

CAD/CAM/CAE

Mechanical Applications

Source:
Dataquest

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CAD/CAM/CAE

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CAD/CAM/CAE

Mechanical Applications

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CCAM-MEC-DP-9201

December 7, 1992

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Opportunities and Obstacles for CAD/CAM/CAE Vendors and Users

Dataquest surveyed vendors and users in the CAD/CAM/CAE marketplace. In this article, we present the most salient findings and analyze the impact of these findings on the market.

By Michael J. Seely

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End-User Analysis

Opportunities and Obstacles for CAD/CAM/CAE Vendors and Users

In August and September, Dataquest conducted a telephone survey of U.S. CAD/CAM/CAE end users to characterize the market penetration by site size, job description, and department to better understand the dynamics of the user environment. This article highlights some of the study's findings, focusing on the impact of the current economic conditions and identifying the best opportunities for CAD/CAM/CAE vendors and users. For more detailed analysis and findings see Dataquest's report *CAD/CAM/CAE Mechanical Applications: User Wants and Needs*, (CCAM-MEC-UW-9201) October 26, 1992.

Dataquest expects the worldwide market for mechanical CAD/CAM/CAE software revenue to be \$2.1 billion for 1992 and to grow at a 5 percent compound annual growth rate (CAGR) in the next five years. The market is fueled by a growing perception that this technology is indispensable in a design and manufacturing environment, independent of industry or location. CAD/CAM/CAE tools have moved out of the hands of the experts and are being used by people with many different job descriptions for hundreds of applications.

Software functionality is steadily improving, with a focus on ease of use and enhanced ability to deal with complex designs and optimization. Economics are forcing the issue: New systems replace older ones because of significant improvements in hardware price/performance. Maintenance costs on some old systems are more than the cost to purchase new systems. In any case, the result is an evolutionary growth with little increase in mechanical CAD/CAM/CAE budgets.

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CAD/CAM/CAE—Mechanical Applications

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An immense diversity of tasks falls under the mechanical CAD/CAM/CAE umbrella. All major subapplications were explored in this survey to better understand the work profile and market penetration in each category. Mechanical CAD/CAM/CAE applications were measured in context with support functions and other computer-related tasks. A view of the total work environment of the typical mechanical CAD/CAM/CAE user was also developed.

Survey Results

Employment History and Forecast, by Industry

Only the aerospace, automotive, and industrial machinery industries had more than 30 respondents—the number necessary for statistical significance in this survey. The other industries can be evaluated with lower confidence.

Aerospace

Total employment in the aerospace industry dropped by more than a 16 percent CAGR from 1990 to 1992 and is expected to have a negative 7.6 percent CAGR from 1992 to 1994. The pool of technical professionals receded in the last two years, but a significant 16 percent growth is expected in the next two years. The number of CAD/CAM/CAE users has held relatively steady. More than 55 percent of these users are working full-time on a system.

Automotive

Automotive employment in the past two years grew in all areas except the number of technical professionals, which had a modest 2 percent drop. CAD/CAM/CAE users grew a significant 10 percent in the last two years and are forecast to grow 7.6 percent in the next two. More than 64 percent of these users are working full-time.

Industrial Machinery

The survey showed flat to downward growth in industrial machinery employment, with the exception of CAD/CAM/CAE users, where a whopping 24 percent CAGR took place and another 21 percent is expected.

Overall

The survey population saw a 9 percent drop in total employment, a 1.7 percent drop in technical professionals, and a 3.6 percent growth in CAD/CAM/CAE users from 1990

to 1992. Continued reduction in total employment is expected, but more technical professionals and CAD/CAM/CAE users are planned.

Site Penetration

The study compared, in detail, seats installed to the number of trained users and technical professionals. The total population of technical professionals, by Dataquest's definition, sets the size of the total available market. Understanding the distribution, size, and user environment of each group will identify the best market growth opportunities for mechanical CAD/CAM/CAE tools.

As a business opportunity for mechanical CAD/CAM/CAE, one group stands above the rest. Figure 1 dramatically shows a large difference between the number of trained users and the total number of technical professionals at very large sites. This group has a large installed base of trained users and support people who can help the new users learn the effective use of mechanical CAD/CAM/CAE. Benefits to the company will be magnified by a higher percentage of users having access to this technology, with a better organization and elimination of many duplicate systems.

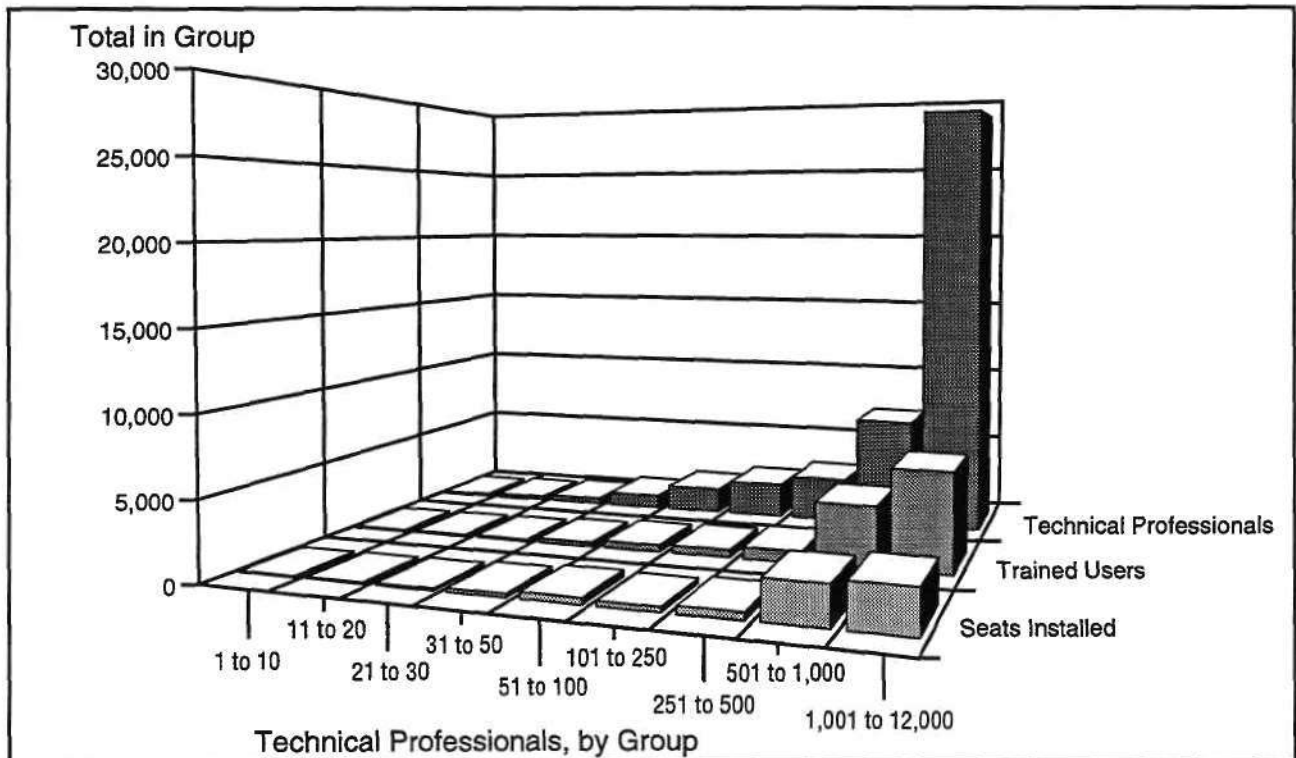
The potential benefits hold true for all sites, regardless of size; but as large sites currently have the lowest penetration levels, they have the highest potential market. The ratio of seats installed to number of technical professionals is 21 to 28 percent at sites with more than 500 technical professionals. The penetration ratio at small sites is in the range of 30 to 60 percent.

