs studies is to provide our clients with the most in-depth, up-to-date information on the electronic design community.

Study Objectives

This study provides an in-depth look at the users of EDA tools in North America. The information presented is the result of a telephone survey of 203 hardware designers in North America. The objectives of this study were as follows:

- To understand what trends are taking place in the electronic design industry
- To investigate the design environment in which users work
- To examine end-user satisfaction with EDA software
- To underscore some of the changes that will take place in the EDA industry in the future

Key Findings

Our research of EDA end users provides us with an insightful look into their preferences and consumption patterns. Results from our survey indicate the following:

- Field-programmable gate array/complex programmable logic device (FPGA/CPLD) design, printed circuit board (PCB) design, and system-integration design were each identified by 55 percent of respondents as designs they do. This supports the theory that in most small companies the design engineer does it all.
- One-third of the respondents said they plan to switch to a new, "other" operating system. That's right, not UNIX, not Windows NT, and certainly not a PC-based operating system (OS).
- Hard macros are the most used macros in today's designs.
- There is an amazingly high percent of the designs that take over 13 weeks to reach production.
- Every area of the design cycle except one was believed to be less time-consuming than a year ago. The exception was systems integration, which increased 10 percent over last year.
- Compared to last year's survey, 17 percent more respondents believe they will be buying more tools next year.

- EDA tool performance is getting much better. However, EDA tool quality has not improved.

Dataquest Perspective

The new growth cycle has been driven more by the replacement of old tools than by seat count growth. The last two years' influx of high-performance tools has helped meet the new designs demands. We must continue to introduce new higher performance tools if we wish this growth to continue. There is clearly room in the industry for a stronger focus on user's wishes for tool interoperability, the use of standards, and EDA software quality.

Structure of the Report

The remainder of this document is organized as follows:

- Chapter 2, "The Designer's Environment," looks at the size of the designer's company, the type of design being done, and the workstation and OS being used. This section also includes a brief look at standard IC design.
- Chapter 3, "Gate Array/CBIC Design," looks at the survey from the perspective of a gate array/cell-based integrated circuit (CBIC) designer.
- Chapter 4, "FPGA/CPLD Design," looks at the survey from the perspective of an FPGA/CPLD designer.
- Chapter 5, "Printed Circuit Board Design," looks at the survey from the perspective of a PCB designer.
- Chapter 6, "EDA Tools," looks at how the design challenge is met by today's EDA tools.
- Appendix A, "Survey Methodology," explains how the survey was designed and executed.

Project Analysts: Gary Smith, Robert Thornhill, and King Hutchinson

Chapter 2
The Designer's Environment

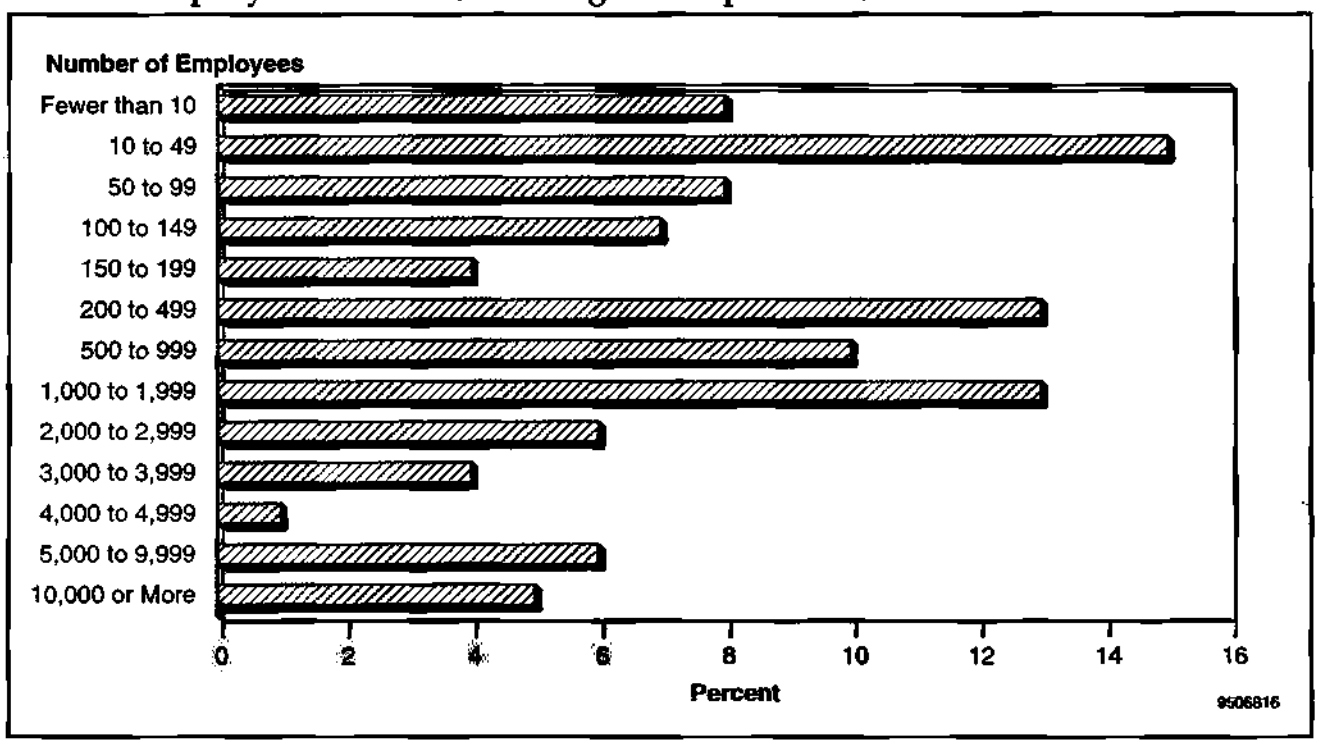
The Survey

In an ever-increasing effort to profile the entire design population, we have attempted to balance our survey between markets, applications, and design type. Unfortunately, once again, we have looked at the resources needed to survey outside of North America and found the demand is still insufficient to carry the cost. Other response shortfalls in this year's survey appear in the consumer market, which is something that could be expected in a North America-only survey, and, despite our best efforts, the automotive market. We could not find a statistically significant sample in either. We were able to get statistically significant samples in all design disciplines, although it took some effort for IC design. Dataquest's new look at applications was generated from client requests in response to last year's User Wants and Needs document, *Electronic Design Automation Worldwide*, published July 25, 1994 (CEDA-WW-UW-9401). As always, any suggestions for improving this year's survey will be appreciated.

The Environment

Over 15 percent of respondents work for companies with 10 to 49 employees. After that, the number of employees clusters between 200 and 2,000. This matches closely with last year's profile (see Figure 2-1).

Figure 2-1
Size of Company or Division (Percentage of Respondents)



Source: Dataquest (November 1995)

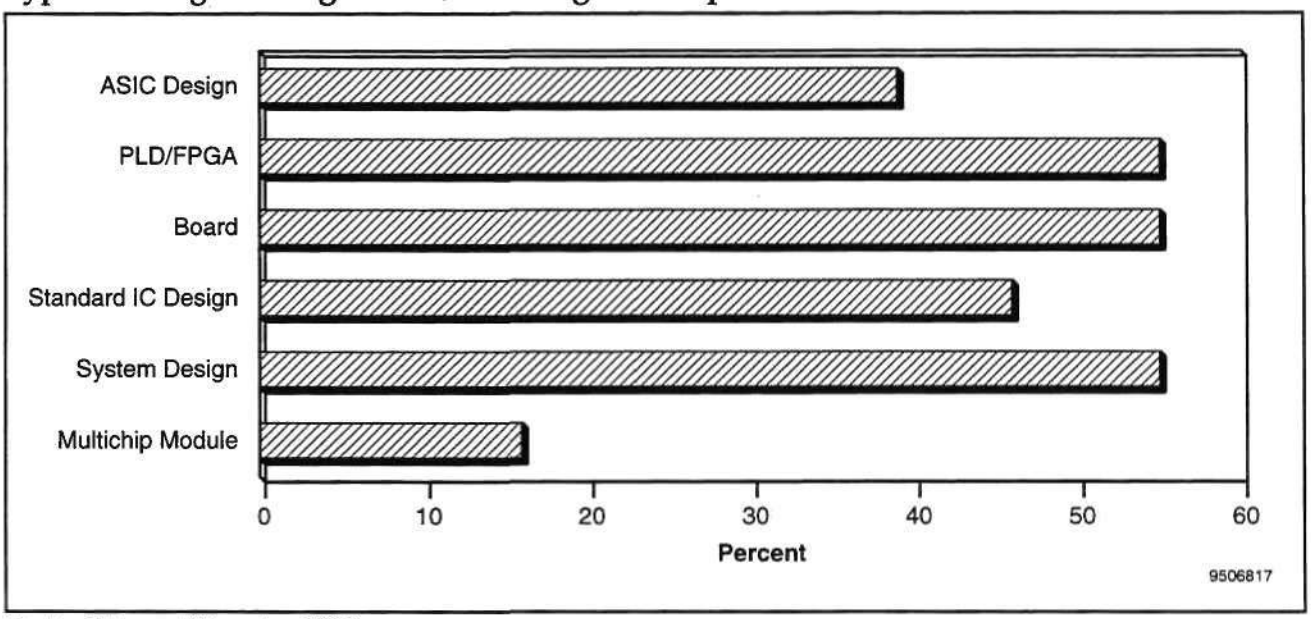
The type of designs being done were, with the exception of multichip module design, amazingly equally distributed. One result of particular interest was that FPGA/CPLD design, PCB design, and systems integration design were each identified by 55 percent of respondents as designs they do. This supports the theory that in most small companies the design engineer does it all. This is the reason many of the larger EDA vendors insist on calling their PCB division the "Systems" division. Unfortunately, 32 percent of the respondents are trying to do true system design, and trying to sell them PCB design tools as a solution to all their problems isn't going over too well (see Figure 2-2).

The designer's primary design task also showed a fairly equal distribution. As could be expected, IC design was the smallest. It was somewhat surprising that gate array/CBIC design was only 1 percent smaller than FPGA/CPLD design. We might want to take another look at the supposed demise of the gate array (see Figure 2-3).

We did get 5 percent more automotive design respondents this year, however, it took a great deal of effort. Not only are automotive designers hard to find, they also don't like to talk much. We also picked up 3 percent more consumer design respondents. While still not a significant sample, their input at least adds more overall to the survey. We left out the semiconductor category this year by asking IC design engineers what was the targeted market of their design. With the increase in application-specific standard product designs going on today, the question was typically easy to answer (see Figure 2-4).

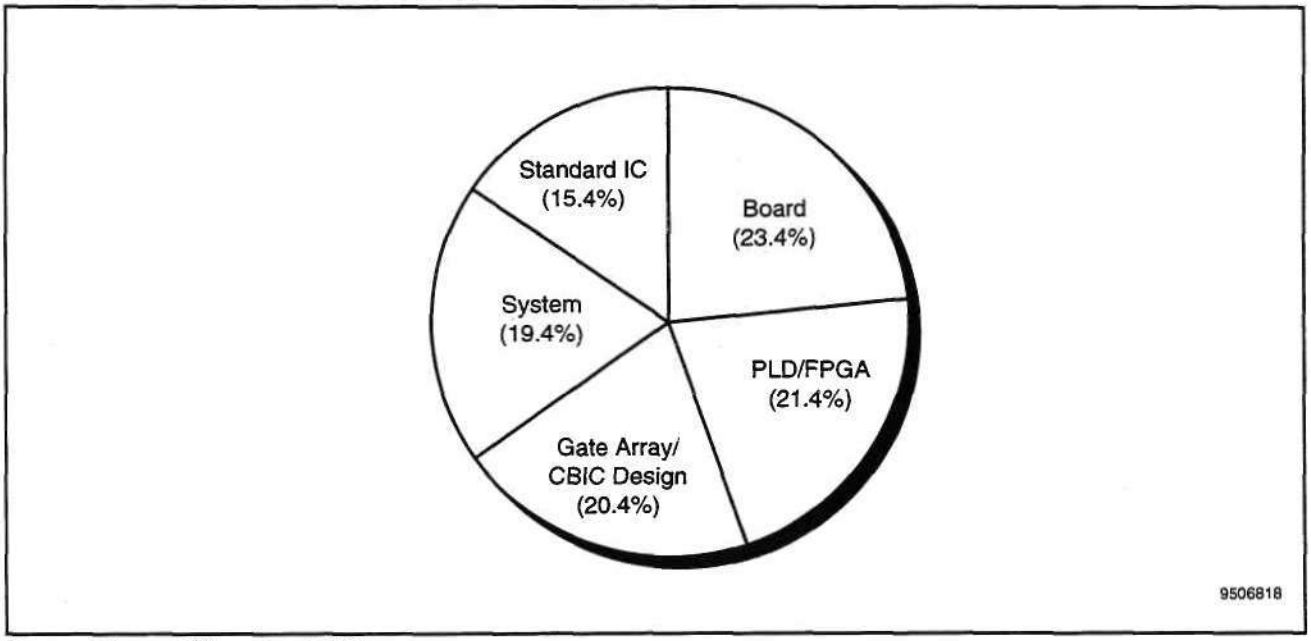
The new applications questions can be considered a good start, but we still have a ways to go. We need to determine the main applications in the industrial and military markets. The weak automotive response was because of a lack of input (see Figure 2-5).

Figure 2-2
Type of Designs Being Done (Percentage of Respondents)



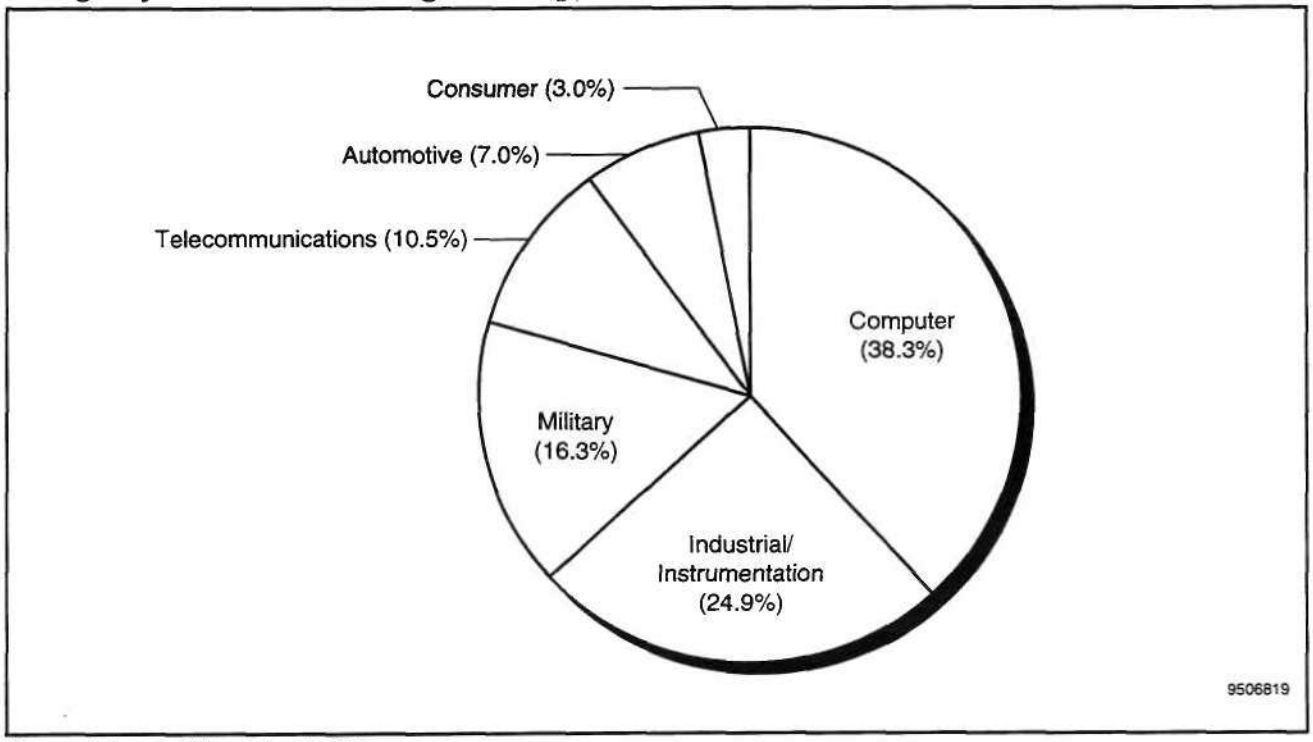
Source: Dataquest (November 1995)

Figure 2-3
Primary Design Task (Percentage of Respondents)



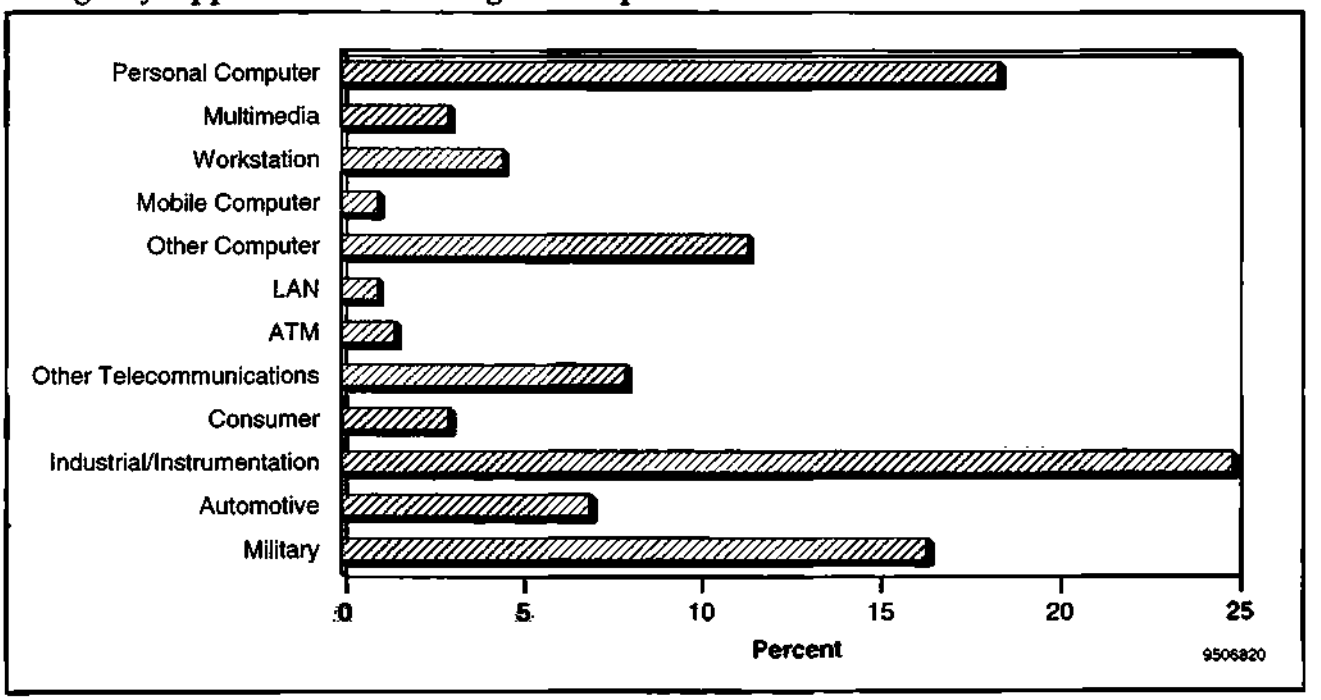
Source: Dataquest (November 1995)

Figure 2-4
Design by Market (Percentage of Respondents)



Source: Dataquest (November 1995)

Figure 2-5
Design by Application (Percentage of Respondents)



Source: Dataquest (November 1995)

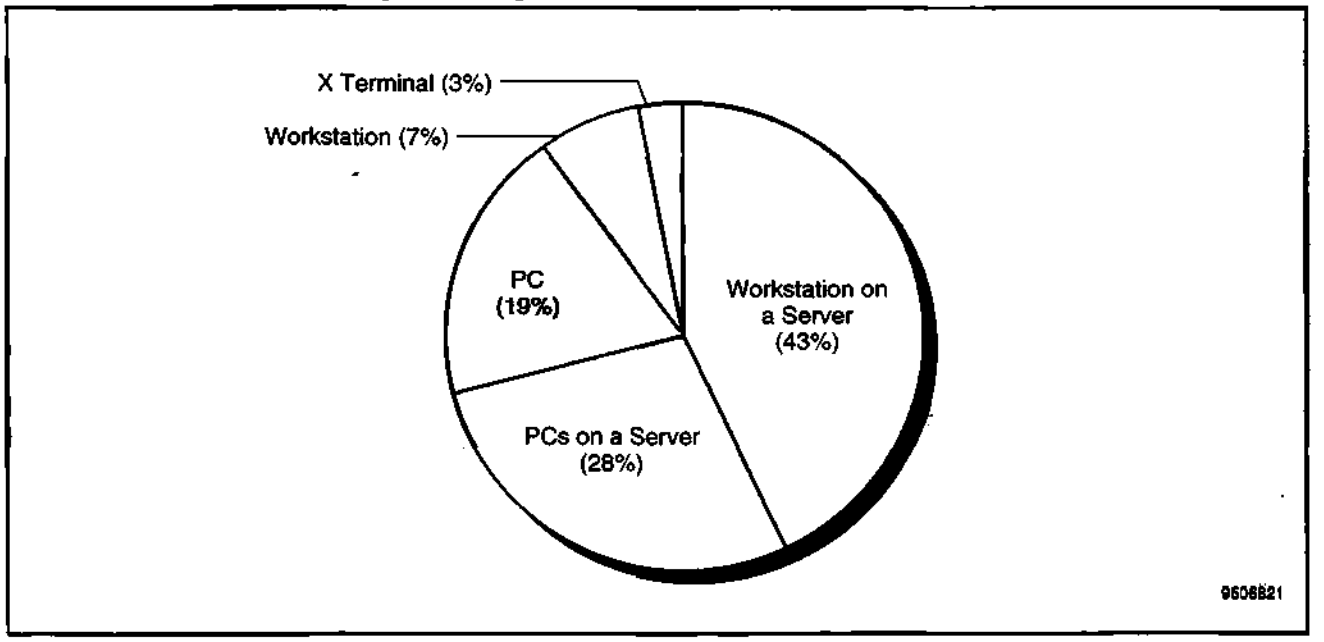
Forty-nine percent of respondents use workstations. Only 7 percent of those workstations are standalone. The design challenge is calling for an ever-increasing amount of compute power. Nineteen percent of the PCs used a server, while only 28 percent were standalone. And yes, 4 percent of the respondents still use X terminals (see Figure 2-6).