1992 Budget for Software and Hardware

Recessionary times have an impact on budgets for all but a top few items on a company's priority list. From a strategic standpoint, investment in CAD/CAM/CAE tools has been on the list for many years. This year is no exception, but the dynamics have changed.

We believe that the decision makers will look at a mix of strategies over the next few years, ranging from large purchases of 200 to 500 seats to a wait-and-see approach of buying no new seats this year. Steady improvement in price/performance of hardware will lead to

Figure 1
Market Penetration, by Site Size



Source: Dataquest (December 1992)

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the oldest systems being replaced with the newest, as economics force the issue. Maintenance costs on some old systems may justify system updates more than purchasing new systems.

In any case, the result is evolutionary growth with little increase in mechanical CAD/CAM/CAE budgets. The good news is that the 1991 budget allocation generated more than \$7.2 billion in mechanical CAD/CAM/CAE products sold worldwide.

Approximately 40 percent of the respondents see the budget situation for CAD/CAM/CAE software and hardware in 1992 unchanged from last year. A few more respondents expect higher budgets with higher growth rates than the group that expects lower budgets. This should yield a slight growth in total expenditure.

A closer look at the expectations of department managers and systems managers indicates a less optimistic view, however, and they may be in a better position to know the

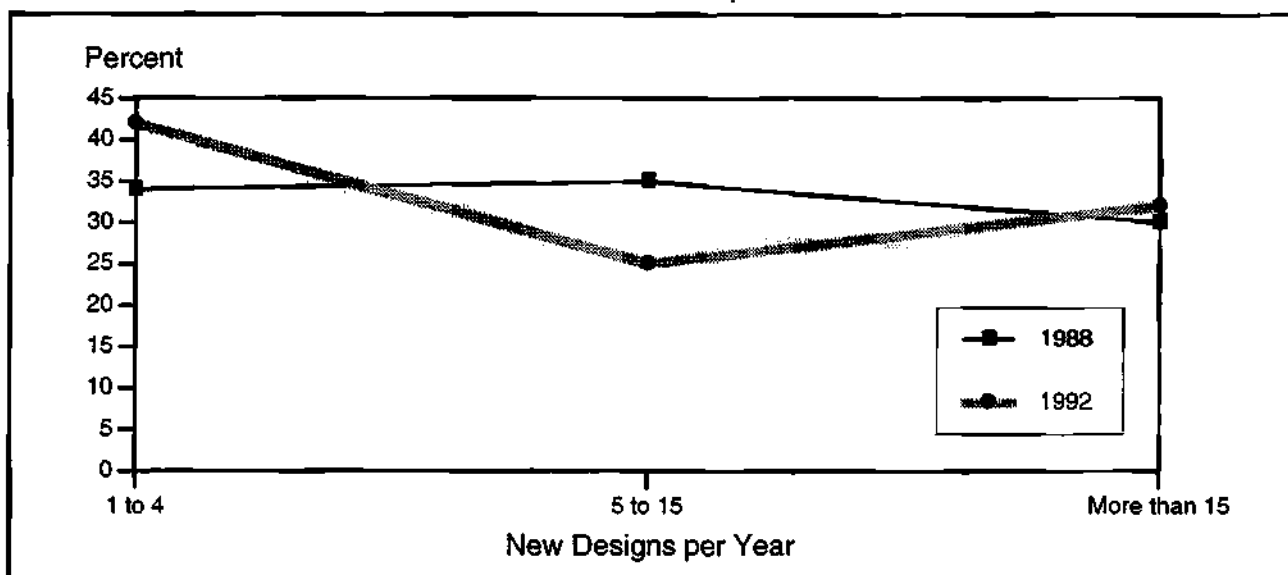
expenditure situation. The industrial machinery industry has the highest growth forecast, with 40 percent of respondents indicating higher budgets, compared with automotive and aerospace, in which about 25 percent foresee higher budgets. In fact, all the other industries indicated higher software and hardware budgets than did automotive and aerospace. R&D/New Product Development has the highest department growth expectation, with almost 50 percent of respondents anticipating growth.

New Design and Enhancement Activity

Comparing data from this survey with a 1988 Dataquest survey of a similar group of designers and engineers in the same industries shows interesting changes over time. Figure 2 shows the distribution of new product design activity in three groups: 1 to 4, 5 to 15, and more than 15 new designs per year.

A case can be made for significant improvement in CAD/CAM/CAE systems' productivity and ease of use. The overall work load

Figure 2
New Product Designs



Source: Dataquest (December 1992)

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or volume of new design work seems to be even or slightly higher in 1992. The number of people doing more than 15 new designs increased, and the group doing only 1 to 4 increased more than 7 percent. The more experienced staff is now doing more designs in the same period, and the group doing only a few designs per year represents a larger portion of the user base. This makes the ease-of-use argument.

The product enhancement and revision data support the view that CAD/CAM/CAE is improving the productivity of the average user (see Figure 3). The distribution of revision activity has definitely dropped. In 1988, each category, from a low level of revision activity to more than 150 changes per year, had about 30 percent of the users in each group. Now the lowest level—1 to 49 changes—has increased to more than 60 percent of the total.

This suggests that better designs are being produced the first time, requiring fewer revisions as the design progresses into the manufacturing and delivery process. This trend is also supported by the shortening of product life cycles. In some cases, especially in consumer products, the product could be out of production before half the product is purchased.

CAD/CAM/CAE Activity Allocation

We asked how many hours per week were spent using CAD/CAM/CAE tools and the amount of time spent on other tasks. The implication was that this number represented the full work period. The average work week is 44 hours. Systems managers exceeded that, with an average score of 47 hours. CAD/CAM/CAE tools may make the manufacturing and design process more efficient, but the systems require significant attention to keep them working properly. Industrial machinery and R&D have the highest ratings in each group. The CAD/CAM/CAE users, on average, work on the systems 24 hours per week.

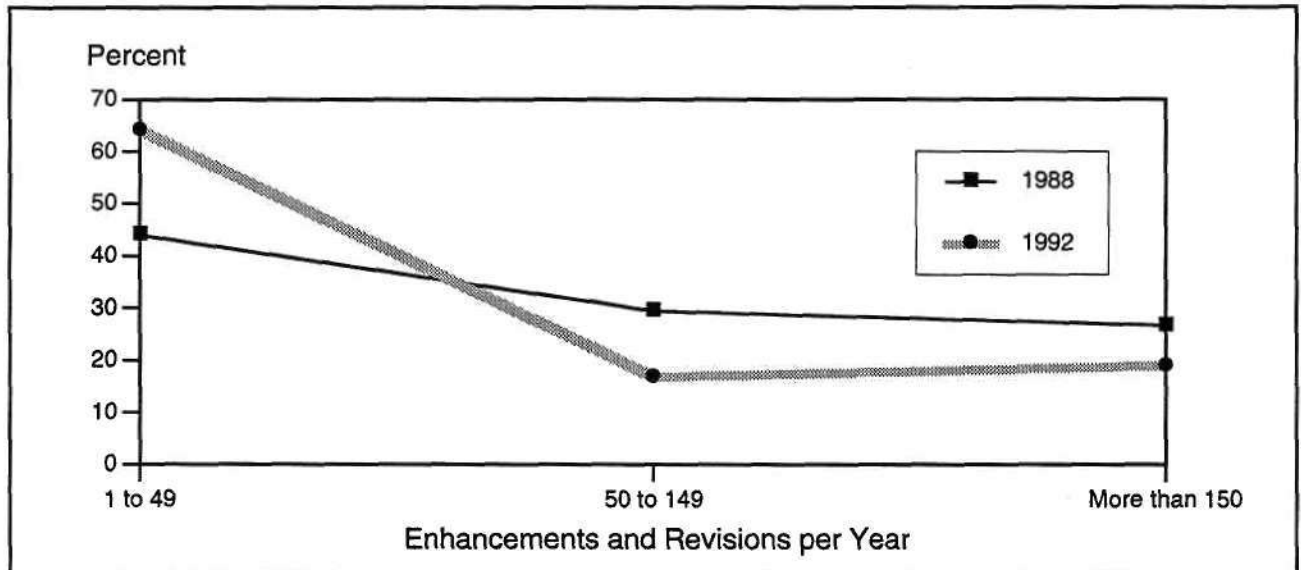
It is worth noting that almost 30 percent of all respondents said they work more than 30 hours per week on a CAD/CAM/CAE system. This group also stated that they believe that an average of 65 percent of all users at their site worked more than 30 hours per week.

The major subapplications of mechanical CAD/CAM/CAE are product detail or functional design, conceptual design, and drafting. These three subapplications make up more than 72 percent of the total work hours. The remaining subapplications cover everything from system management to resource planning.

Figure 4 shows the full list of subapplications, with distribution of total hours worked in each subapplication by the total population in

the survey. These data provide an accurate evaluation of the actual work activity on today's mechanical CAD/CAM/CAE systems.

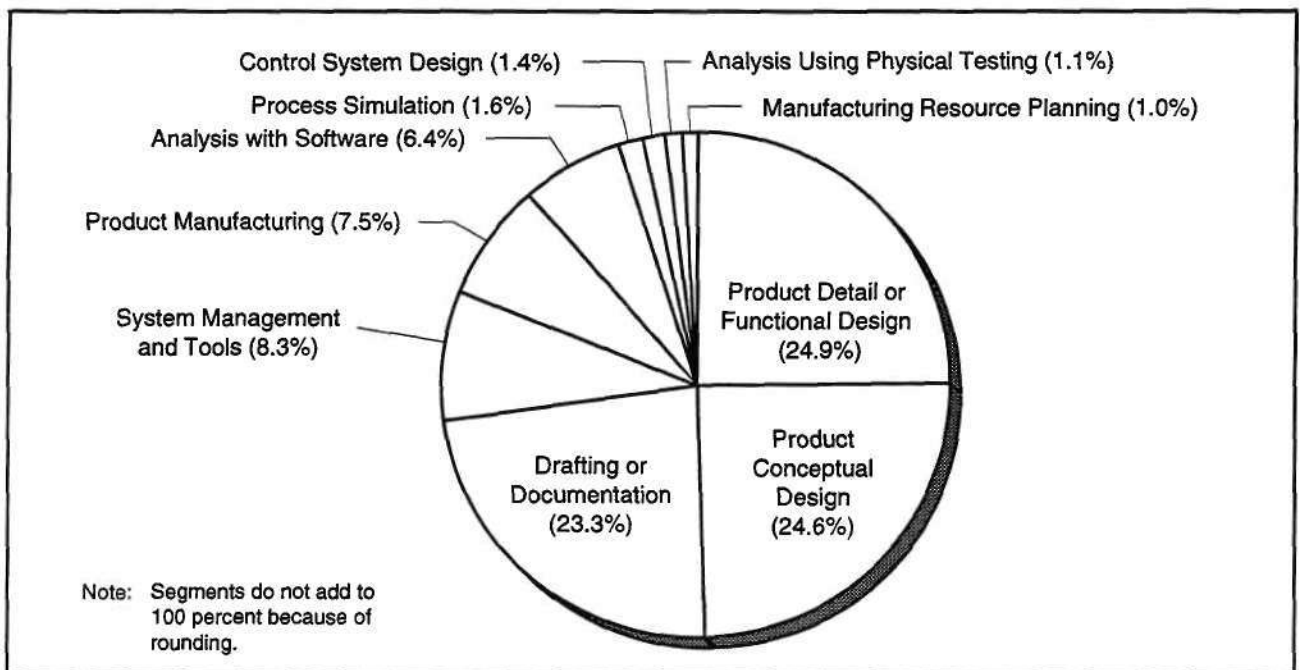
Figure 3
Product Enhancements and Revisions