A Surprise

It's always a pleasant surprise to get an unexpected result. We asked our OS-related questions more as an attempt to simplify the issue than anything else. We collect OS information from all the vendors, and last year we listed many of the various UNIXs and PC-platform OSs, while keeping Aegis and VMS. This year we condensed UNIXs together and asked about PC OSs only, keeping Windows NT separate. This also has been the first year the Aegis and VMS numbers have dropped to a point of being insignificant. The original idea for asking OS-related questions was to get a better picture of the impact of Windows NT on the market and to be able to judge whether the designer thought of Windows NT as a PC OS or a workstation OS.

We need to explain a point that isn't often mentioned in these surveys. There is a group of engineers that are different. They represent 8 percent to 12 percent of all respondents. What they want never quite exists. They avoid the mainstream with a passion. If something is popular, they will do something else. This isn't to be critical—Dataquest's own EDA analyst falls into this category. But readers need to take this small population into account when analyzing data because up to 12 percent of the respondents answer "something else" to the pertinent questions. When confronted with this input, it is best to say, "Oh, it's them," and continue with the analysis.

Figure 2-6
Platforms Used (Percentage of Respondents)



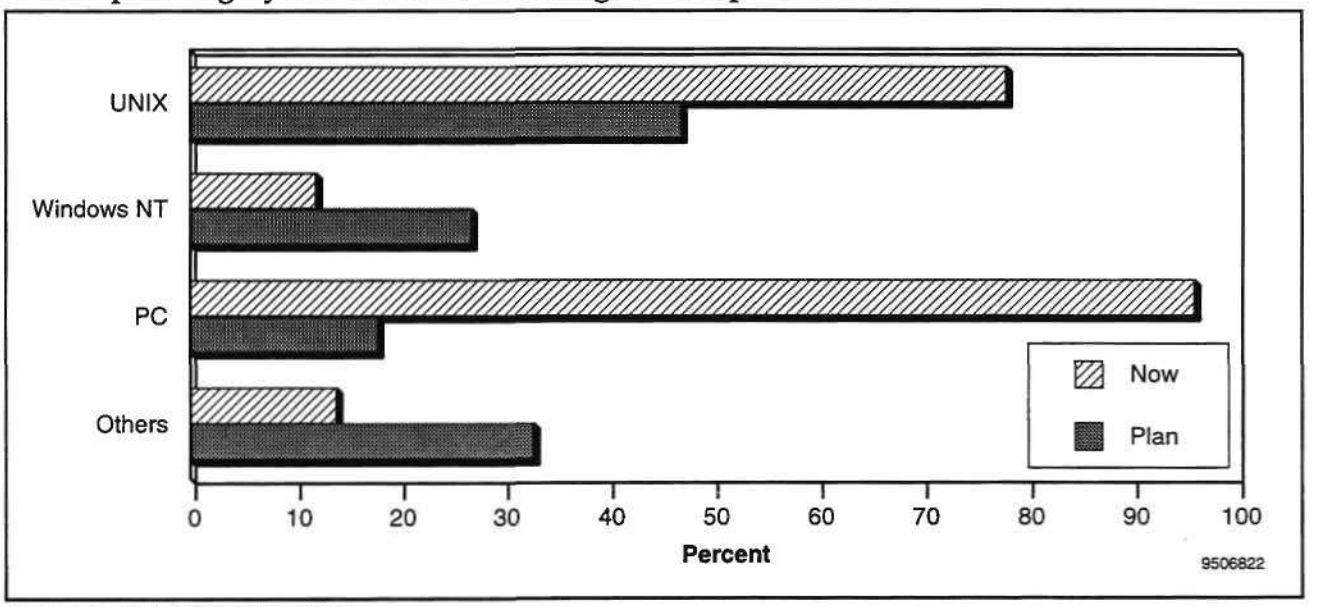
Source: Dataquest (November 1995)

Now that that's clarified, we can look at the data. One-third of the respondents said they plan to switch to a new "other" operating system. That's right, not UNIX, not Windows NT, and certainly not a PC-based OS. So, not only is the generally dissatisfied group dissatisfied, but so is over 20 percent of the mainstream designers. This is the type of response that requires follow-up phone calls. The general feeling was that the world was ready for a 64-bit OS. We could say that UNIX now comes in a 64-bit variety, but many designers aren't yet convinced. Dataquest's sense is that there is a race going on between 64-bit Windows NT and a truly standard 64-bit UNIX. We do not believe the engineering community will continue to put up with a loose standard UNIX. If the UNIX world doesn't get its act together, it will lose the race to Windows NT or some other 64-bit OS coming out of left field (see Figure 2-7).

IC Design

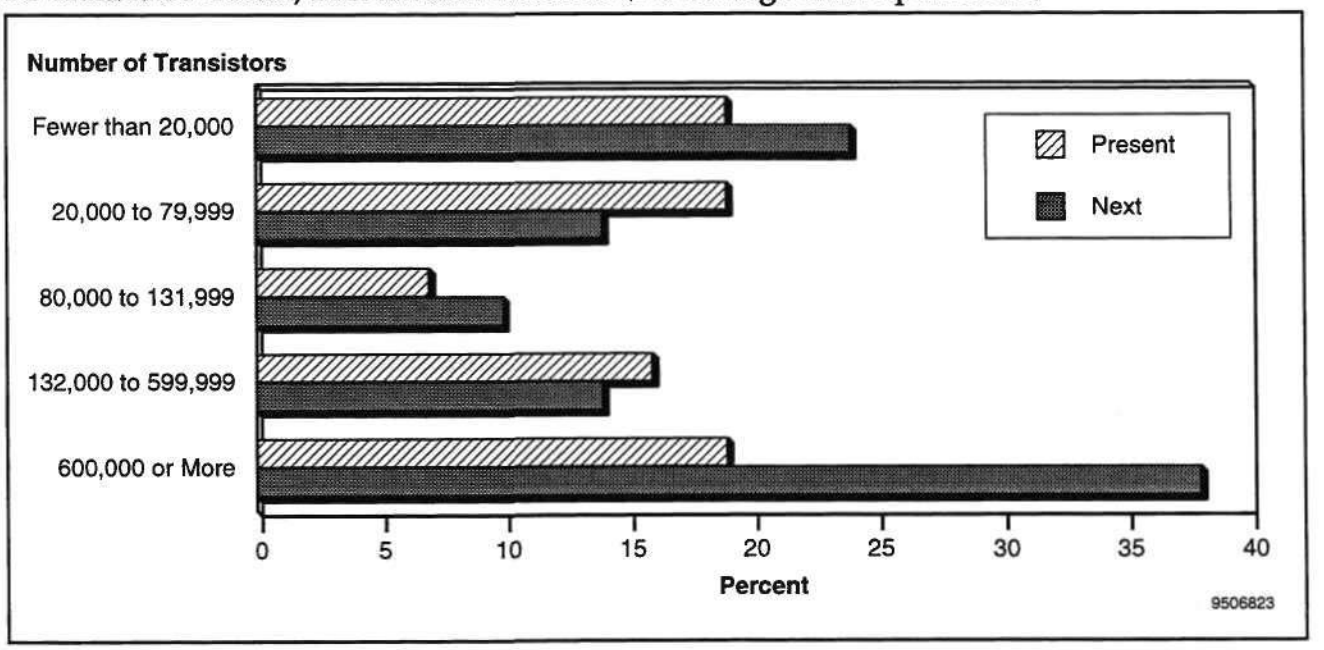
This year we have separated gate array/CBIC design, FPGA/CPLD design, and PCB design by chapters. This year's survey did not get enough significant data to justify a separate IC design section, so we will include it in this chapter. The trends in transistor count look more like a cyclical wave than anything else. The big jump was in the number of designers who are going to do more than 600,000 transistor designs. This is the largest group, and, at 38 percent, it represents almost 20 percent more than the present designs. On the other hand, 24 percent say they will in the future be doing designs smaller than 20,000 transistors, 5 percent more than at present. There is also an increase in the number of designs planned in the range of 80,000 to 131,999 transistors (see Figure 2-8).

Figure 2-7
EDA Operating Systems Used (Percentage of Respondents)



Source: Dataquest (November 1995)

Figure 2-8
IC Transistor Count, Present and Planned (Percentage of Respondents)



Source: Dataquest (November 1995)

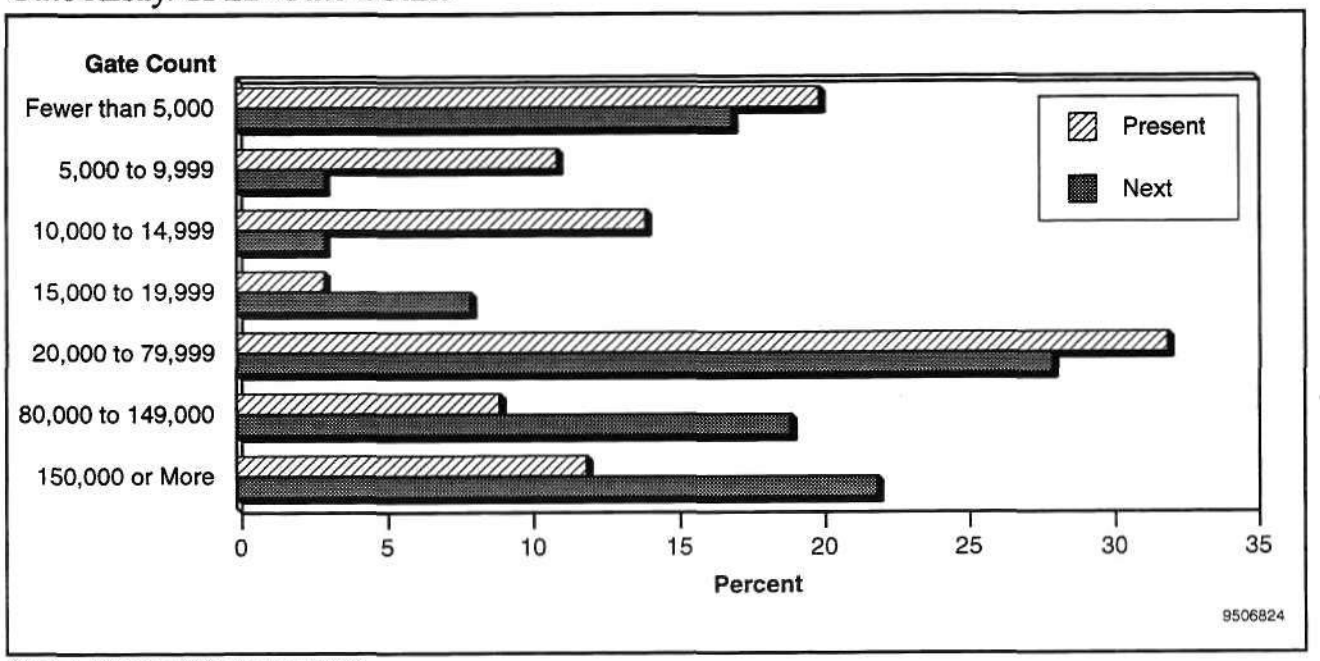
Chapter 3
Gate Array/CBIC Design

This section is the result of inputs from designers who use gate arrays or CBIC. This is not to be confused with the gate array/CBIC vendors themselves.

Gate Count Climbs

The impact of the large FPGA/CPLDs are being felt. The designers reported that design starting below 15,000 gates will drop for their next design. This is in contrast to last year's survey, which found that all ranges of gate counts were increasing. The other story is the increasing size of today's designs. After a falloff of designs in the 20,000-to-79,999 range, there is an increase of 10 percent each in the categories of 80,000 to 149,999 and over 150,000. One of the questions the FPGA/CPLD vendors need to consider is whether there is a large market for ASICs between 20,000 and 80,000 gates. Glue logic pretty much runs out after 20,000 gates. On the other hand, for systems level integration (SLI) at least 80,000 gates are needed. One of the first advocates of SLI was Intel's ASIC group. It had the right idea but not the technology. The silicon back then could not get up to the 80,000-gate area. And the rest, as they say, is history, at least for Intel's ASIC business (see Figure 3-1).

Figure 3-1
Gate Array/CPLD Gate Count



Source: Dataquest (November 1995)

System Level Macros (SLMs)

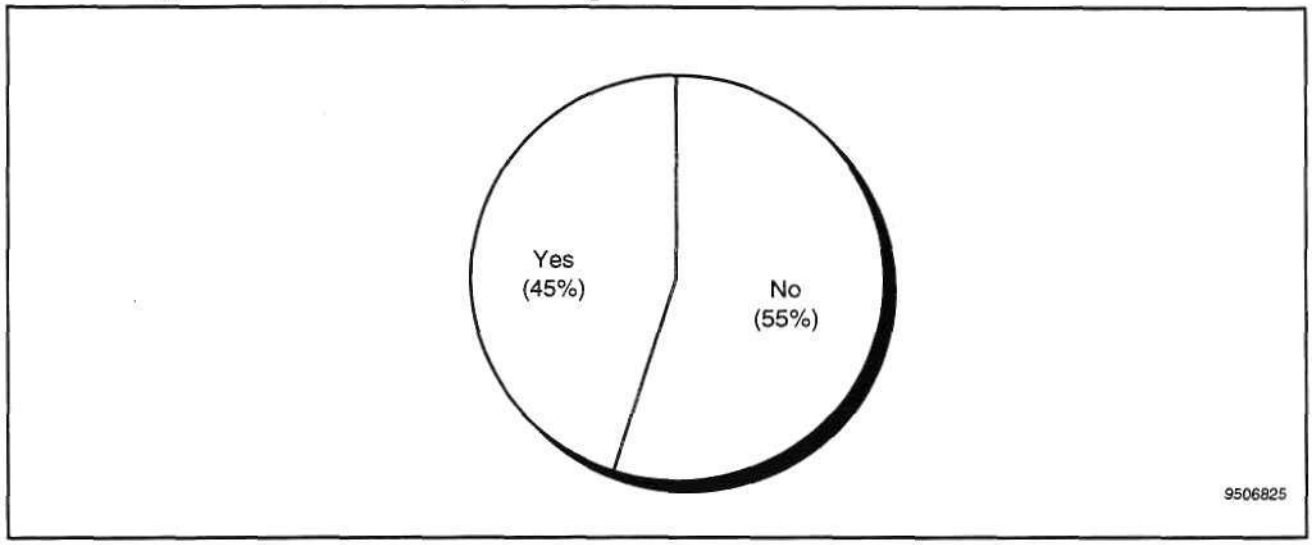
By definition, SLI requires macros. The SLI design of today includes a processor of some sort: a microprocessor, microcontroller, or digital-signal processor (DSP). It also includes blocks of memory and typically at least one other application-specific macro. The reasons for these large blocks are architectural and design throughput. At the register-transfer level (RTL) you can design 1,000 to 2,000 gates a week. With today's nine-month to one-year design times you can only do 100,000 gates without using system level macros (SLMs). Even using electronic-system level (ESL) methodologies, we cannot expect to design more than 1 million gates without the use of SLMs. That is why SLMs are the biggest bottleneck in today's design environment. It is becoming increasingly clear that the "black box" approach to SLMs is just not working. Almost all SLI today is being done using SLM source code. That has placed the ASIC vendor in a difficult position. There are two reasons to need source code. First, in any complex design you need to know what's going on inside the SLM. The challenge is letting the engineer simulate the SLM without giving out the source code. Synopsys's Logic Modeling division has made a good living doing just that in the last five years. Now the open model forum standards group is tackling the issue and there is a new encryption method coming out of Viewlogic's Chronologic's subsidiary. So why is so much of today's SLI being done with source code? The second reason is because engineers need to modify most SLMs. At present, an ASIC vendor needs to trust that the customer will not rip off the SLM and trust that the customer will not screw up the macro's design. This does not favor a hands-off ASIC vendor-to-customer relationship.

Today there are two answers. The first is that the Power Users, as usual, get the source code. This group has always received favorable treatment from the ASIC vendors and probably always will. Those not in the Power User community cannot count on doing state-of-the-art design. The other answer is that the ASIC vendor takes over the design responsibility. This is limited by the ASIC vendor's design resources, so do not count on having an order accepted unless you have large volume. Also, plan to lay out a sizable NRE fee. That being said, let's look at the use of macros in today's design environment (see Figure 3-2).

One of the reasons for such a large group of respondents using large macros is that we left the definition of "large" open. This was to get a feel for the engineers' perspective. The smallest "large macro" was 1,000 gates. This area also had the largest number of respondents, 43 percent of the total. Many of these macros are not true SLMs. There are not too many applications-specific macros—much less processors—that can be designed under 2,500 gates. Realistically, not much can be done under 5,000 gates. Still, it is design reuse, and even these nonSLMs increase a designer's productivity (see Figure 3-3).