Source: Dataquest (December 1992)

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Figure 4
Distribution of End-User Hours, by Application



Source: Dataquest (December 1992)

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Recommendations:

For the Vendor

Recommendations that are particularly relevant to the vendor are as follows:

- Find a way to interest the large number of technical professionals working at the larger sites in using mechanical CAD/CAM/CAE. This, by far, represents the largest untapped market for new system sales. These big sites already have more than one different system installed, which highlights the importance of the installed vendors to work together to ensure that this site is effective in its use of this technology. Anything less will open the door for competitive systems to be installed, or worse, the customer may become non-competitive.
- Do not overlook growth industries with a high probability to need CAD/CAM/CAE technology. This survey identified the industrial machinery group as an above-average growth opportunity. Other industries have strong potential as well, such as fabricated metal parts, electrical and electronic machinery, and computers and peripherals. In fact, almost every industry is doing well except the aerospace and automotive industries, considering the forecast for growth in the population of mechanical CAD/CAM/CAE users.
- Read and heed the list of suggestions for vendor improvement from users, which is contained in the larger report. Suggestions range from improving manuals to establishing a 24-hour hot line to being more responsive to customers. The users know what they need for the short term. Invest some time and effort into "what-if" scenarios to help define the products to be made 5 and 10 years from now.

For the User

Recommendations to the user are as follows:

- Develop a technology enrichment plan that systematically removes old systems from use and replaces them with the best of the best. The price competition common in this industry borders on insanity. The resulting marginal profit levels may not allow the vendors to invest in R&D, high-quality product releases, and high-quality services.

But take advantage of the situation. Buy the latest technology at bargain prices, realizing that almost any vendor in this business can fall on its sword.

- Be aggressive in using this technology. Get your experts with their hands in their pockets involved. In this case, the automation of a group effort is exponentially better than the incremental improvement of the individuals. Get all the oars in the water.
- Understand the full cost of ownership. Some vendors are clever in getting in the door with low installation fees and then charging high monthly service fees. Check a full three-year cost of ownership and support cost model. Size the tool for the job.

For the Investor

The following are recommendations to the investor:

- Find the people who understand this business and have demonstrated an ability to move with it.
- The market needs to invest more than \$10,000 for every engineer, designer, and technician annually for the foreseeable future. Expenditure is below this level and is growing, which will fuel long-term growth in the user base.
- The design, analysis, and manufacturing industry is becoming more complex, more diverse, and cross-pollinated with ideas from other technical applications. Developments in multimedia and virtual reality will have in impact on mechanical CAD/CAM/CAE. Understand what the next-generation products will look like, because they will obsolete any product more than five years old.
- Education and training are perhaps the biggest stumbling blocks to the full potential of mechanical CAD/CAM/CAE. The users need to break through the mental mush of focusing on how they get specific commands to work or how to get the plotter to run. Think about what is possible from a personal value-added scenario. Users need tools that help them do tomorrow's job better. This may sound like the better mousetrap story, but a company such as Parametric Technology, with an 80 percent annual growth rate, makes the point. Find the next Parametric.

Methodology and Respondent Profile

This survey focused on a set of respondents selected from a filtered but random population. An attempt was made as the survey progressed to steer the interviewers toward sites with the designated profile, so that the resulting population would match the desired characteristics.

The survey sample was selected from the Dataquest CAD/CAM/CAE end-user database, from contact names provided by vendors, and from company contacts identified with The Dun & Bradstreet Corporation million-dollar directory. The respondents represented a wide range of job titles from all major departments and all major manufacturing industries.

The single largest group of respondents is department managers. Following closely are the titles of system manager, project engineer, and design engineer. These people represented more than two-thirds of the respondent base (see Figure 5).

These job classifications are expected to provide good insight into use of equipment, budgets, and site penetration levels. Sufficient responses were given in each of these job title groups to allow comparison, providing further insight into

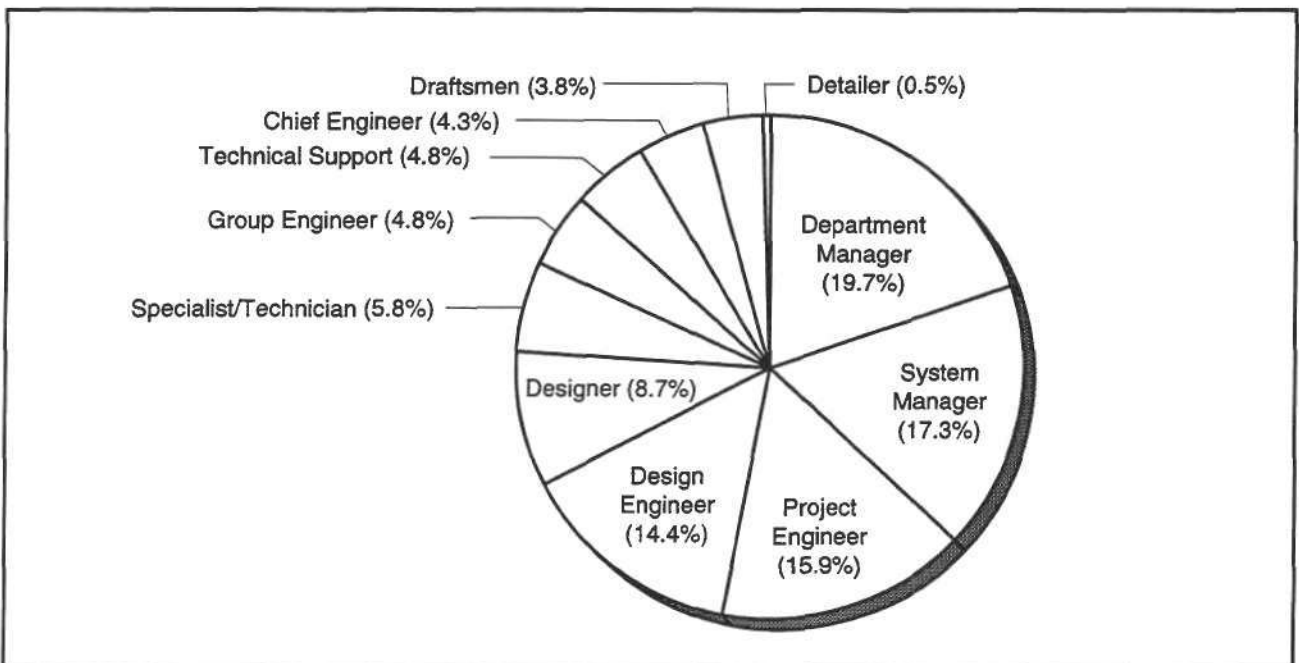
the decision-making process and work environment in mechanical CAD/CAM/CAE.