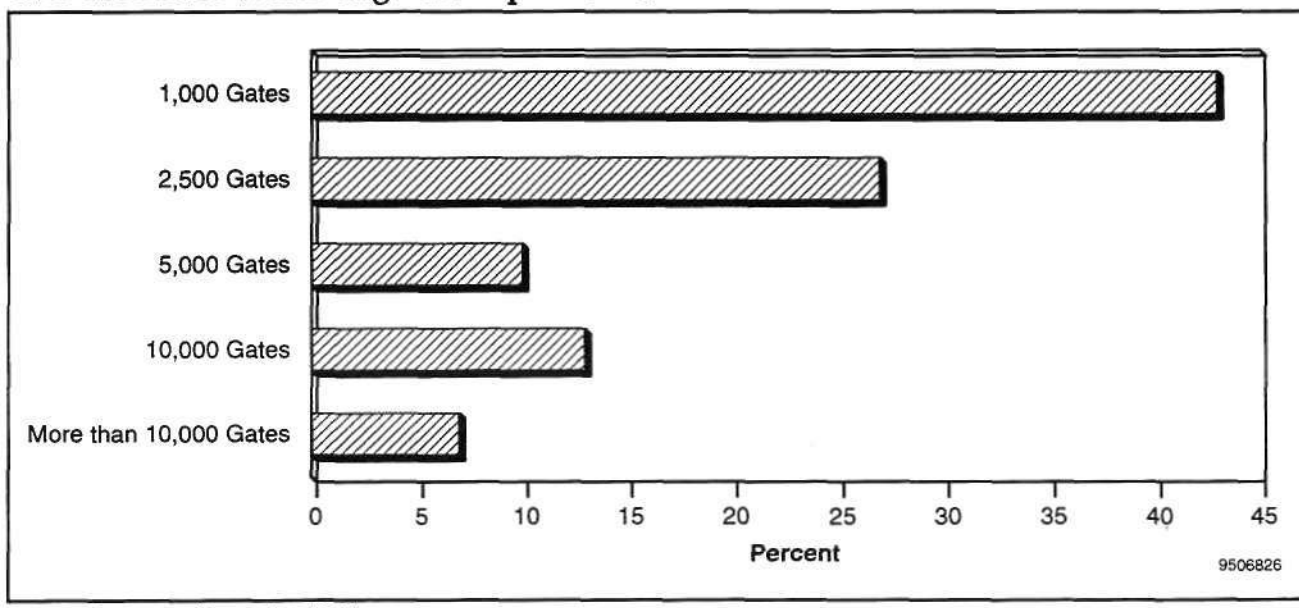
Most of these macros are being purchased from ASIC or EDA vendors. Still, 40 percent of them are being developed in-house. The most important business issue facing the electronics industry today is who or what will control the SLMs. This is the intellectual property issue that is starting to make news. On one hand, there is a lot of money to be made in SLMs, and both the ASIC vendors and the EDA vendors want a piece of the pie. On

Figure 3-2
Use of Large Macros (Percentage of Respondents)



Source: Dataquest (November 1995)

Figure 3-3
Size of Macros (Percentage of Respondents)



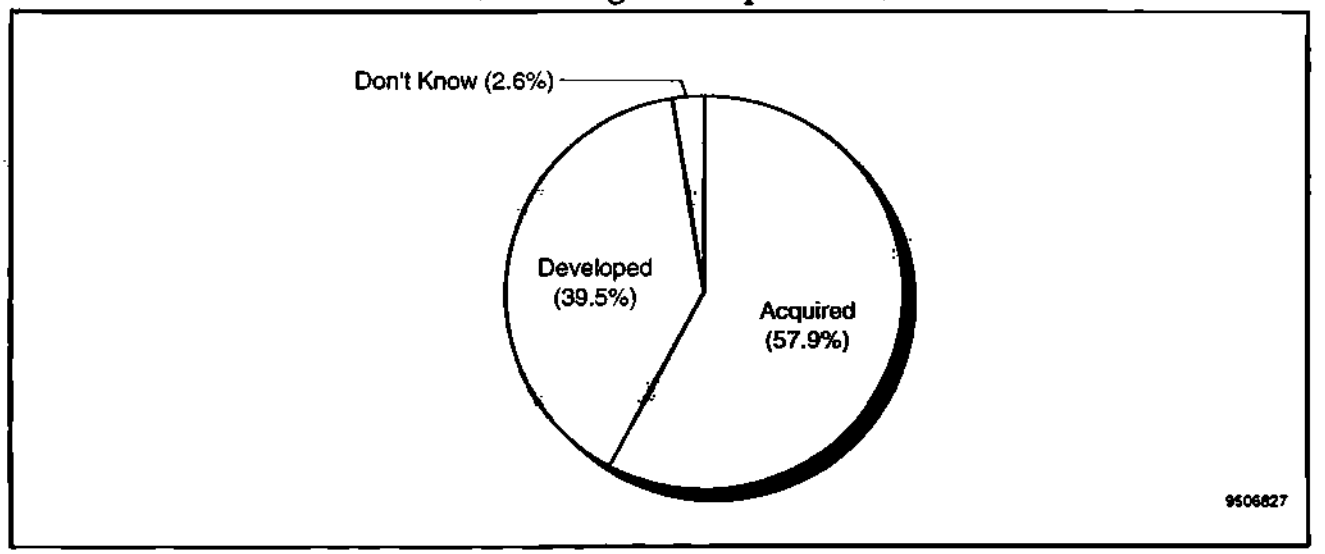
Source: Dataquest (November 1995)

the other hand, we are talking about a hardware vendor's crown jewels. One of the obvious differences between Power Users and the mainstream is the development and upkeep of a highly leverageable in-house macro library (see Figure 3-4).

Until recently, most macros were what is called a "soft macro." That means the physical implementation of the macro hasn't been predetermined. This gives the design a lot of flexibility. As soft macros only exist in Verilog or VHSIC Hardware Description Language (VHDL), they are easily maintained and extremely portable. Next in line in terms of desirability are the

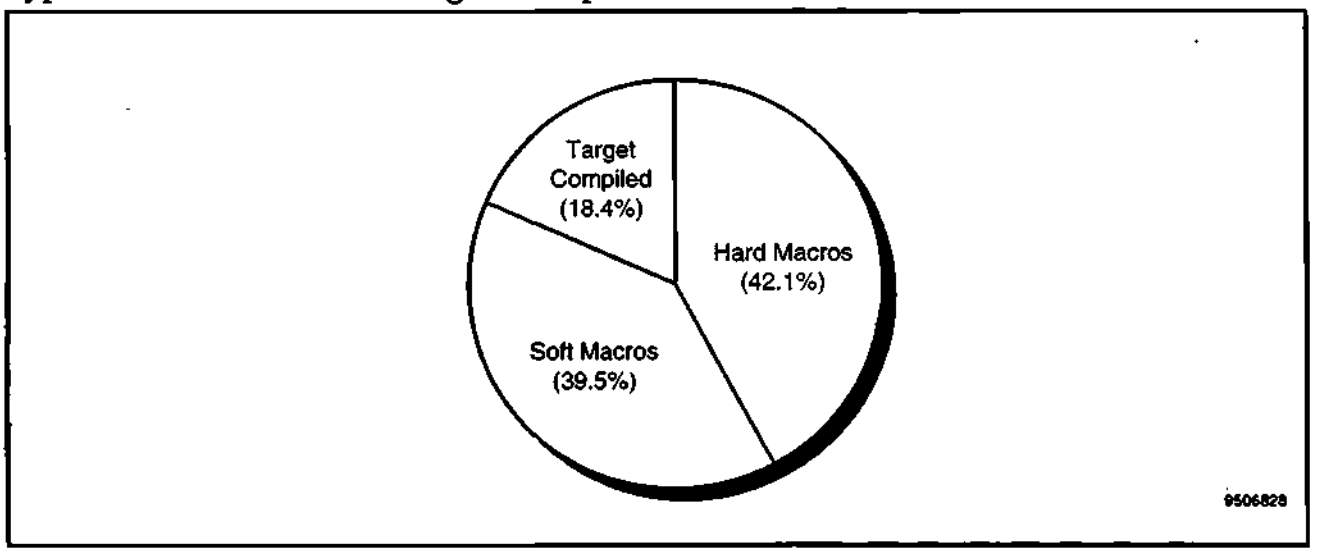
target compilers. Coming out of the old, silicon-compiler technology, they were somewhat of a secret until recently. Most target compilers are provided by the ASIC vendor, and the major application is memory design. With today's upsurge in DSP design, the datapath compiler has become an extremely important tool. The target compiler's strength is its ability to efficiently implement regular structures into silicon. The portability is fair, but the maintenance of these compilers has proven a burden on the ASIC vendors. The bottom of the list in desirability is hard macros. These are macros that have been implemented in silicon and call out this implementation every time they are used. Flexibility is zero, maintenance issues are bad, and portability is terrible. Despite the negatives, they are now the most used macros in today's design (see Figure 3-5).

Figure 3-4
In-House or Purchased Macros (Percentage of Respondents)



Source: Dataquest (November 1995)

Figure 3-5
Type of Macro Used (Percentage of Respondents)



Source: Dataquest (November 1995)

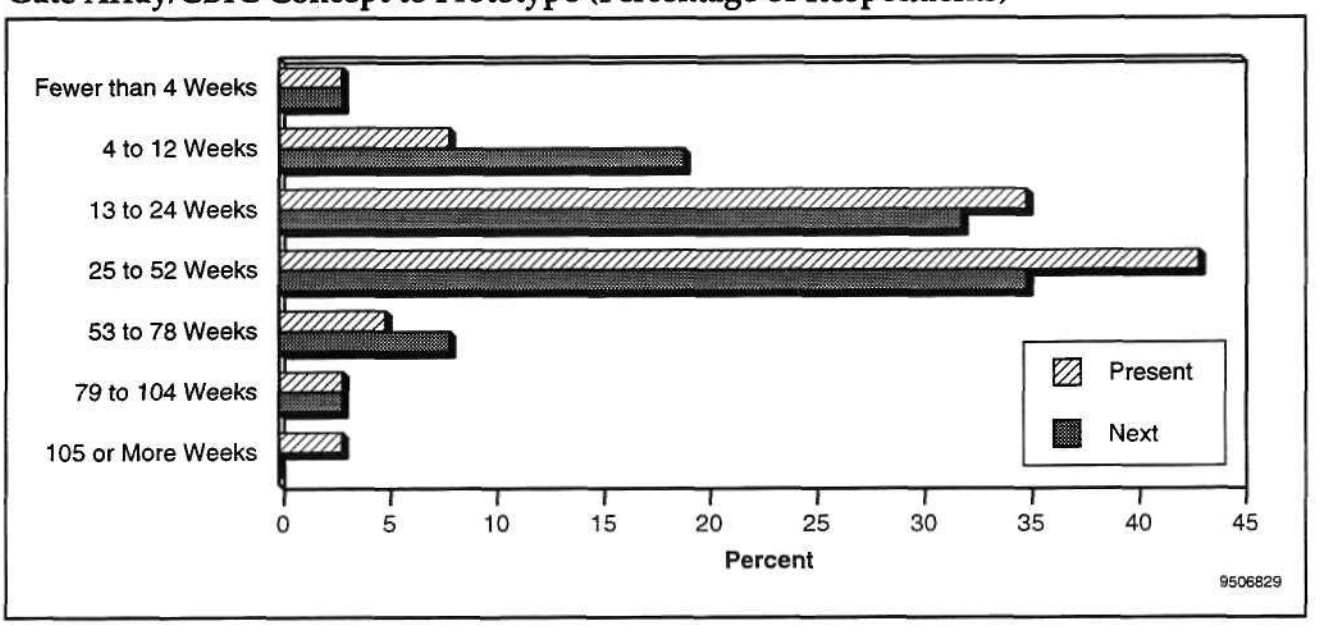
So why are hard macros used? They always exhibit the same characteristics every time they are used. With today's clock speed, a designer has to know how fast the macro runs. Of course, the designer also has to know the signal integrity, power, and electromagnetic interference (EMI) issues that are only exhibited after silicon implementation. (And coming soon to a design close to you, metal-migration problems.) A designed, laid-out, implemented, tested, and thoroughly characterized hard macro really helps an engineer sleep at night.

The Design Process

These designs are getting to be a lot of fun. That is, they're becoming fun for those who like challenges. For those who don't, it might be time to consider another career. Most designs—43 percent—are coming in during the standard, 9-to-12-month time frame. What is surprising is that although a small group expects these designs to take longer than 12 months, there is an 11 percent increase in respondents expecting the next designs to come in at 4 to 12 weeks. Eleven percent of the respondents—most likely the group of dissatisfied engineers discussed earlier—optimistically expect their present design to come in under 4 weeks (see Figure 3-6).

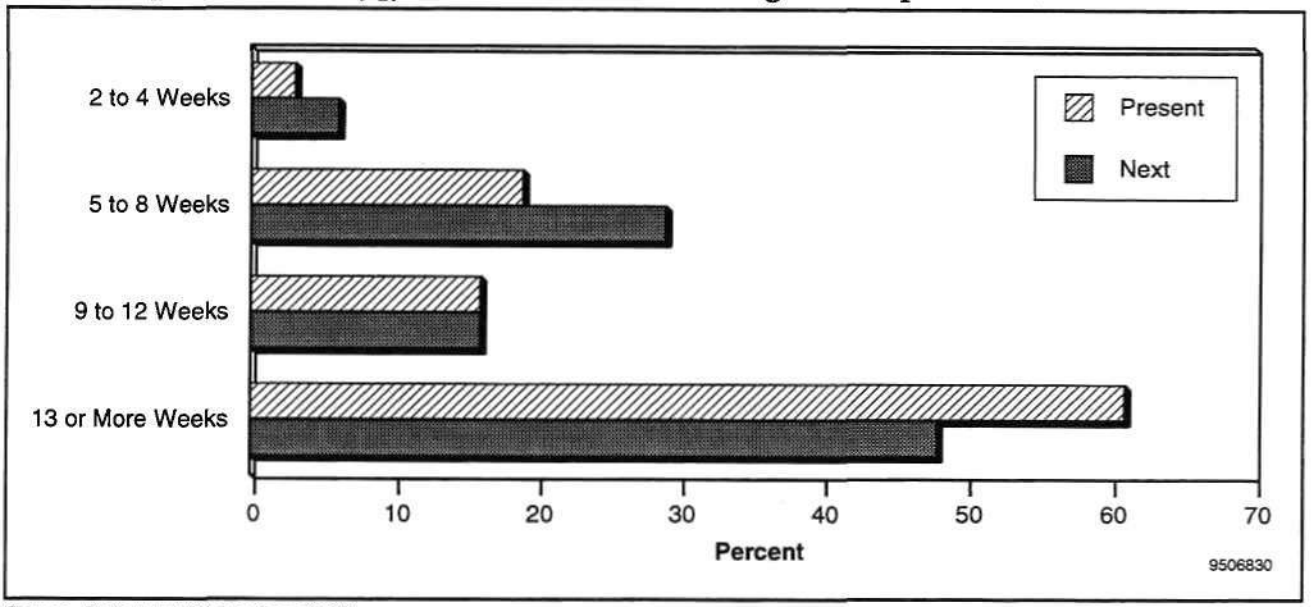
There is an amazingly high percent of designs that take over 13 weeks to reach production. This could be an indication of the verification problems facing today's designs. This will be an interesting area to explore in the future. The biggest increase from today's designs to the next design is in the 5-to-8-week period. In general, this is the throughput targeted by most of today's design groups (see Figure 3-7).

Figure 3-6
Gate Array/CBIC Concept to Prototype (Percentage of Respondents)



Source: Dataquest (November 1995)

Figure 3-7
Gate Array/CBIC Prototype to Production (Percentage of Respondents)



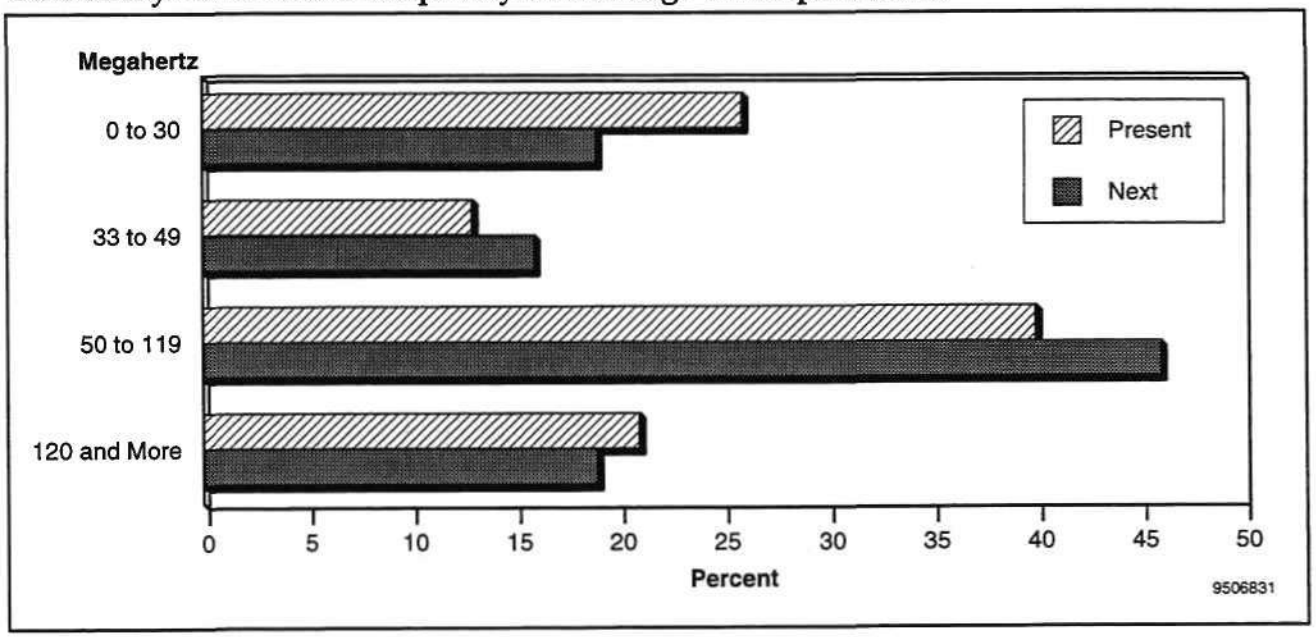
Source: Dataquest (November 1995)

As expected, the frequency of today's design has jumped from the range of 33 MHz to 49 MHz to the range of 50 MHz to 119 MHz. For those who haven't noticed, the design now transitions from digital effects only to full analog effects between 50 MHz and 80 MHz. That is why we are seeing a whole raft of analysis tools, from plain SPICE simulators to RTL, gate-level, switch-level, and transistor-level analysis tools, aimed at solving the five sisters problems: signal integrity, power, thermal, EMI, and metal migration. The frequencies discussed here are the highest clock frequency on board the gate array/CBIC (see Figure 3-8).

Design iterations are still low. Eighty percent are under three iterations. Although a few designers are experiencing up to 29 iterations—far more than the 15 we saw last year—most designers feel their skills and their tools are up to the task. These figures do show some optimism from the design engineers. Dataquest surveys that ask about the last design finished invariably come up with a higher iteration count than a survey like this, which asks about anticipated results. Although gate count, clock speed, and cycle time can be accurately predicted, it seems designers always believe they will have less iterations than they experience (see Figure 3-9).