Figure 6 shows the distribution of the respondents' companies by industry. The intention of having the survey distribution match the Dataquest market model for installed base was partially successful. In general, the distribution matched. Unfortunately the total number of completed surveys was insufficient to allow statistically valid comparison among all industries. Comparison is made among the aerospace, automotive, and industrial machine industries. The education and government sectors were intentionally excluded from this survey primarily because of the interest in comparing product engineering and manufacturing engineering activities.

Dataquest Perspective

We expect to see a slight growth in total expenditure in the mechanical CAD/CAM/CAE application areas, with the largest growth anticipated in R&D and New Product Development. Large sites provide the greatest market opportunity since the percent of technical professionals that are trained users is lowest in this group.

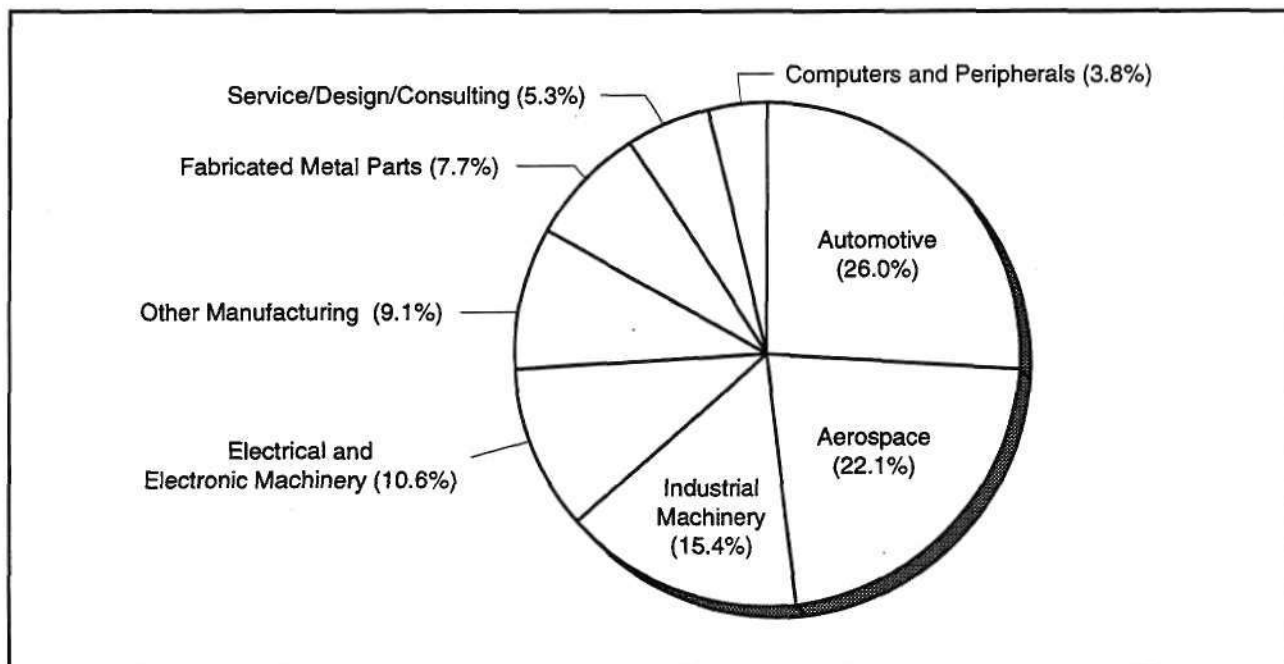
Figure 5
Respondents' Job Function



Source: Dataquest (December 1992)

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Figure 6
Respondents' Primary Business



Source: Dataquest (December 1992)

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The use of CAD/CAM/CAE systems have shown noticeable improvement in users' productivity and in ease of use. These systems are currently used predominantly for three main subapplications: functional design, conceptual design, and drafting. The use of CAD/CAM/CAE in analysis and manufacturing continues to grow less rapidly.

to users to find out what business pressures, organization changes, or application requirements will be driving system enhancement requirements. These requirements will vary by industry and will evolve with unique applications of enabling technologies such as multimedia and virtual reality.

By Michael J. Seely

To ride the crest of the wave in the mechanical CAD/CAM/CAE area, vendors should listen

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Dataquest Perspective

CAD/CAM/CAE

Mechanical Applications

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Market Analysis

Design Optimization: Opening New Frontiers in the Automation of Design

Design optimization is the next logical step in the general trend of task simulation using CAD/CAM/CAE systems. The tasks to be simulated have evolved in complexity and importance as the abilities of the tools have progressed to automate the task. Design optimization potentially meets all these needs. It is just a matter of time before all mechanical CAD/CAM/CAE systems will be required to have strong design optimization capability. Anything that makes it easier to use the system, do the job, and improve the quality of the result will be greeted with open purchase orders.

By Michael J. Seely

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End-User Survey

Product Data Management

Product data management is the single most challenging issue in CAD/CAM/CAE. A tremendous amount of CAD/CAM/CAE data is being produced at an exponential rate. Every piece of data must be tracked and stored in a safe place for rapid update. The implementation of a well-functioning solution for most users is critical. The effective design of these environments will determine the ability of these users to be competitive in their businesses.

By Michael J. Seely

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Market Analysis

Design Optimization: Opening New Frontiers in the Automation of Design

Design optimization is the next logical step in the general trend of task simulation using CAD/CAM/CAE systems. The tasks to be simulated have evolved in complexity and importance as the abilities of the tools to automate them have progressed. The early 1980s witnessed the full automation of drafting and documentation tasks. Most would agree that the vast majority of user expectations have been met in automating drafting tasks. Other tasks in analysis and manufacturing applications have progressed during the same period with dramatic improvement in price/performance primarily because of the amazing changes in computing hardware.

This dramatic change in computing performance has facilitated yet another step in the design environment. In the last five years, more and more attention has been given to the automation of multiple tasks with the system managing the flow of information between applications. Mechanical computer-aided engineering (MCAE) is perhaps the best example of this trend, with a modeling task being married to an analysis function, thereby increasing the value of both applications because of the quick turnaround in modifying the design and re-evaluating the result to determine if further design modification is necessary.

Design optimization is the next step in this process. Now, the computer has the necessary computing resources and software designers possess the know-how to integrate the processes that allow the computer to execute and manage the iterative design process. Automatic mesh construction, error-checking, and problem definition have been stumbling blocks in the implementation of design optimization. These problems currently are not fully solved for all design problems. However, this concept has been proven effective and, perhaps more importantly, users' expectations are being reset to the point where they will demand access to this type of simulation process.

The addition of parametric input for the user is a recent development that has greatly improved the usability of systems. This relatively simple

concept of allowing the user to drive dimensions and the corresponding geometry from interactive modification, formula, or table dimensions is a significant productivity improvement for the CAD/CAM user. Because the ratio of new design activity to revision is roughly 10:1, the value of a fast geometry modification process is readily obvious. However, parametric input is not design optimization. Using parametrics can facilitate the process, but the optimization activity actually takes place in the designer's mind. The designer makes every decision, albeit much faster than in the past.

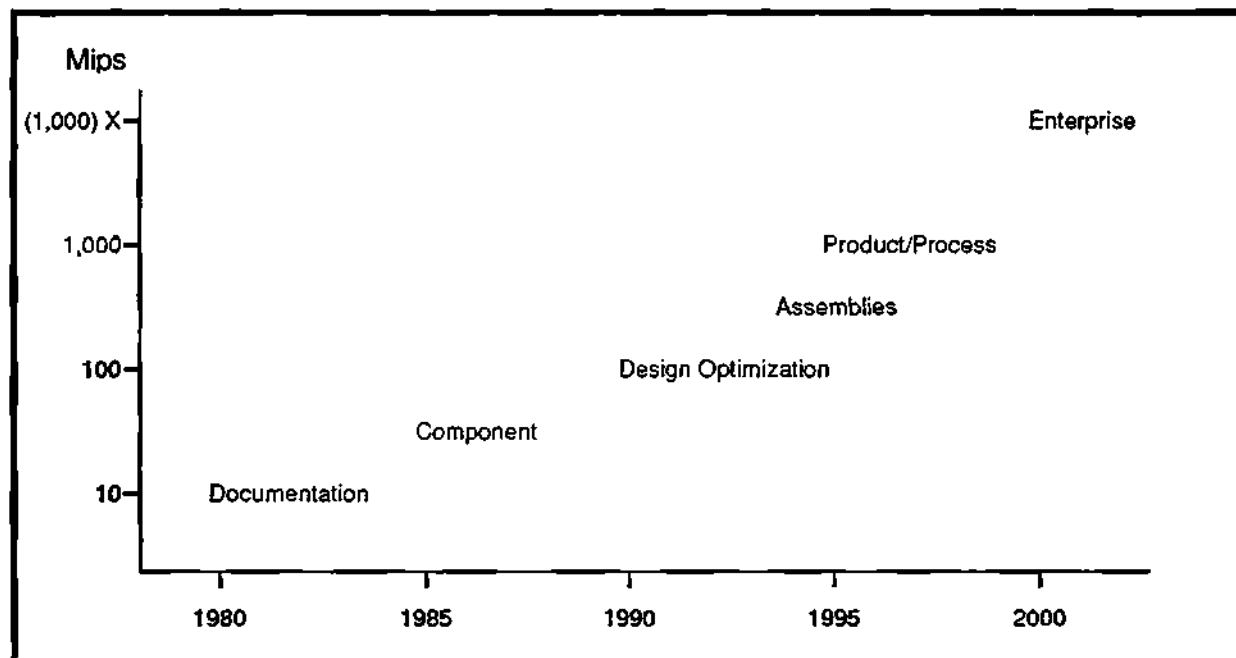
An Evolution in Mechanical Design

Over the next five years, designers will see a fast evolution on two fronts that will forever change the nature of mechanical design. The true nature of design optimization will emerge: designers will spend the majority of their time setting up a variety of problems or design scenarios for the computer to optimize. The second element of this change is a result of systematic effort on the part of software developers to add optimization functionality to almost every vertical market application. The net result will be an easier-to-use system where the designer will have to the ability to create what-if scenarios with almost real-time feedback of the results. The exponential increase in computing performance will support this process and the parallel development in user interfaces, databases, and communication. Any potential excess capacity will be matched with simulation and optimization tasks that have more components, more detail in the design and, perhaps more importantly, that will automate the flow of information between work groups.

Linking product development with manufacturing engineering for tool and fixture design is a good example. Eventually, the whole enterprise would be linked in an as-built model. In such a scenario, any proposed change in product design form, material, or tolerance can be evaluated against the manufacturing process. Any proposal changes in manufacturing process can also be evaluated for impact on cost, time for delivery, or quality. In order to support business simulation on this level, multiple 1,000-million-instructions-per-second (mips) and 100-million-floating-point-operations-per-second (mflops) workstations will be required. Luckily, many of the major computer manufacturers are looking into the feasibility of producing such machines within the next three to five years (see Figure 1).

Figure 1

Evolution of Simulation Tasks in the Design and Manufacturing Process



Source: Dataquest (December 1991)

The enterprisewide simulation process can be described from many viewpoints. Sometimes the discussion sounds like a series of disjointed technologies or competing organizational structures, but the resulting goal remains the same: Shorten time to market, design and build it right the first time, and meet the customers' needs better than the competition.

Leading Design Optimization Product Strategies

Leading vendors in the mechanical CAD/CAM/CAE market have adopted various strategies in meeting this growing awareness for design optimization tools. Some vendors have focused on a key part of the solution by developing unique products and forming alliances in order to be successful. Others are selling integrated solutions for one or more vertical markets.

The following is a brief overview of product positioning statements from several industry leaders. These companies represent a range of solutions with different product goals and business models and the public statements represent the current status of the existing products offered. As the market matures and each product offering evolves toward nirvana, the optimum design optimization solution will evolve. Each vendor certainly has a strategic plan in

place for successfully supplying these tools at some point. The intention of this analysis is not to describe the future, but to define the reality of today's solution set.

Comments from Vendors

Adra Systems Inc.

As CAD/CAM systems have developed, Adra Systems has recognized a need for tools to optimize component design. In many cases, design engineers like to develop design models that contain all the variables of the design problem. In order to achieve a benefit over the conventional methods for determining design alternatives, the design model must have enough intelligence to take into account the impact of changes to design parameters and physical dimensions.

Adra has a tool called FlexDesign that combines parametric, variational, and dimension-driven functionality into one product. With FlexDesign, users can generate what-if scenarios to optimize the design. Dimensions and geometry are linked so that users can update the geometry by picking a dimension and entering a new value. Users can also use equations to ensure that, if one dimension changes, associated dimensions will be updated.