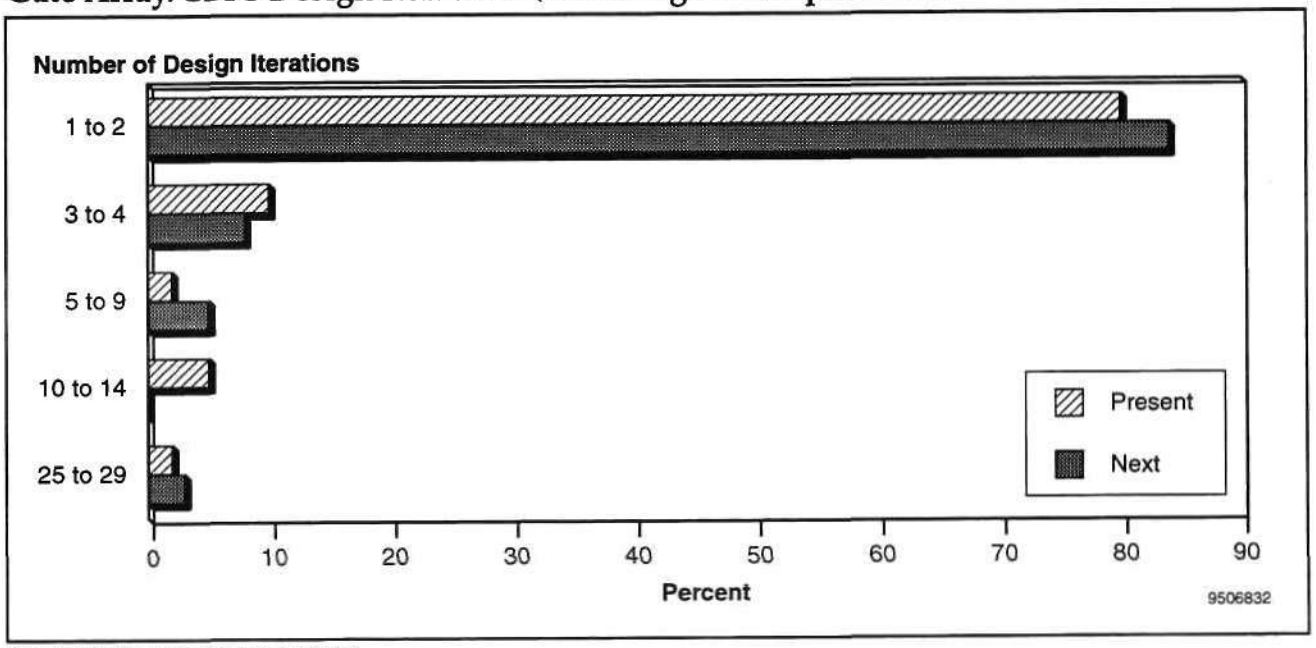
An increasing number of engineers are using synthesis. Although the percent of respondents synthesizing 90 percent or more of their design is flat with last year, the number of engineers synthesizing 50 to 59 percent of their design has grown by almost 15 percent. An interesting point is the recent change in RTL methodology. The trend used to be that engineers synthesized all of the design they didn't care about and then designed the critical circuits at the gate level. This worked well when the golden net list was a gate-level net list. As the designs became larger, design teams started using the RTL description as the golden net list. This produced the problem of how to handle the gate-level portion of the design. Ideally,

Figure 3-8
Gate Array/CBIC Clock Frequency (Percentage of Respondents)



Source: Dataquest (November 1995)

Figure 3-9
Gate Array/CBIC Design Iterations (Percentage of Respondents)



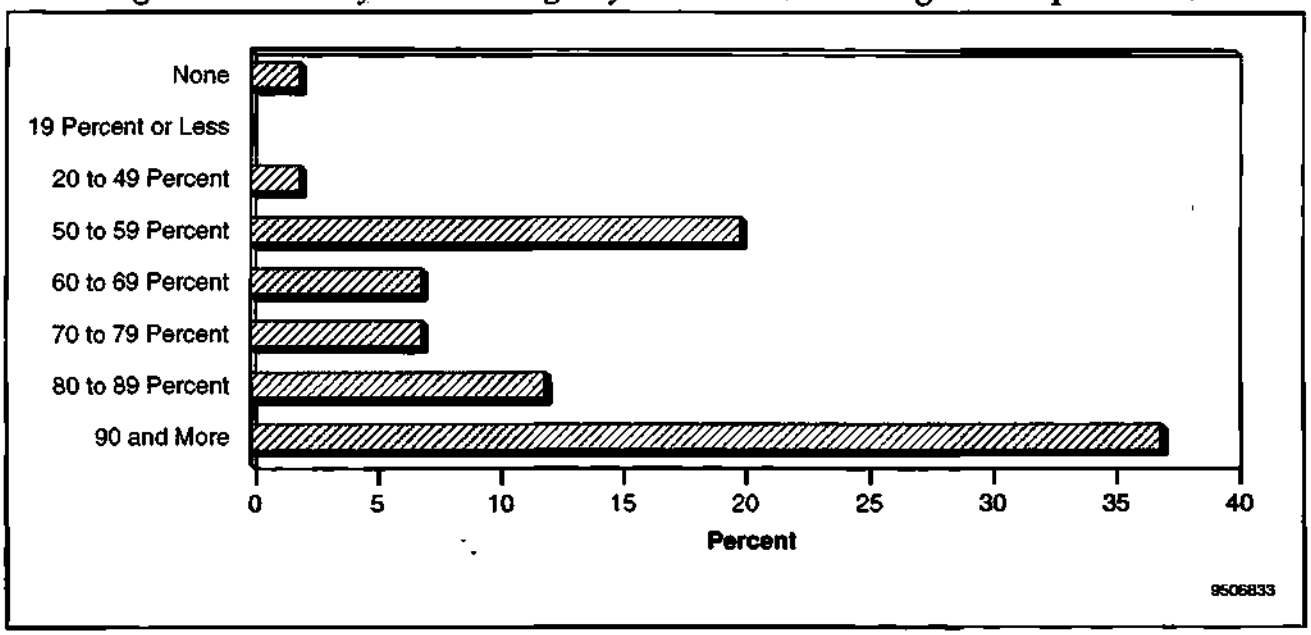
Source: Dataquest (November 1995)

the gate-level net list was brought back up to the RTL. Unfortunately, "ideally" is not a very good engineering term. Not only were design teams handing off mixed-level golden net lists to the verification engineers, but those that did actually convert their gate-level net lists to RTL code were making mistakes.

Recently, some of the most advanced designs have switched to a 100 percent synthesis approach. This has only been successful with a great deal of custom library development and manipulation, but it has been successful. Some of the fastest design out today has used this new RTL methodology (see Figure 3-10).

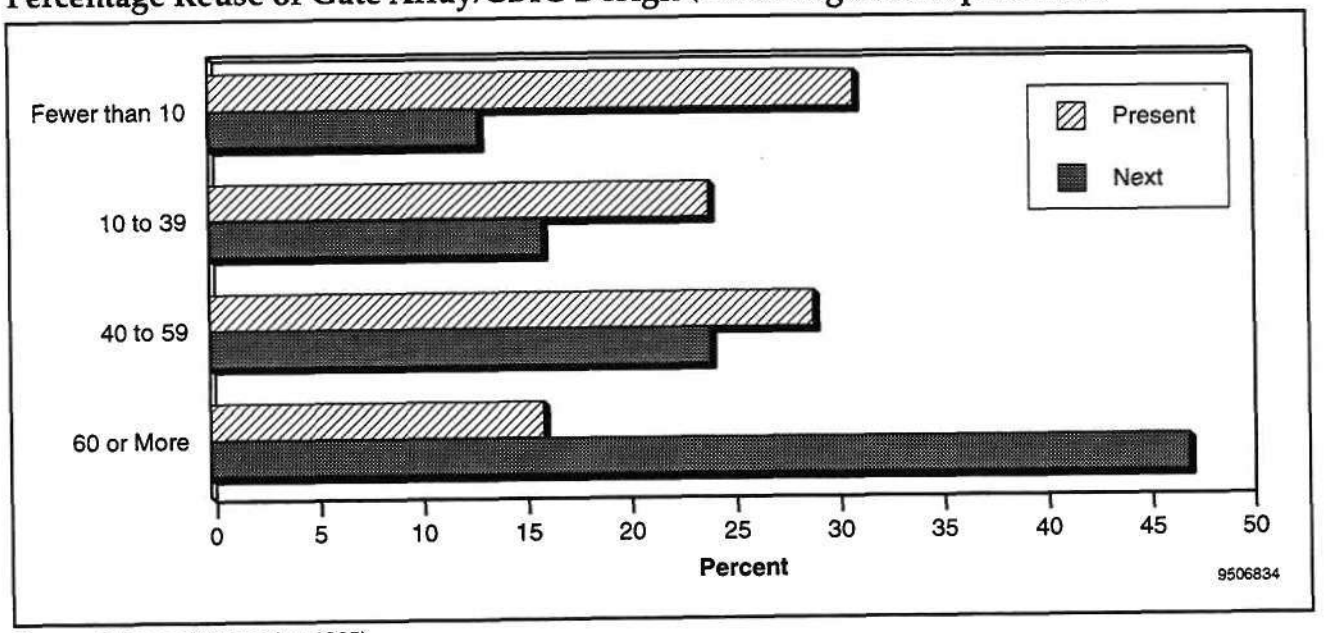
Reuse goes hand-in-hand with synthesis and the large macro issue. What is interesting is that those engineers who use less than 60 percent reuse on today's design expect to do less reuse in their next design. On the other hand, those doing 60 percent or more expect a large jump in reuse in their next design. It sounds like they either know how to do it, or they do not. Those who don't know had better learn (see Figure 3-11).

Figure 3-10
Percentage of Gate Array/CBIC Design Synthesized (Percentage of Respondents)



Source: Dataquest (November 1995)

Figure 3-11
Percentage Reuse of Gate Array/CBIC Design (Percentage of Respondents)



Source: Dataquest (November 1995)

Chapter 4
FPGA/CPLD Design

FPGA/CPLD Gate Count Climbs

FPGA/CPLDs have always run counter to conventional wisdom. On the surface, they have acted like a reactionary force in the design community. When they first appeared on the scene, they were discounted as being far too expensive for anything but prototype design. Still, they went into production because once the prototype was completed, the design engineers were put on another project. Then there was the claim by the FPGA vendors that these devices didn't need simulating, they just needed programming and implementation. This was a throwback to the days of soldering-iron engineering. This was also a dream come true for many designers. When a mistake is made with an FPGA/CPLD, it is fixed and the design continues. When mistake is made in a gate array, all hell breaks loose. Generally, the president of the company, or at least the division manager, must sign off the respin purchase order.

Today, the constant drive to produce smaller geometry silicon has played into the hands of the FPGA/CPLD vendors. The cost curve for a gate array is a bath tub curve. The highest gate count base array and the lowest gate count base array are always the most costly to produce when you use a cent-per-gate measurement. At the high end, yield is the problem. At the low end, the problem is packaging. Anyone going back to the days of the 7400 TTL series will remember that the silicon was free. What cost money was the package. It's the same with any small, and therefore high-yielding, semiconductor. Therefore, as the geometries shrink, it becomes unprofitable to sell gate arrays at an ever-increasing gate count. The FPGA/CPLD vendors have filled this void. This has caused the FPGA/CPLD gate count to continue to climb (see Figure 4-1).

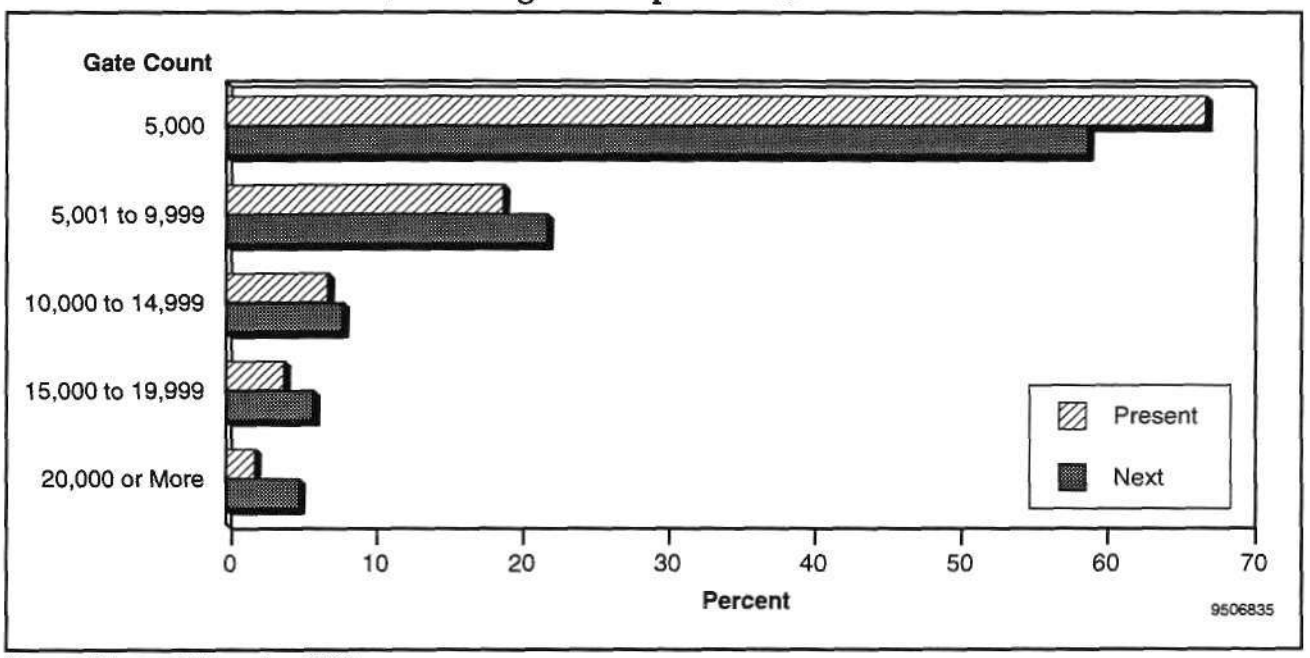
The Design Process

As the gate count increases, the FPGA/CPLD design cycle is starting to resemble the gate array/CBIC design flow. There are two trends. The first is that the respondents that complete their designs in 12 weeks or less expect to be able to pull that into four weeks. This seems to indicate a greater use of EDA tools, or possibly the use of smaller FPGA/CPLDs. The second trend is that the rest of the respondents see their design cycle stretching out, with the exception of the poor designers who are doing designs that have stretched out over two years (see Figure 4-2).

These designs are moving into production faster than gate array/CBIC designs, but not by much. The 13-week-or-longer category is down, but the 9-to-12-week category is double that of gate array/CBICs. This could be caused by the practice of debugging FPGA/CPLD designs in hardware rather than extensive use of simulation (see Figure 4-3).

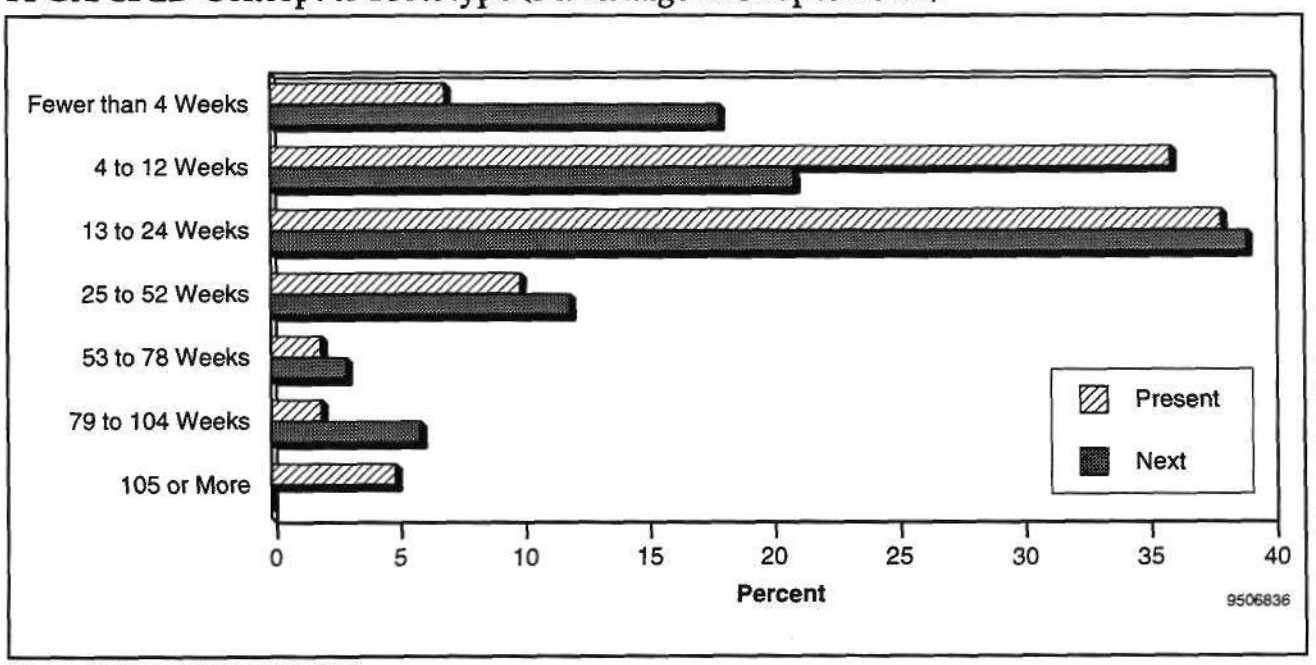
The clock frequencies of FPGA/CPLDs are starting to become respectable. There's nothing over 120 MHz yet, but quite a few designs are being done in the range of 50 MHz to 119 MHz. This is showing the impact of the 66-MHz PCI bus (see Figure 4-4).

Figure 4-1
FPGA/CPLD Gate Count (Percentage of Respondents)



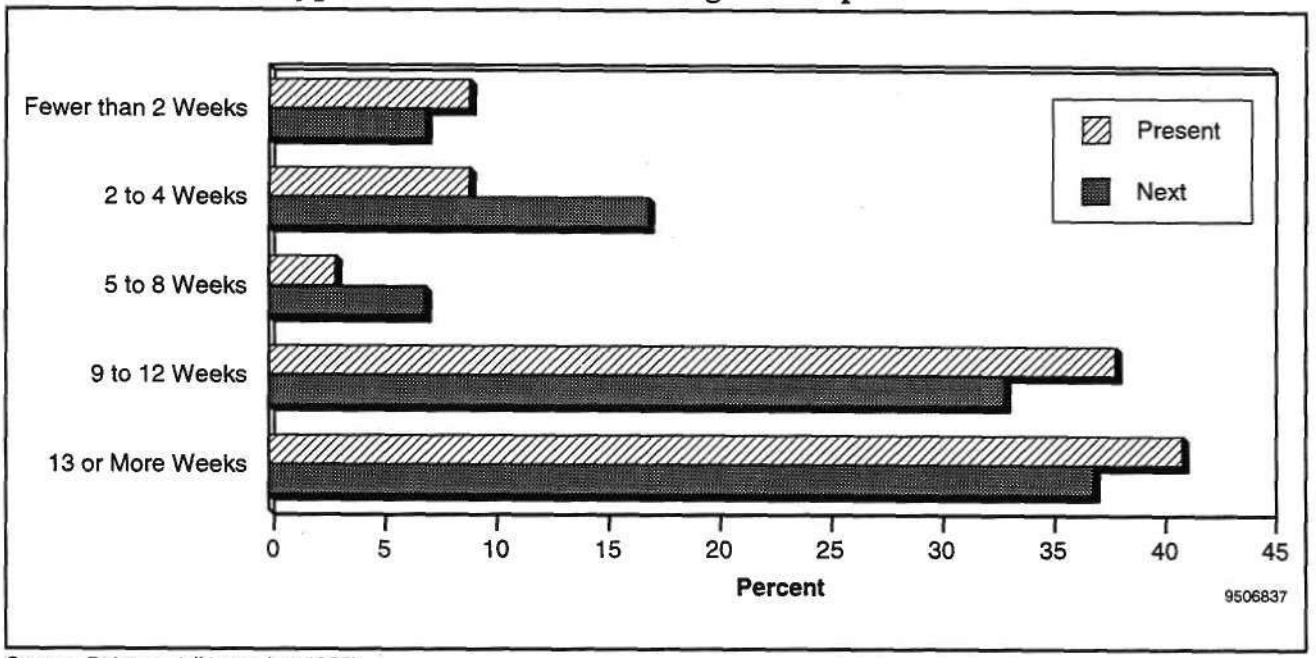
Source: Dataquest (November 1995)

Figure 4-2
FPGA/CPLD Concept to Prototype (Percentage of Respondents)