Frequently, designers like to vary the set of design parameters to determine the physical impact to the design. With FlexDesign, equations can be linked to a macro program that will generate a new set of design parameters based upon user action.

FlexDesign uses standard mechanical engineering conventions to implicitly define constraints and shield the user from having to define all the relationships of the design geometry. FlexDesign does not require that all of the geometry be dimensioned in order to develop the various design alternatives. Thus, with very little user input, a design engineer can then optimize the design by trying various alternatives and approaches with minimal effort and rework.

Anything that makes the system easier to use, easier to get the job done, and improves the quality of the result will be greeted with open purchase orders.

A manufacturing engineer employs FlexDesign's tolerance recognition capability to easily modify the part geometry within the tolerance band defined on the blueprint. This modified part description is then used for in-process drawings and with CADRANC to create efficient part programs for any numerically controlled machine tool.

CADRA-III FlexDesign provides the type of system intelligence that is a valuable component for design optimization. Adra Systems is dedicated to providing productivity tools for design and manufacturing automation. Adra is focused on two areas of the design and manufacturing processes: production design/drafting and flexible numerical control part programming. These key components are ideally suited for the pursuit of intelligent CAD/CAM systems and the achievement of design optimization.

Alias Research Inc.

Alias Research is committed to the full automation of the conceptual design task. Alias software, Alias Studio and Alias Designer, optimizes the design task by providing sophisticated tools for the industrial designer. These tools support the iterative design process by facilitating communication among those involved in the design process. They provide interactive, easy-to-use tools that stimulate design option development

and bypass data to and from engineering systems.

Alias products facilitate communication among members of the design team by offering a 3-D development environment for a traditionally 2-D process. Designers can see every detail of the conceptual design on-screen, through plots, color prints, numerical control (NC) milled models, and stereolithography models. Alias shows even minor changes in shape or color instantly so that the designer can pursue a multitude of what-if scenarios. These models are so accurate and realistic that they can even be used to present designs to prospective consumers in consumer research. The Alias 3-D data can be moved to and from many engineering systems through standard file formats or specific translators.

Alias design tools automatically create curvature plots pinpointing the areas of the surface that may need fine-tuning. Possible problem areas can be identified quickly and accurately. Highlights can also be automatically simulated with a highlight evaluation tool allowing the designers to see surface reflections long before the prototyping stage. Design dimensions can be automatically determined with special tools incorporated into the Alias software.

Alias also optimizes the design process by providing productivity tools proven to help the designer create more designs faster. The designer's work flow is seriously considered in software development, with designers on-staff developing tools to make conceptual design a fast yet flexible process.

Autodesk Inc.

Design optimization has always been part of the engineering process. The creation of ideas and their subsequent analysis is the iterative process that serves to validate engineering options. What is changing are the tools used for the evaluation. New application software programs that have enabled engineers to rely more on software rather than physical prototypes have done much to speed up the design verification loop. Not only is the design cycle shortened but, equally important, a larger number of iterations are possible within any given time deadline.

Just as design alternatives are optimized by increasing choice, so are the tools used to validate them. With engineering disciplines fragmenting into ever-increasing numbers of highly

specialized areas, it is difficult for any one software vendor to supply a design optimization system tailored for everyone's specialized needs. Because of this diversity, it is important that the design and analysis applications used for optimization deliver a wide variety of software tools and function in an environment that allows for easy communication.

Autodesk's position in the CAD market has always been focused on delivering a design foundation that can serve as an "information bus." AutoCAD provides an open and flexible system running on a wide variety of hardware platforms that encourages application development. This approach has been very successful in giving engineers a great deal of choice in selecting solutions that make sense for them without having to worry about issues of compatibility or integration. For example, the AutoCAD Development System (ADS) allows application developers to run their programs seamlessly within AutoCAD, providing the customer with advantages in ease of use and data integrity. This cooperative atmosphere allows Autodesk application developers such as SDRG, MSC, and Rasna to complement AutoCAD and deliver design optimization solutions.

With key technology advancements such as ACIS well under way, AutoCAD will continue to serve not as the application but rather as the underlying database for design optimization.

Computervision

In fulfilling its objective to help customers bring higher-quality products to market more quickly, Computervision offers a set of interoperable tools for use across the entire design process, from conceptual engineering and analysis through modeling, drafting, and manufacturing engineering. These software tools share a common database that enables users to easily pass design data among different departments without time-consuming and inaccurate data conversions.

Computervision core software design capabilities include easy-to-use, dimension-driven, parametric, feature-based modeling tools. Built on top of these core capabilities are a host of specific applications. To provide engineering analysis capability, for example, Computervision has integrated a family of interactive analysis tools such as StressLab for finite element modeling, ThermoLab for heat transfer analysis, and Physical Properties for geometric and mass properties analysis.

In addition to Computervision's own tools, the architecture is open to third-party developers that wish to integrate their own specialized applications, such as knowledge-based engineering tools or quality-control tools, into Computervision's core functionality.

Electronic Data Systems (EDS)/Unigraphics

EDS/Unigraphics understands the importance of design optimization and has taken steps to see it realized as part of an integrated CAD/CAE/CAM product. Key to this effort will be its work with parametric and variational solid modeling, automatic solid meshing, and embedded finite element analysis (FEA) solvers. The company also is exploring the use of Boundary Integral Method for predicting design response without the need for meshed models. This effort will be accomplished through a combination of internally funded projects as well as through work on joint developments with the company's strategic technology partners and major customers, who now require a more participative relationship with their system suppliers than in the past. Only when the customer, the technology experts, and the system integrator work together will these new products emerge from the lab and become commonplace.

Design Power Inc.

Design++ is a knowledge-based engineering (KBE) tool that operates from within favorite CAD systems and allows users to automate the concurrent engineering process. It is a general-purpose, object-based geometry and rule encapsulation tool with the ability to define mathematical, logical, functional, and geometric relationship rules between its objects. It allows for the definition in libraries of parametric "standard parts" and intelligent parts, including geometry, instantiation, and association rules as sets of classes and subclasses. These parts may then be assembled into a "product" via definition of a bill of materials, like a hierarchy tree. Upon execution of the resulting parts libraries and rule bases, and the entry of instance-specific data by the user, the system is capable of coordinating all rule interdependencies and producing a preliminary or final design (either schematic- or physical-model based) including selection of parts from standard catalogs and production drawings via interaction with the CAD system.