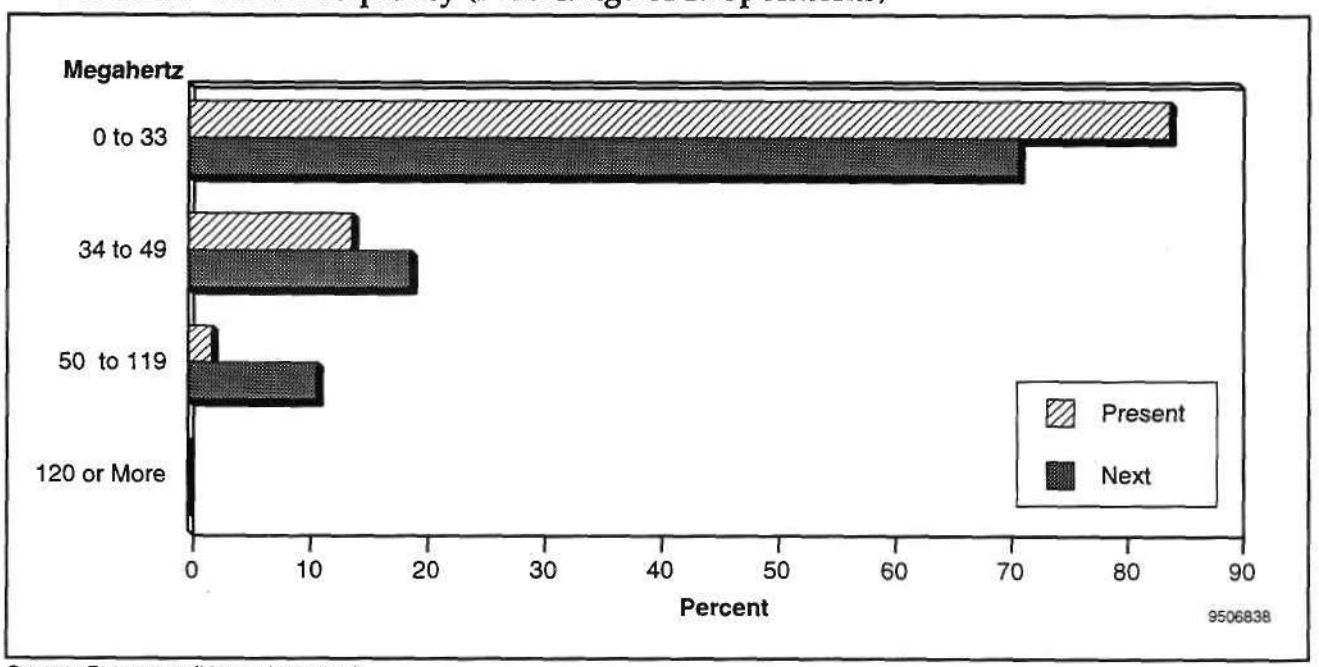
Source: Dataquest (November 1995)

Figure 4-3
FPGA/CPLD Prototype to Production (Percentage of Respondents)



Source: Dataquest (November 1995)

Figure 4-4
FPGA/CPLD Clock Frequency (Percentage of Respondents)



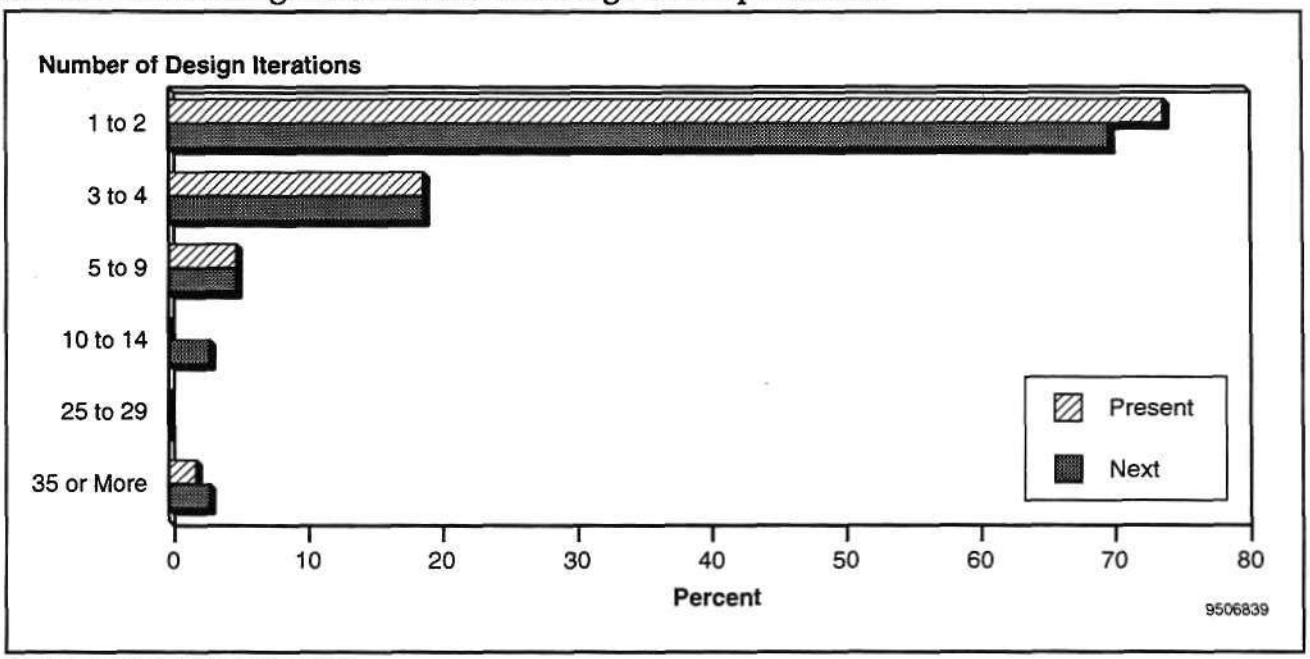
Source: Dataquest (November 1995)

As can be expected, there are more design iterations in the FPGA/CPLD world than there are in the gate array/CBIC world. If one can iterate a design for generally less than $1,000 and in hours, it becomes an acceptable design practice. Gate array/CBIC designers are willing to spend big money to cut down design iterations. It has been estimated a design for a satellite can cost up to an extra $1 million per day if it is delayed. A majority of today's design can measure program delays in the area of $100,000 or more per week. Unfortunately, the FPGA/CPLD design is changing. Iterations of larger designs are starting to take days instead of hours. Soon the price paid for the practice of hardware debug will become prohibitive. Dataquest believes more money is wasted by saving money on EDA tools than by anything else in the hardware design industry (see Figure 4-5).

We are starting to see an upswing in the use of synthesis in FPGA/CPLD design. Still, 36 percent of the respondents do not use synthesis. The largest group, 22 percent, synthesize between 20 percent and 49 percent of their design (see Figure 4-6).

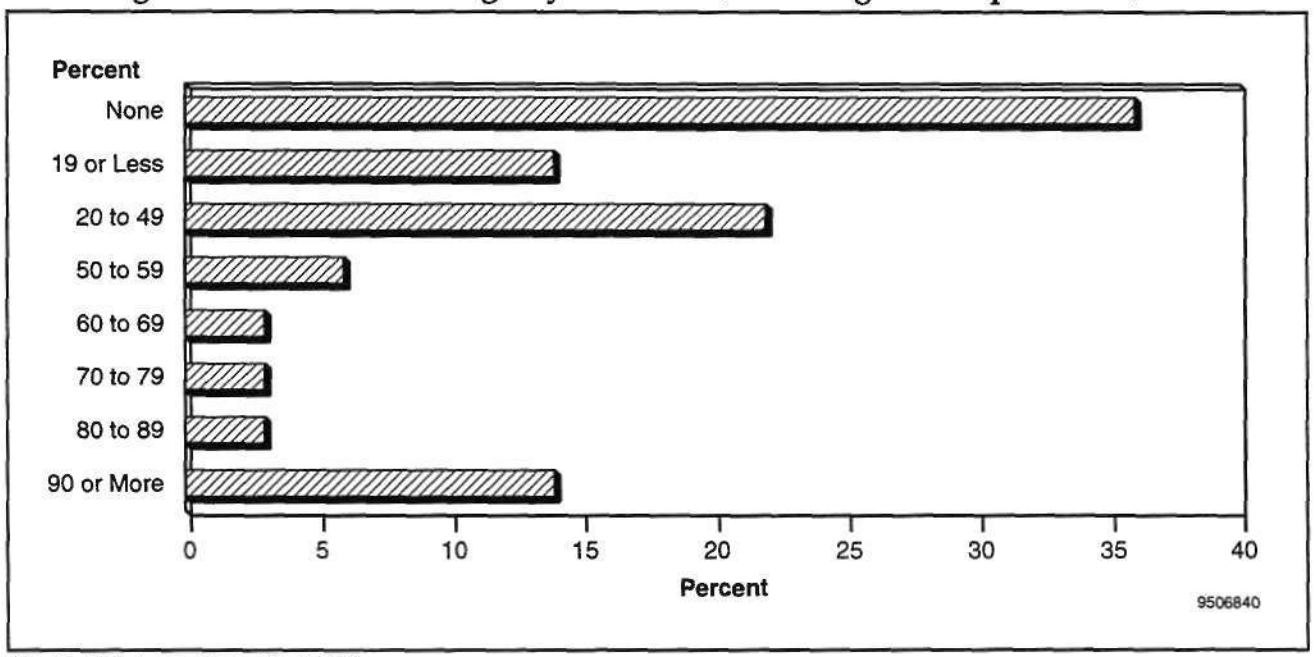
Design reuse in FPGA/CPLD design is far more evenly distributed than in the gate array/CBIC world. That is probably because this is somewhat of an apples-and-oranges comparison. FPGA/CPLDs are still far too small for SLI designs. Therefore, there are few SLMs available to the FPGA/CPLD designers. FPGA/CPLD reuse is being accomplished with macros, whereas the upswing in gate array/CBIC design reuse is being driven by SLMs (see Figure 4-7).

Figure 4-5
FPGA/CPLD Design Iterations (Percentage of Respondents)



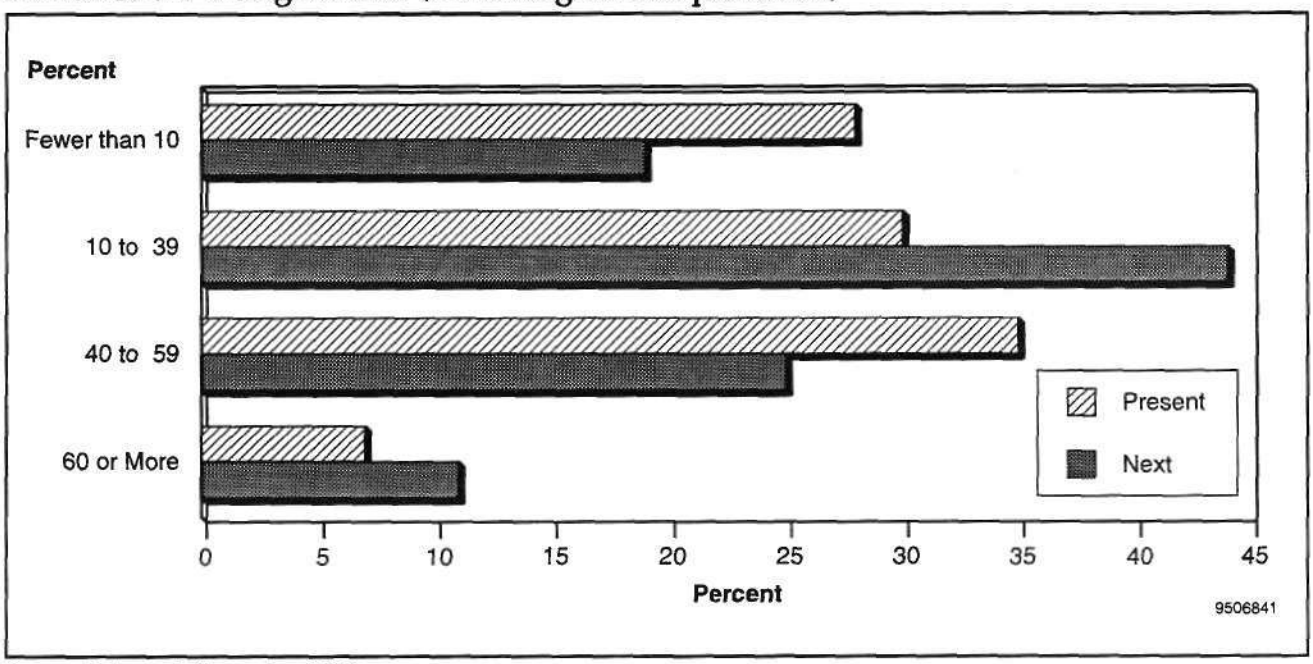
Source: Dataquest (November 1995)

Figure 4-6
Percentage of FPGA/CPLD Design Synthesized (Percentage of Respondents)



Source: Dataquest (November 1995)

Figure 4-7
FPGA/CPLD Design Reuse (Percentage of Respondents)



Source: Dataquest (November 1995)

Chapter 5
Printed Circuit Board Design

Gate Count Climbs

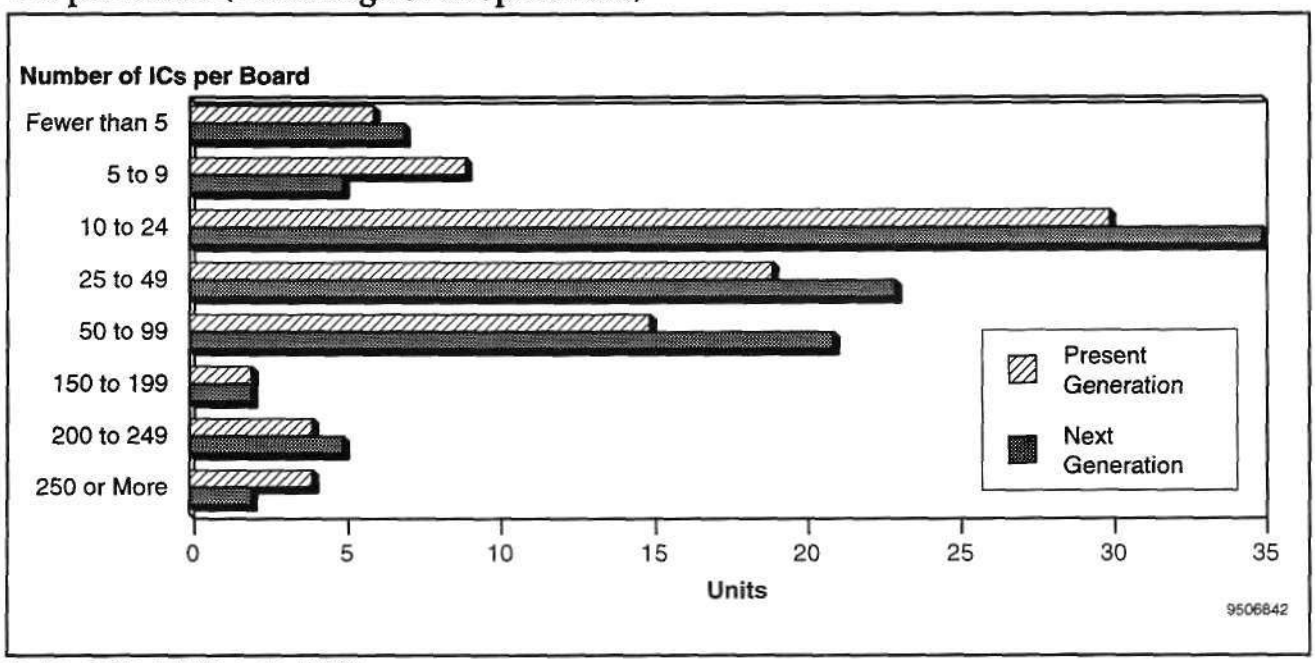
The IC package count on a PC board has started to climb again. Only at the real high end and in the area of five to nine ICs per board are the percent of designs expected to decline. In fact, far fewer high package count designs were actually done this year than expected. Over 50 percent of tomorrow's designs will fall in the 10 to 49 package count (see Figure 5-1).

The Design Process

The concept-to-prototype design cycle clusters around 4 weeks to 24 weeks. The aim is to pull all the designs that fall into the 13-to-24-week period into the 4-to-12-week period. With the increase in board-level clock frequencies, we wish them luck (see Figure 5-2).

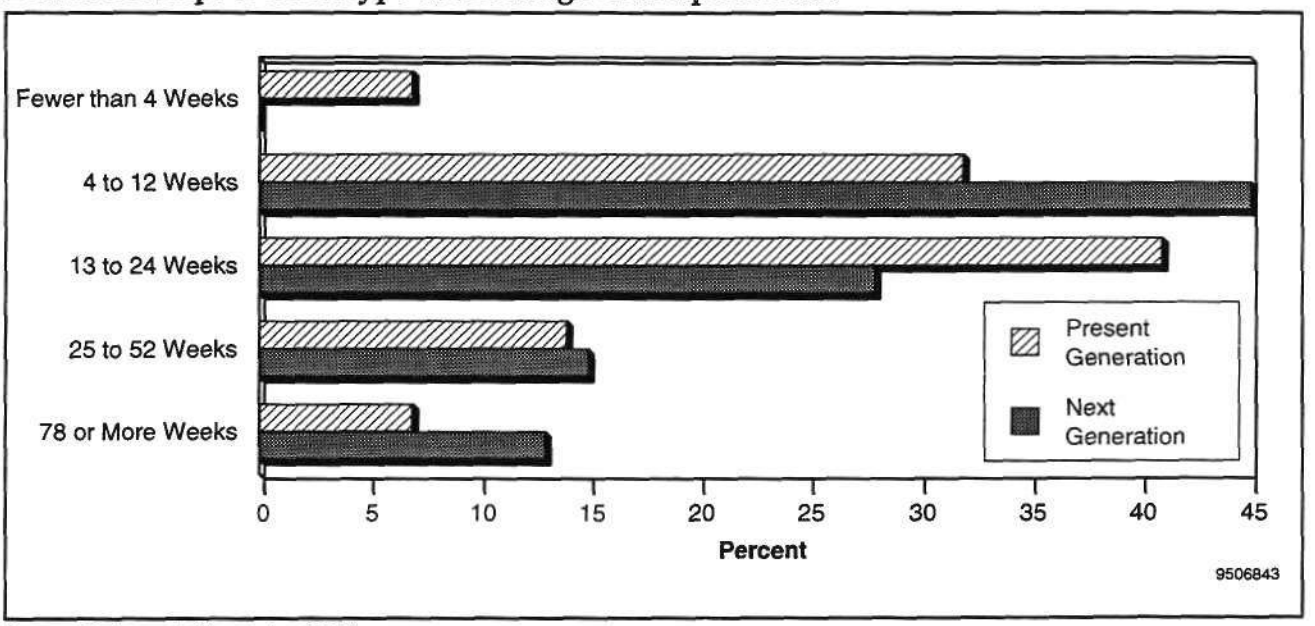
The prototype-to-production time frame remains a problem. We are seeing almost 50 percent of the designs take over 13 weeks. The attempt is to pull that time frame down to the 5-to-8-week period, but it will be a struggle (see Figure 5-3).

Figure 5-1
ICs per Board (Percentage of Respondents)



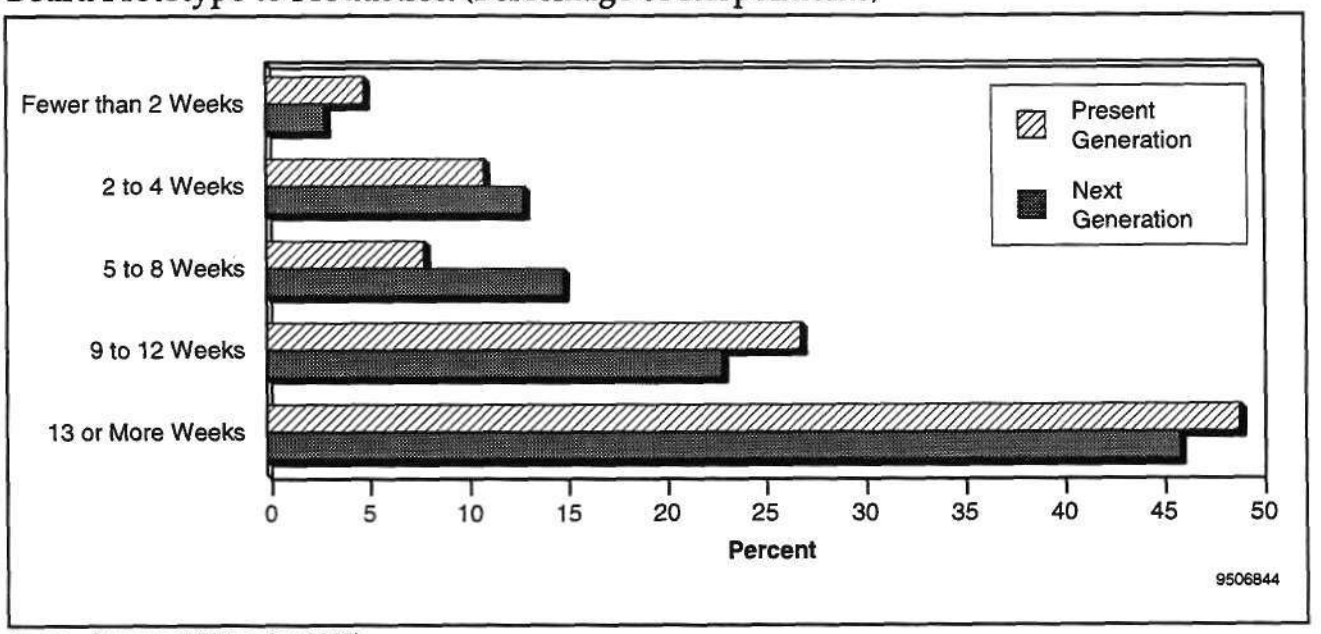
Source: Dataquest (November 1995)

Figure 5-2
Board Concept to Prototype (Percentage of Respondents)



Source: Dataquest (November 1995)

Figure 5-3
Board Prototype to Production (Percentage of Respondents)



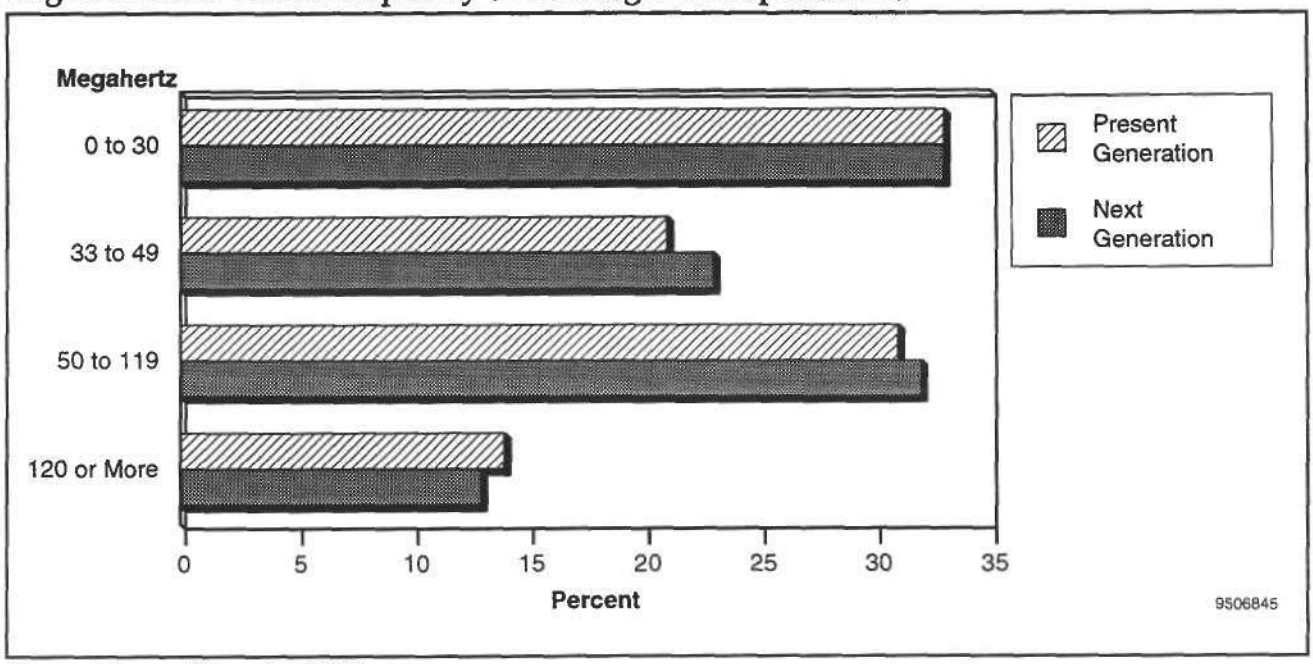
Source: Dataquest (November 1995)

The problem is that the PCB clock frequency has now climbed to over 50 MHz. Thirty-one percent of today's designs are between 50 MHz and 119 MHz; another 14 percent reach higher speeds. One of the more interesting results of last year's survey came from a question that measured the importance and satisfaction ratings on signal-integrity tools. A fairly large percentage of respondents stated the tools were important but gave no satisfaction rating. When called back, they said they believed the tools were important and had in fact bought them, but had yet to use them. Their average clock frequency was 44 MHz. You can bet they are using them on this year's designs (see Figure 5-4).

Board design iterations are traditionally low. A lot of design work goes on prior to doing the artwork for a production board. Also, a board design has much more latitude than a silicon design. Designers could actually cut traces on an ASIC when they used 2-micron technology. It's a bit harder today (see Figure 5-5).

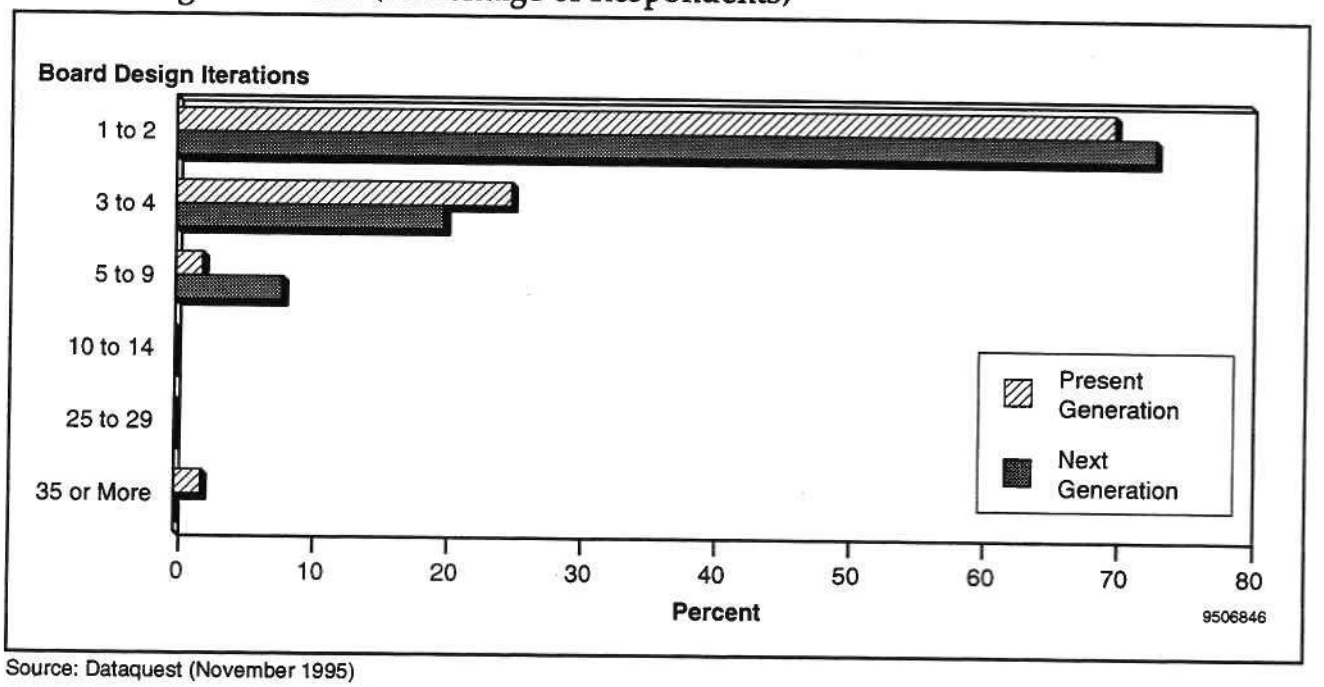
PCB design reuse looks much more like gate array/CBIC reuse than FPGA/CPLD reuse. Although a large percent of FPGA/CPLD designers also design the PC board, the design challenges are different. Today's gate array/CBICs are not glue-logic repositories. They have at least the complexity of a PCB, if not multiple PCBs (see Figure 5-6).

Figure 5-4
Highest Board Clock Frequency (Percentage of Respondents)



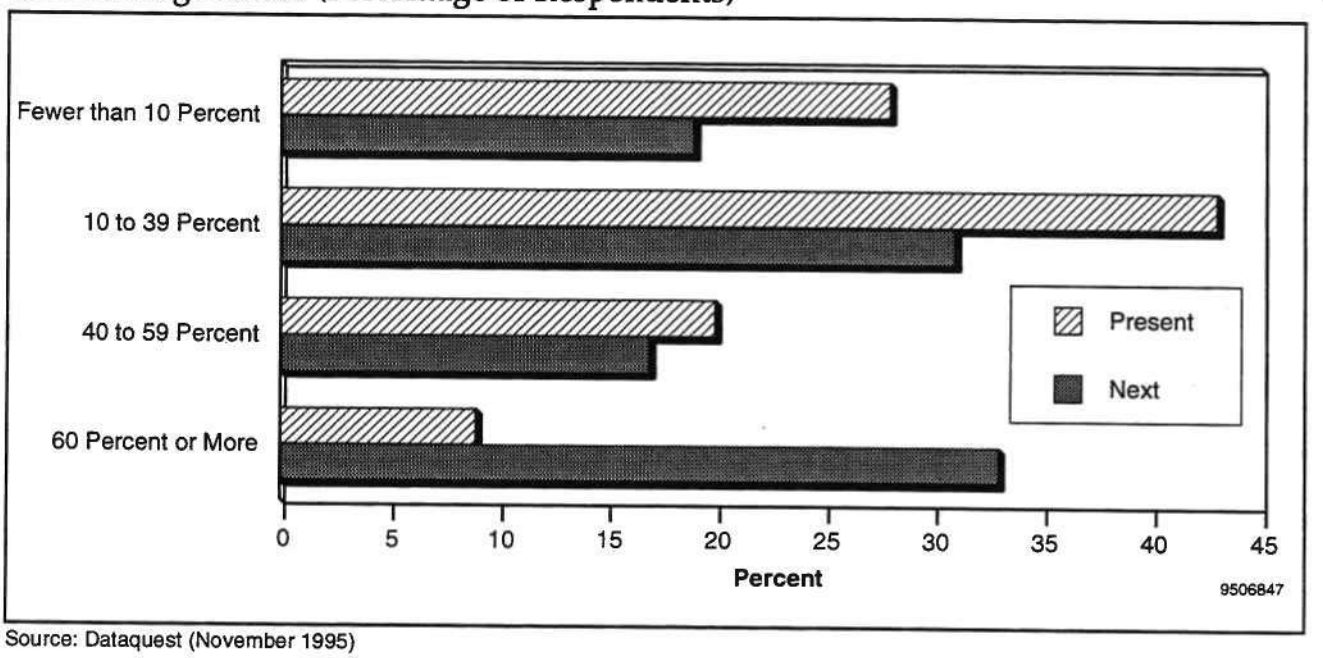
Source: Dataquest (November 1995)

Figure 5-5
Board Design Iterations (Percentage of Respondents)



Source: Dataquest (November 1995)

Figure 5-6
Board Design Reuse (Percentage of Respondents)



Source: Dataquest (November 1995)

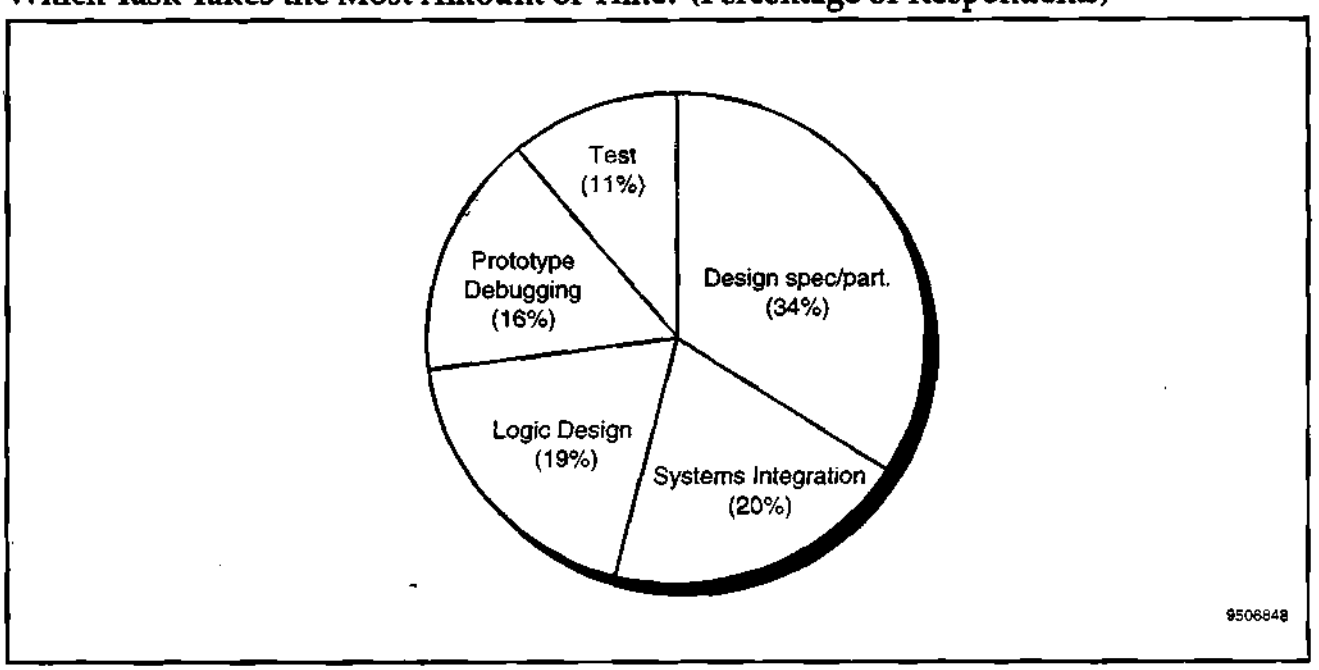
Chapter 6
EDA Tools

The Design Challenge

This year and last year, our survey asked what takes the most amount of time in the design cycle. Every area was shown to be less time-consuming than it had been a year ago. That is, every area except systems integration. Systems integration increased by 10 percent over last year. Design specification and partitioning was still by far the largest category, with 34 percent of the respondents saying it was the most time-consuming. As we said last year, ESL tools are sorely needed by today's engineers. Unfortunately, these tools have been hard to justify to upper management. Again, more money is wasted by saving money on EDA tools than by anything else in the hardware design industry (see Figure 6-1).

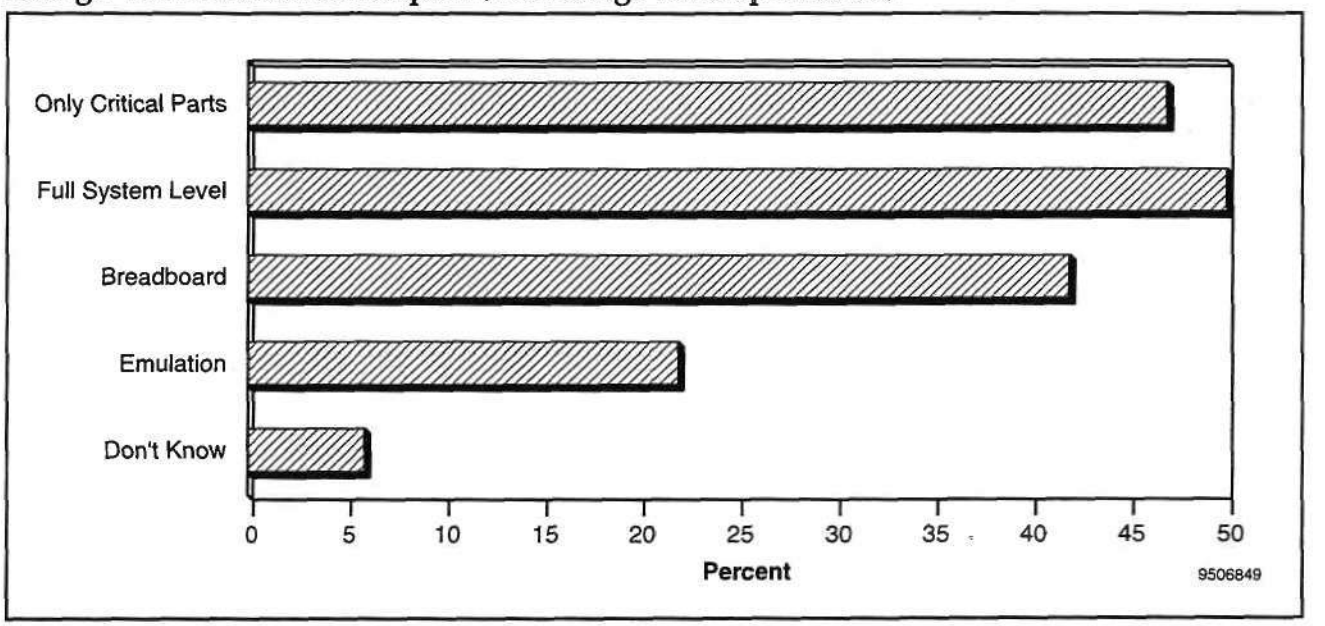
We asked the design-verification question differently this year. Most respondents use more than one technique for verification. Fully 50 percent of the respondents are now doing full system-level simulation. These designers also tend to simulate critical paths and to use emulation. The next-highest category was simulating critical paths. The engineers who simulate critical paths but do not do system-level simulation tend to rely on breadboarding for final verification. Six percent of the respondents didn't know how their company did verification. This is an indication of verification teams being formed, in the larger companies, that are separate from the design teams (see Figure 6-2).

Figure 6-1
Which Task Takes the Most Amount of Time? (Percentage of Respondents)



Source: Dataquest (November 1995)

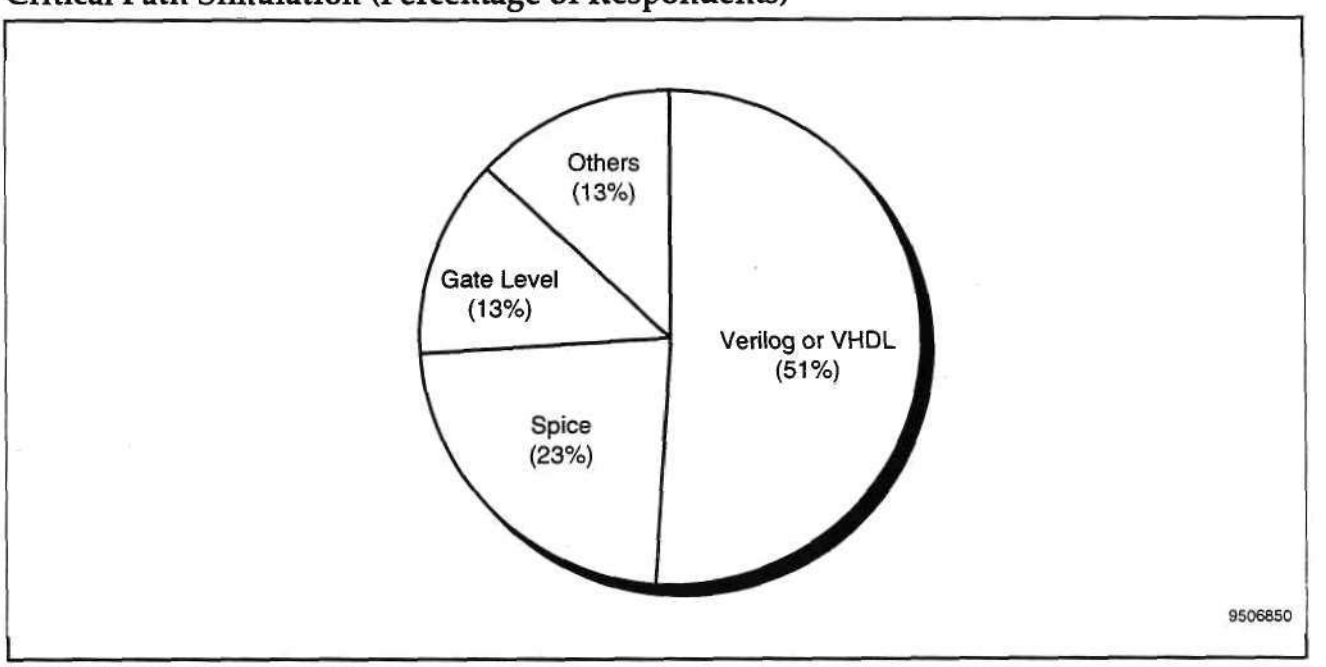
Figure 6-2
Design Verification Techniques (Percentage of Respondents)



Source: Dataquest (November 1995)

Fifty-one percent of the respondents are still using Verilog or VHDL for critical paths. This is not a practice that works well in high-speed designs. Only 13 percent are still using gate-level simulators. A full 23 percent are using SPICE, and on top of that 13 percent are using other transistor or switch-level simulators. This will be a growing trend (see Figure 6-3).

Figure 6-3
Critical Path Simulation (Percentage of Respondents)



Source: Dataquest (November 1995)

The question about present licenses brought some surprises. The two winners in the "we do not have any" category were signal-integrity tools and design-for-test (DFT) tools at 79 percent and 78 percent, respectively. The one that was a surprise was SPICE. We believed everyone had a copy of SPICE lying around somewhere. Not true—57 percent of the respondents have no SPICE licenses. Microsim and Meta Soft have plenty of customers left. The companies with only one toolset tend to be RTL designers, with synthesis as the most popular tool at 25 percent. Of that 25 percent, 16 percent had one license of RTL simulators, so the other 9 percent had a minimum of two simulators for each synthesizer being used. Twenty-four percent report one license of PCB tools and a high 22 percent report having an IC-layout tool in-house. The challenge of high-speed design is starting to impact the IC-layout market. The respondents that report six or more licenses are primarily gate-level designers reporting the most licenses in schematic capture programs and gate-level simulators. It looks like the EDA industry still has plenty of room to grow (see Figure 6-4).

Compared to last year, there were 17 percent more respondents who believed they will be buying more tools next year. The total expecting to buy new tools was 39 percent. The category of respondents who do not believe they will be buying tools dropped from 67 percent to 45 percent, a good sign for EDA growth this year (see Figure 6-5).

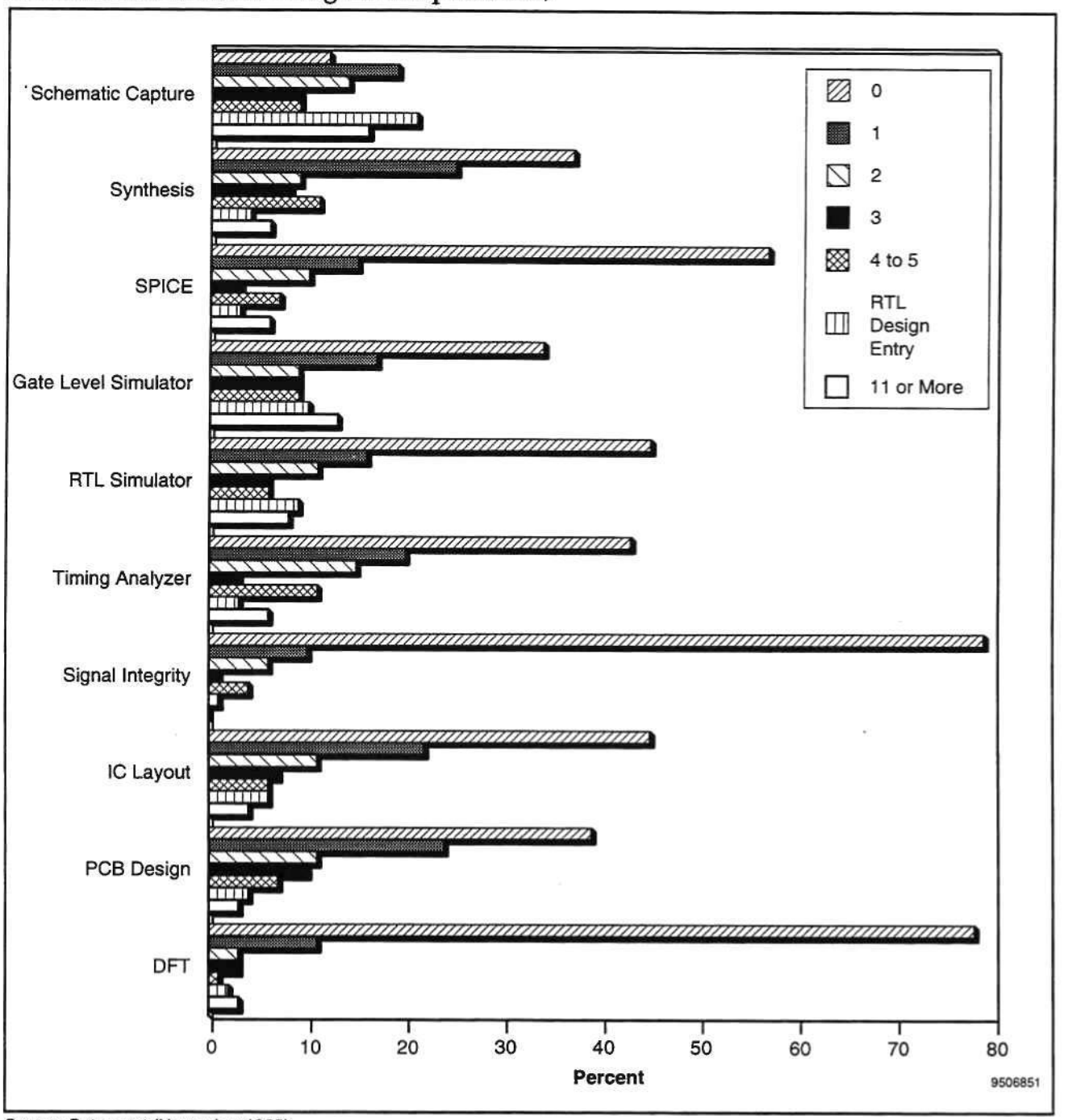
The percent of respondents reporting in-house tool development continues to shrink. Seventeen percent reported some in-house development (see Figure 6-6).

We looked at the type of tools developed a little differently this year, measuring the percentage against the respondents who answered "yes" to the in-house development question. Again, system-design tools led in the percentage of tool developed. DFT was next, followed by RTL entry tools. Engineers are still writing their own scripts and shells that allow the RTL design flow to work smoothly (see Figure 6-7).

The EDA tool importance/satisfaction gap continues to improve. We asked designers to rate their tools with respect to importance and satisfaction on a scale of 1 (not important) to 5 (very important). This year, the average gap fell to 0.43, a full one-tenth better than last year. EDA tool performance is getting much better. Simulation and DFT continue to be the two most important tools. Both have improved their importance/satisfaction gap, however, they are still the two worst in the survey. It was interesting that EMI and Power User analysis improved dramatically over last year. It would be easy to say the gap has decreased because designers are starting to use the various analysis tools more and therefore they have become more used to them. It would be easy to say that, except for the fact the most frequently used analysis tool is the signal-integrity tool, and its gap increased this year (see Figure 6-8).

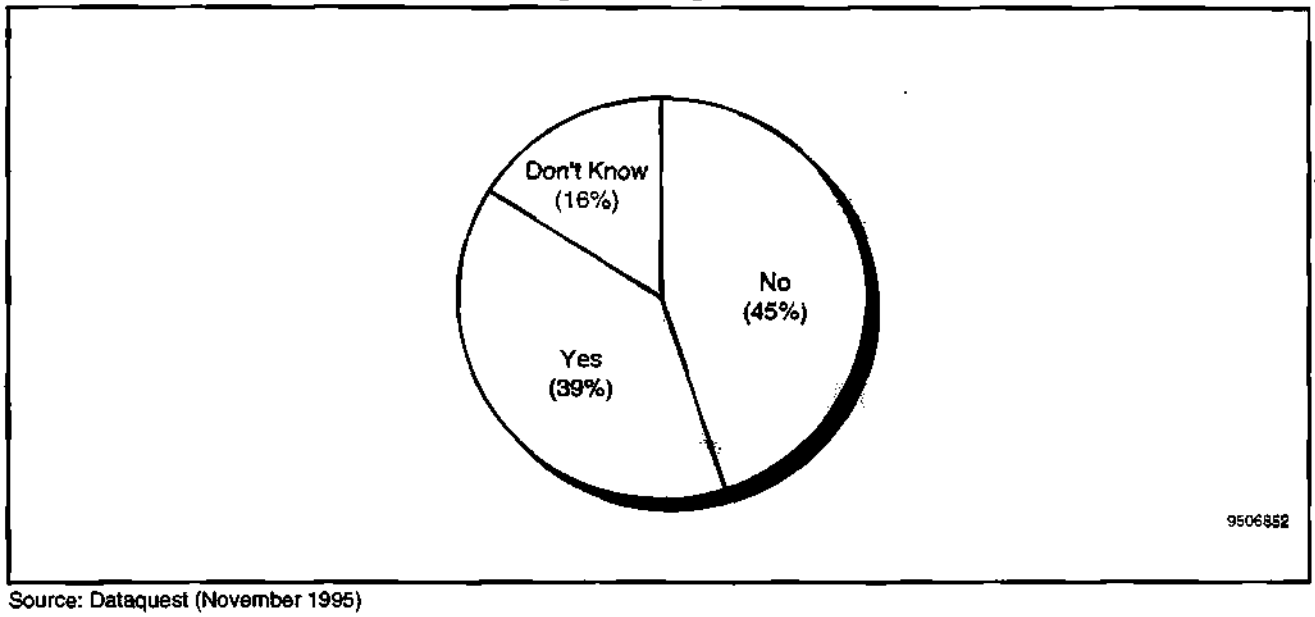
EDA tool quality continues to be a hot topic. Still, the overall importance/satisfaction gap has stayed flat at 0.68. Although some categories have switched places, little has happened to raise the overall quality of the tools. Design size capacity remains the only category where satisfaction is higher than importance. As could be expected, the importance rating fell this year. Ease of use has improved. The introduction of tools this year

Figure 6-4
Present Licenses (Percentage of Respondents)



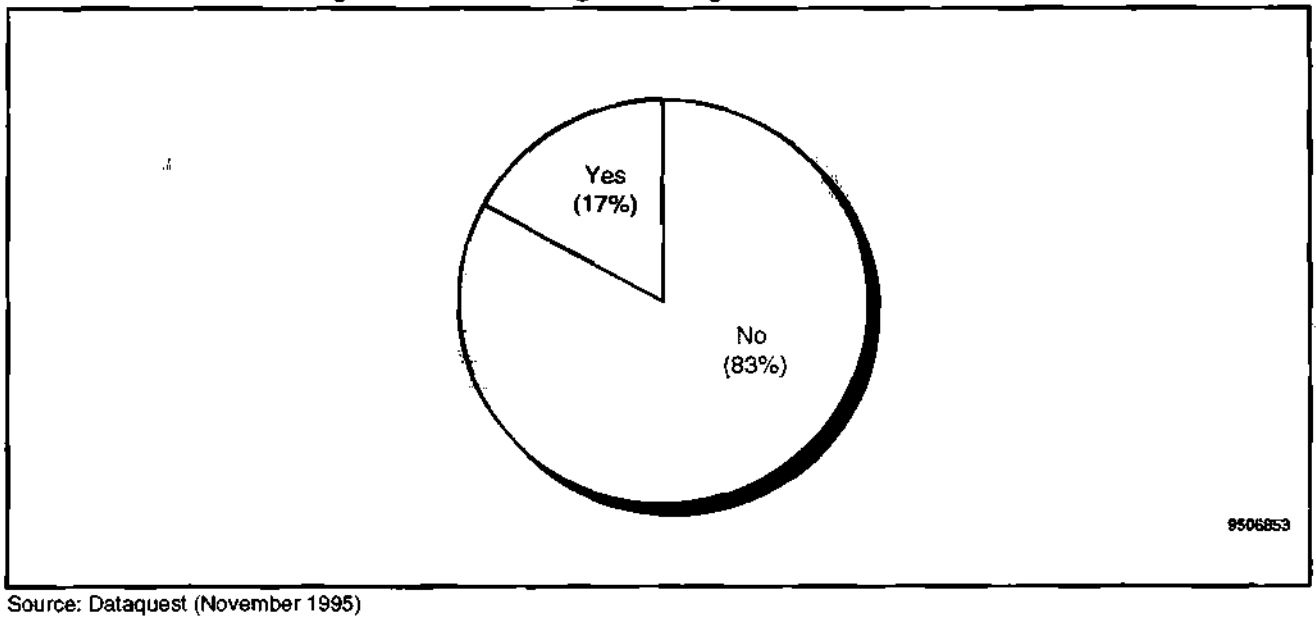
Source: Dataquest (November 1995)

Figure 6-5
1996 New License Purchase (Percentage of Respondents)



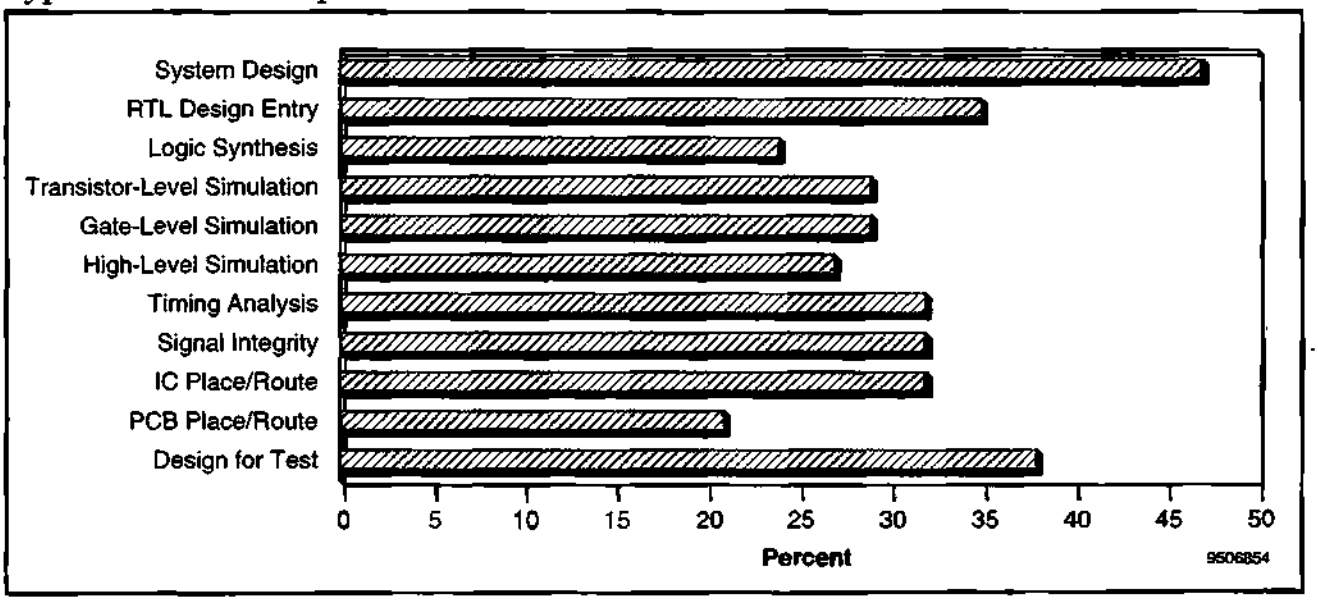
Source: Dataquest (November 1995)

Figure 6-6
In-House Tool Development (Percentage of Respondents)



Source: Dataquest (November 1995)

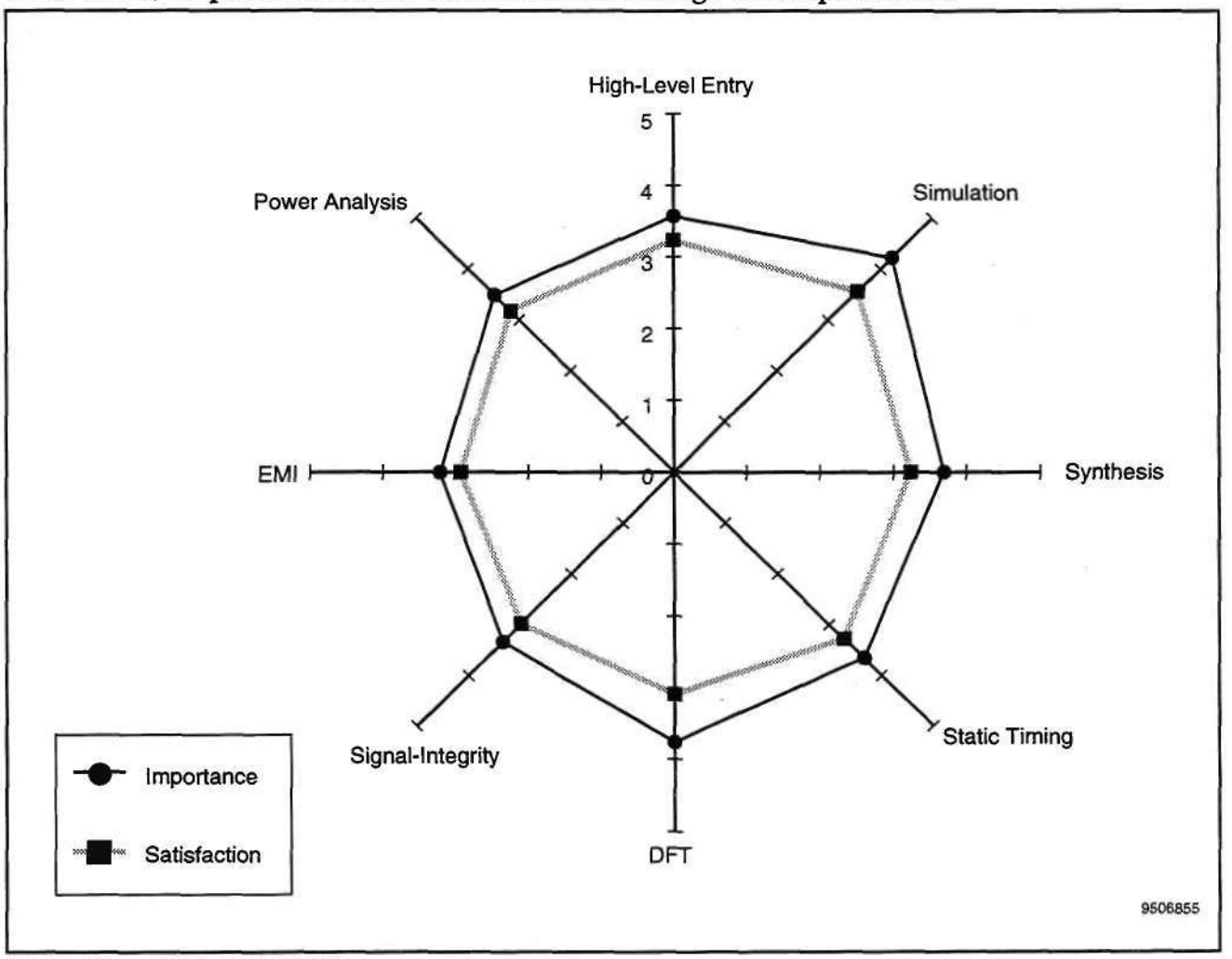
Figure 6-7
Type of Tools Developed



Source: Dataquest (November 1995)

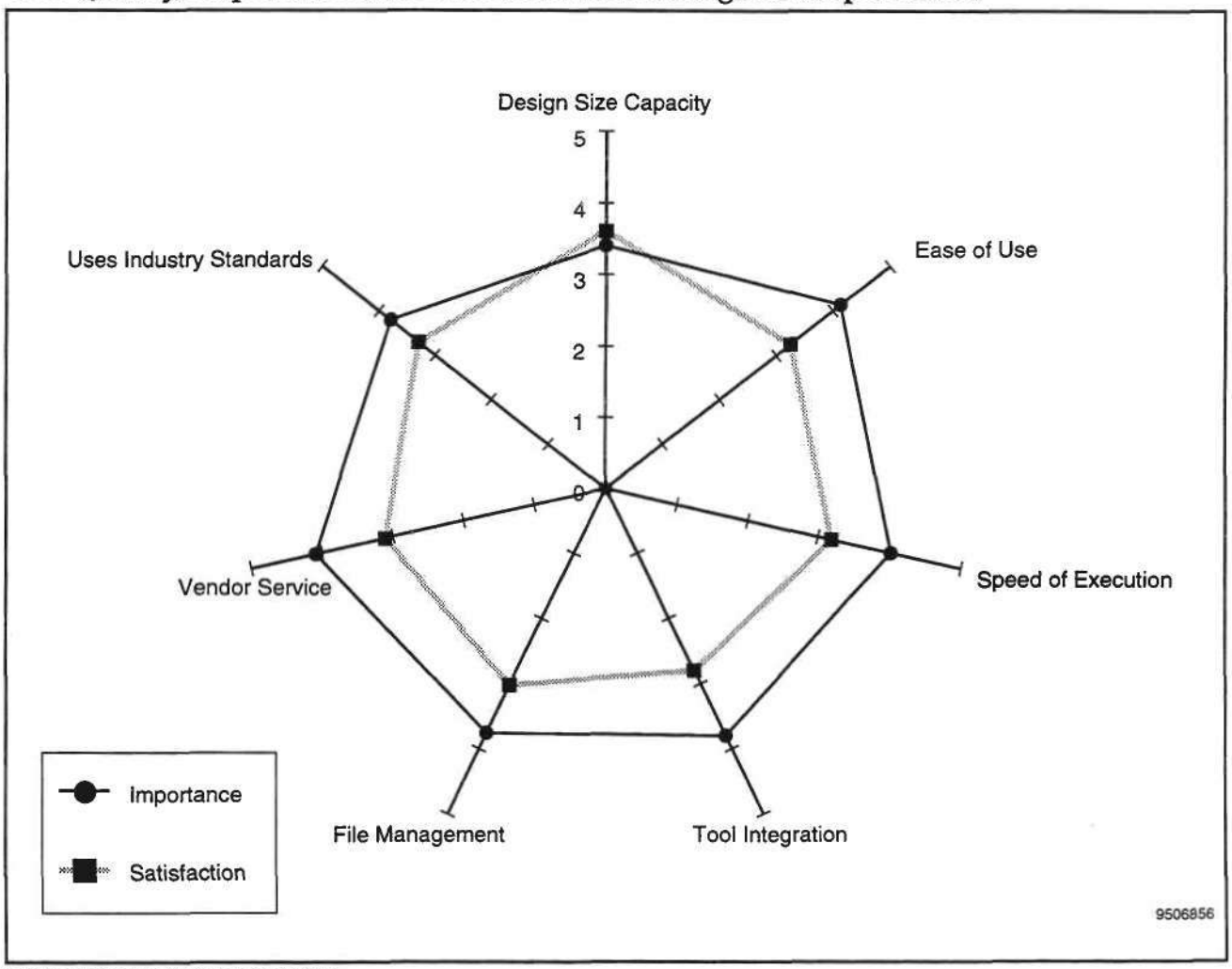
from PADS and Intergraph, where ease of use became a selling point, helped. User interface labs such as Cadence Design Systems in San Jose, California, will continue the process. One area that in a year's time seemed to gain in importance was the "uses industry standards" category. Unfortunately, at the same time its satisfaction rating dropped. Although we have seen more activity on standards this year than in any other year in recent memory, it hasn't done much for the design engineer. The other area where importance was up was vendor service. But though the satisfaction rating did go up some, it still is the second lowest in the survey. This year tool integration fell from fourth from the bottom to dead last. It was the only category where the importance/satisfaction gap was over 1.0. All in all, the EDA industry has a long way to go on tool quality (see Figure 6-9).

Figure 6-8
EDA Tools, Importance and Satisfaction (Percentage of Respondents)



Source: Dataquest (November 1995)

Figure 6-9
Tool Quality, Importance and Satisfaction (Percentage of Respondents)



Source: Dataquest (November 1995)

Appendix A
Survey Methodology

Dataquest end-user data was gathered using an online computer-aided telephone interviewing system. End users were identified through a variety of means, including magazine subscriber lists, databases of past survey respondents, and corporate intelligence databases. The surveys were conducted by telephone (allowing for better screening of prospective respondents) during the third quarter of 1995. The results of this survey were then entered in a statistical analysis package for analysis of the data.

This survey was designed and executed using resources from several Dataquest groups, as follows:

- The survey questionnaire was developed by analysts from Dataquest's Electronic Design Automation Worldwide program and comprised 86 questions. On the average, a respondent answered 53 of the questions because not all respondents were qualified to answer all questions (for example, if a designer did board design, he or she was not asked an expanded set of questions applying only to FPGA/CPLD design).
- The 20-minute telephone survey was conducted by trained interviewers from Dataquest's Field Interviewing staff dialing from a centrally located and monitored WATTS facility at Dataquest in San Jose, California. Respondents' answers were entered into an online survey program that allowed immediate access to survey results.
- The results were checked, validated, and tabulated by analysts from Dataquest's Research Operations Department.
- The data was analyzed by Dataquest's EDA Worldwide program analyst, who then prepared the final written analysis.

The Survey Sample

The survey sample comprised respondents who identified their group's primary end product as belonging in one of the following six industry sectors:

- Industrial/instrumentation
- Consumer
- Telecommunications and data communications
- Computers and computer peripherals
- Automotive
- Military and government electronics

We targeted these areas to obtain the broadest sampling of electronic design methodologies. We did not limit the size of companies with a minimum number of employees, annual revenue, or other metrics.

The survey list was selected in part from subscriber lists from *Integrated System Design* magazine and *Computer Intelligence* magazine. From these

databases we selected about 4,000 subscribers who stated their primary job function was design and development engineering, and whose design activity was either systems, circuit, or component design. The list was supplemented to add to the standard IC-design category and the automotive industry.

To participate in the survey, the person interviewed had to be knowledgeable about the EDA tools used by the company. Dataquest made a total of 2,682 calls. The sample disposition is as follows:

- 203—Completed interview
- 1,897—Were unavailable
- 582—Refused interview (or did not qualify to participate in the study)

We tabulated the data by the entire survey group to provide cross-tabulations by the respondents' self-identified primary design activity and the primary end product of their group.

The survey results are presented in this report for the aggregate group. Any data point collected in the survey can form the basis of a cross-tabulation. Special cuts of the data (for example, by company size or computer platform used) are available to Dataquest's EDA service clients by special request. However, the identities of the end users surveyed are strictly confidential.

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December 1995

Dear Dataquest Client:

In 1996, Dataquest will celebrate its 25th year as the leading global supplier of market intelligence to the IT vendor and financial communities. I would like to thank you, on behalf of all Dataquest associates worldwide, for your support. We are proud to be your information partner by providing the IT market insight and analysis you need to make crucial business and planning decisions.

The enclosed binder is for filing and storing the printed market research newsletters and reports that you will receive on an ongoing basis throughout 1996 as part of your subscription to Dataquest. You may notice that we've streamlined the binder tab and document filing structure this year. We hope that this 5-tab scheme increases your efficiency in filing and locating documents.

You probably know that in addition to paper-based delivery, Dataquest is also committed to delivering our market statistics and analysis electronically. We expect that our electronic products, known collectively as *Dataquest on the Desktop*, will play an increasing role in our ability to deliver information to you in a timely, efficient way. For your information, our electronic tools include:

- ***Dataquest on Demand***—Our monthly CD-ROM containing a rolling 13 months of Dataquest's printed documents
- ***MarketView***—A data analysis tool containing many of Dataquest's market statistics databases
- ***Electronic NewsTakes and Dataquest Alerts***—Weekly/event-driven summary and analysis of top IT news, published via e-mail or fax by most Dataquest research groups
- ***Dataquest Interactive***—Our Internet-based electronic delivery system that you are invited to preview at this URL: http://www.dataquest.com

One last note: an optional binder called *Electronic News* is available on request for clients who wish to file their electronic newsletters and Dataquest Alerts. To order your copy, please fill out the FaxBack form found in the binder pocket and fax it back to us.

We look forward to working with you in our continuing process to improve the content, quality, and timeliness of our products and services. I encourage you to share with us your comments about our publications and electronic delivery tools.

Sincerely,

Jeffrey A. Byrne
Vice President, Worldwide Marketing

1996 RESEARCH PROGRAMS

From semiconductors to systems, software to services, telecommunications to document management, Dataquest's scope of expertise provides clients with a clear view of the relationships among information technology segments – relationships that can have a profound impact on making strategic business decisions.

Computer Systems and Peripherals

Computer Systems
- Client/Server Computing *Worldwide*
- Computer and Client/Server Systems *Europe*
- Servers *Europe*
- UNIX and Open Systems *Europe*

Workstations
- Advanced Desktop and Workstation Computing *Worldwide*
- Workstations *Europe*

Computer Storage
- Removable Storage *Worldwide*
- Optical Disk Drives *Worldwide*
- Optical Disk Drives *Europe*
- Rigid Disk Drives *Worldwide*
- • RAID Storage Systems *Worldwide*
- Rigid Disk Drives *Europe*
- Tape Drives *Worldwide*
- Tape Drives *Europe*

Graphics
- Graphics and Displays *Worldwide*

Personal Computing
- Personal Computers *Worldwide*
- Personal Computers Strategic Service *Europe*
- Personal Computers *Asia/Pacific*
- Mobile Computing *Worldwide*
- PC Distribution Channels *Worldwide*
- PC Distribution Channels *Europe*
- Desktop PC Technology Directions *Worldwide*
- Mobile PC Technology Directions *Worldwide*
- Personal Computers *Central and Eastern Europe*

Quarterly Statistics
- Advanced Desktop and Workstation Quarterly Statistics *Worldwide*
- Workstation Quarterly Statistics *Europe*
- Server Quarterly Statistics *North America*
- Server Quarterly Statistics *Europe*
- PC Quarterly Statistics *United States*
- PC Quarterly Statistics *Europe*
- PC Quarterly Statistics *Japan*
- PC Quarterly Statistics *Asia/Pacific*
- PC Quarterly Statistics *Worldwide by Region*

Online, Multimedia, and Software

Emerging Technologies
- Multimedia *Worldwide*
- Multimedia *Europe* (Module)
- Online Strategies *Worldwide*
- Online Strategies *Europe* (Module)

Productivity/Development Tools
- Client/Server Software *Worldwide*
- Workgroup Computing *Worldwide*
- Workgroup Computing *Europe* (Module)
- Personal Computing Software *Worldwide*
- Personal Computing Software *Europe* (Module)

Technical Applications
- AEC and GIS Applications *Worldwide*
- Electronic Design Automation (EDA) *Worldwide*
- Mechanical CAD/CAM/CAE *Worldwide*
- CAD/CAM/CAE/GIS *Europe* (Module)
- CAD/CAM/CAE *Asia/Pacific* (Module)

Services

Customer Services
- Customer ServiceTrends *North America*
- Customer Services and Management Trends *Europe*

Professional Services
- Professional Service Trends *North America*
- • Systems Integration and Applications Development
- • Consulting and Education
- • Systems Management
- Vertical Market Opportunities *North America*
- Professional Services *Europe*
- • Systems Integration
- • Consulting and Education
- • Systems Management
- Professional Services Vertical Market Opportunities *Europe*
- Professional Service Trends *Asia/Pacific*

Sector Programs
- System Services *North America*
- • Desktop Services
- • Notebook Services
- • Server Services
- User Computing Services *Europe*
- Network Integration and Support Services *North America*
- Network Integration and Support Services *Europe*
- Software Services *North America*
- Strategic Service Partnering *North America*

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1996 RESEARCH PROGRAMS

Document Management

Copiers
- Copiers *North America*
- Copiers *Europe*

Facsimile
- Facsimile *North America*

Printers
- Printers *North America*
- Printers *Europe*
- Colour Products *Europe* (Module)
- Printer Quarterly Statistics *Europe*
- Printer Distribution Channels *Europe*
- Printers *Asia/Pacific*
- Printer Quarterly Statistics *Asia/Pacific*

Semiconductors

Regional Markets
- Semiconductors *Worldwide*
- Semiconductors *Europe*
- Semiconductors *Japan*
- Semiconductors *Asia/Pacific*
  - China/Hong Kong
  - Taiwan
  - Korea
  - Singapore

Devices
- ASICs *Worldwide*
- ASIC Applications *Europe*
- Memories *Worldwide*
- Memory Applications *Europe*
- Memory IC Quarterly Statistics *Worldwide*
- Embedded Microcomponents *Worldwide*
- Microcomponent Applications *Europe*
- DRAM Quarterly Supply/Demand Report

User Issues
- Semiconductor Supply and Pricing Worldwide

Application Markets
- Semiconductor Application Markets *Worldwide*
- Semiconductor Application Markets *Europe*
- Semiconductor Application Markets *Asia/Pacific*
- Communications Semiconductors & Applications *WW*
- Consumer Multimedia Semiconductors & Applications *Worldwide*
- Semiconductor Directions in PCs & PC Multimedia *WW*
- PC Teardown Analysis
- PC Watch *Europe*
- Electronic Equipment Production Monitor *Europe*
- Electronic Application Markets *Europe* – Automotive
- Electronic Application Markets *Europe* – Communications
- Electronic Application Markets *Europe* – Consumer
- Electronic Application Markets *Europe* – EDP

Manufacturing
- Semiconductor Equipment, Manufacturing, & Materials *Worldwide*
- LCD Industry *Worldwide*
- Semiconductor Contract Manufacturing *Worldwide*

Telecommunications

Networking
- Networking *North America*
  - Local Area Networks *North America*
  - Wide Area Networks *North America*
  - Modems *North America*
- Networking *Europe*
  - Asynchronous Transfer Mode *Europe*
  - ISDN *Europe*
  - Modems *Europe*
  - Local Area Networks *Europe*
  - WANs *Europe*
- Quarterly Market Watch *North America*
- Intelligent Hubs & Switches
  - Network Interface Cards
- Network Distribution Channels *Europe*

Voice
- Voice Communications *North America*
  - Voice Processing *North America*
  - Computer-Integrated Telephony & Automatic Call Distributors *North America*
  - Premise Switching Systems *North America*
- Voice Communications *Europe*
  - Voice Processing *Europe*
  - Call Centres *Europe*
  - Telephones *Europe*
  - PBX/KTS Systems *Europe*

Public
- Public Network Equipment & Services *North America*
  - Public Network Equipment *North America*
  - Public Network Services *North America*
- Public Network Equipment & Services *Europe*
  - Public Network Equipment *Europe*
  - Public Network Services *Europe*

Personal
- Cellular Telephony *Worldwide*
- Personal Communications *North America*
- Personal Communications *Europe*
  - Infrastructure and Services *Europe*
  - Terminals *Europe*
- Personal Communications Distribution *Europe*

Cross-Technology Programs

Technology Insights for:
- Financial Services
- Government Agencies
- Publishing, Media, and Consulting Firms

- IT Business Development for Financial Organizations
- IS and Purchasing Organizations
- IT Supporting Industries

Emerging IT Markets

Central and Eastern Europe
- Personal Computers
- Telecommunications

Latin America
- Personal Computers
- Printers

Asia/Pacific
- IT Market Insight *Asia/Pacific*
- Personal Computers *Asia/Pacific* & Quarterly Statistics
- Printers *Asia/Pacific* & Quarterly Statistics
- Professional Service Trends *Asia/Pacific*
- Country-level reports on Asia/Pacific IT markets

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DATAQUEST 1996 CONFERENCES

Dataquest sponsors an on-going series of conferences and invitational events focusing on trends and issues in information technology and IT services. These conferences are the preeminent source of insight and analysis of global IT market dynamics.

North America	January 24	Capitalizing on the Wireless Phenomenon	San Jose, California
	January 30	Dataquest Predicts	Boston, Massachusetts
	February 20	Dataquest Predicts	San Jose, California
	March 7	Channel Trends Conference	San Jose, California
	April 1-2	ServiceTrends Conference	Orlando, Florida
	April 1 *	Mining the Internet	Boston, Massachusetts
	May 6-7	Personal Computer Conference	San Jose, California
	May 13-14	Copier Conference	Boston, Massachusetts
	June 26-27	Storage Track Conference	Monterey, California
	July 1 *	SEMICON/West	San Francisco, California
	September 25-26 *	Multimedia	San Jose, California
	October 24-25	Semiconductors '96	Palm Desert, California
	December 1 *	Mining the Internet	San Jose, California
Europe	January 24	Computer Storage	Munich, Germany
	May 22-23	Semiconductors '96	Frankfurt, Germany
	September 10	Computer Storage	London, England
Japan	May 13-14	Semiconductors '96	Tokyo, Japan
	September 10-12	Computers and Peripherals	Tokyo, Japan
	December 6	Telecommunications	Tokyo, Japan
Dataquest Invitational Computer Conferences	December 1 *	Asia/Pacific Series	Tokyo, Japan
	December 1 *	Asia/Pacific Series	Seoul, Korea
	December 1 *	Asia/Pacific Series	Beijing, PRC
	December 1 *	Asia/Pacific Series	Shanghai, PRC
	December 1 *	Asia/Pacific Series	Xi'an, PRC
	December 1 *	Asia/Pacific Series	Guangzhou, PRC
	March 5	Dataquest Storage Solutions Series - USA	San Jose, California
	April 10	Dataquest Storage Solutions Series - USA	Irvine, California
	April 24	Dataquest Storage Solutions Series - USA	Nashua, New Hampshire
	September 24	Dataquest Storage Solutions Series - USA	Newton, Massachusetts
	April 1	Mediterranean Series	Dubai, UAE
	May 21	Mediterranean Series	Athens, Greece
	October 30	Mediterranean Series	Tel Aviv, Israel
	November 6	Mediterranean Series	Istanbul, Turkey

** Date tentative/may change*

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DATAQUEST 1996 CONFERENCES

Dataquest Invitational Computer Conferences *(continued)*

January 17	Dataquest Storage Solutions Series-Europe	Paris, France
January 23	Dataquest Storage Solutions Series-Europe	Munich, Germany
January 30	Dataquest Storage Solutions Series-Europe	Milan, Italy
February 1	Dataquest Storage Solutions Series-Europe	Rome, Italy
June 10	Dataquest Storage Solutions Series-Europe	Budapest, Hungary
June 12	Dataquest Storage Solutions Series-Europe	Prague, Czech Republic
June 21	Dataquest Storage Solutions Series-Europe	St. Petersburg, Russia
June 25	Dataquest Storage Solutions Series-Europe	Moscow, Russia
July 1	Dataquest Storage Solutions Series-Europe	Warsaw, Poland
September 1	Dataquest Storage Solutions Series-Europe	Amsterdam, Holland
September 5	Dataquest Storage Solutions Series-Europe	Stockholm, Sweden
September 11	Dataquest Storage Solutions Series-Europe	London, England
September 19	Dataquest Storage Solutions Series-Europe	Frankfurt, Germany
October 1 *	Latin America Series	Caracas, Venezuela
October 1 *	Latin America Series	Mexico City, Mexico
October 1 *	Latin America Series	São Paulo, Brazil
October 1 *	Latin America Series	Buenos Aires, Argentina
October 1 *	Latin America Series	Santiago, Chile
October 1 *	Latin America Series	Bogotà, Columbia
October 1 *	Latin America Series	Lima, Peru
February 19	South Africa Series	Capetown, South Africa
February 22	South Africa Series	Johannesburg, South Africa
April 11	LINK Series - North America	Orlando, Florida
April 30	LINK Series - North America	Austin, Texas
May 1	LINK Series - North America	Philadelphia, Pennsylvania
May 9	LINK Series - North America	Charlotte, North Carolina
May 14	LINK Series - North America	Denver, Colorado
May 21	LINK Series - North America	Portland, Oregon
November 1 *	LINK Series - North America	Montréal, Québec
November 1 *	LINK Series - North America	Ottawa, Ontario
November 1 *	LINK Series - North America	Calgary, Alberta
November 1 *	LINK Series - North America	Vancouver, BC
November 1 *	LINK Series - North America	Toronto, Ontario

**Date tentative/may change*

Want more information about Dataquest?

Place your request by calling our Fax-on-Demand system at 1-800-328-2954

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Dataquest provides a separate binder called *Electronic News* to help you organize your printouts of the electronic newsletters and Dataquest Alerts that will be sent to you by your Dataquest North America research programs throughout the year.

Although not all clients will print out electronic news bulletins or file faxes, the *Electronic News* binder is available by request for those who do.

To order your *Electronic News* binder, just fill out the form below and fax it back to us. We will mail your binder to you immediately.

Note: If you subscribe to more than one Dataquest North America research program, then indicate how many binders you need in the space provided below (plan on one binder per research program), and we'll send them to you in one shipment.

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