Design++ supports design optimization by allowing the user to produce multiple variations of a design through a what-if process. As a

result, current users are able to optimize designs through design requirements that iterate based on designing a product that is manufacturable at the lowest cost, or the lowest cost with the best materials. This excellence in design can be accomplished because the technology has the ability to incorporate knowledge from different disciplines (such as manufacturing, standards, costing, engineering quality, materials, and inspection requirements) all at design time.

ICAD Inc.

Knowledge-based engineering is becoming one of the leading technologies for design optimization, helping shorten product development cycles for semicustom designs, tooling, and one-of-a-kind designs for large or complex assemblies. With a KBE system like The ICAD System, engineers can automate the design and engineering process by capturing company expertise in the form of rules. These can be design rules, rules that define optimization strategies, standard engineering rules, or rules about physical product attributes as well as manufacturing process information. This collection of rules is called a Smart Model (a term that ICAD has trademarked) or product model.

The model takes input specifications, applies the relevant rules, and automatically generates a product design. Because a KBE system automates most of the repetitive work, engineers have more time to study alternatives before committing costly design and manufacturing resources. In addition, a KBE system can integrate information from external database or analysis programs to create a single system so that the user can optimize the design, taking into account all the relevant information as it changes. By creating a rule base containing geometric and nongeometric information, a company can build a Smart Model of an extremely complex design process and then use that model over and over again to optimize the design.

ICAD is the leading worldwide provider of knowledge-based engineering systems. Its goal is to dramatically increase customer competitiveness by automating strategic engineering applications. To protect a company's existing investments, The ICAD System works with current automation tools such as CAD systems from leading vendors and engineering analysis software. More and more companies are realizing the benefits of adding KBE to their arsenal of tools for design optimization.

Intergraph Corporation

To close the loop between design and analysis, Intergraph has developed the Geometric Element Modeling System, I/RASNA. An innovative new tool for design engineers, I/RASNA seamlessly integrates the parametric and variational design capabilities of Intergraph's Engineering Modeling System (I/EMS) with sensitivity analysis and design optimization technologies from Rasna Corporation. The result is a system that quickly evaluates many design variables and determines the best solution for specific design objectives.

I/RASNA helps designers evaluate multiple design variations and determine the best design. I/RASNA provides accurate, designer-oriented analysis capabilities that do not require an in-depth knowledge of structural analysis techniques. For structural optimization, I/RASNA determines the optimal values of multiple design variables to achieve a specified design objective. The software directly applies the results to automatically produce a *precise geometric model* of the optimized design.

MacNeal Schwendler Corporation (MSC)

MSC/NASTRAN is the leading finite element analysis program used by engineers and designers around the world to analyze the stress, vibration, and heat transfer characteristics of structures and mechanical components. The structural optimization capability of MSC/NASTRAN automatically modifies the structural design and the associated analysis model to satisfy criteria prescribed by the user. This is distinctly different from ordinary structural analysis capabilities in which structural responses are calculated for a given and fixed analysis model. In structural optimization, the design parameters and the associated analysis model parameters are actively modified to make the structural responses assume desirable values or fall within a defined range. These structural responses are computed by the analysis capabilities. Therefore, the quality of the design obtained by applying the optimization capability depends on the quality of the information generated by analyses. Accordingly, high-quality analysis models and accurate analysis capabilities are essential ingredients for obtaining a superior design by means of automated redesign.

The most significant feature of MSC/NASTRAN's structural optimization capabilities is its versatility in handling a variety of problems of different types, complexities, and sizes. MSC/NASTRAN can simultaneously perform sizing

optimization of the design model with respect to responses from static analysis, eigen value analysis, and buckling analysis. The design can be optimized on any of a broad selection of design characteristics, including weight, volume, displacement, stress, strain, internal force, natural frequency, buckling load factor, composite lamina stress, composite lamina strain, composite failure index, or an explicit analytic function combining these characteristics and the design parameters. Design sensitivity calculations can be performed on static, normal modes, buckling, frequency response, and transient response with respect to sizing or shape variables. MSC/NASTRAN's capability for the user to define target responses as a combination of design characteristics and model parameters is a very powerful feature in the design of real-life, complex structures.

Parametric Technology Corporation

Parametric Technology supports the goal of design optimization in two key ways—through its core product architecture and through its rapidly expanding network of strategic third-party relationships.

The company's Pro/ENGINEER software is the *only* mechanical design automation tool that integrates the entire design-through-manufacturing process.

Pro/ENGINEER is a feature-based system, meaning that models are created as combinations of design-specific features such as ribs, slots, chamfers, and shells. This approach to model building is natural and intuitive to the engineer and eliminates the need to design with complex geometry.

The parametric nature of the system assigns symbols to model dimensions rather than to fixed values. This allows engineers to relate model dimensions and features to each other. With the simple change of any parameter, all related features update. This capability facilitates change and encourages design optimization.

In addition, Pro/ENGINEER is built on a single, underlying database and not many proprietary databases as is the case with traditional, older-generation CAD/CAM systems. One database means one source of information for all engineering disciplines. This allows individuals from different departments to work concurrently, all from one product model or definition.

With Pro/ENGINEER, as changes are made in one discipline, all related areas are updated

automatically. Full associativity throughout the entire design-through manufacturing process allows engineers to reconfigure product designs on the fly without incurring time and cost penalties in downstream applications such as manufacturing. This also promotes design optimization and makes it possible for companies to bring their products to market faster and more cost-effectively.

To permit customers to leverage existing technology investments as well as further automate the design process, Parametric Technology has developed strategic relationships with many of the premier suppliers of complementary engineering applications. These relationships have resulted in seamless interfaces between Pro/ENGINEER and the leading analysis, visualization, prototyping, electronic design, and other key engineering applications. These links permit Pro/ENGINEER users to integrate complementary technologies into their design process through the familiar, easy-to-use Pro/ENGINEER environment.

As it relates specifically to design optimization, Parametric Technology offers direct interfaces between Pro/ENGINEER and the leading technologies for finite element analysis, motion analysis, dynamic analysis, and kinematic analysis. These interfaces allow engineers to perform design optimization and verification early in the design cycle, resulting in better-designed products at a lower cost.

Parametric Technology's strategic relationships in this area include Computer Aided Design Software Inc. (CADSI), Engineering Mechanics Research Corporation, MacNeal Schwendler, Marc Analysis Research Corporation, Modern Computer Aided Engineering, PDA Engineering, Rasna Corporation, Structural Research and Analysis Corporation, and Swanson Analysis Systems Inc.

PDA Engineering

Design optimization includes not only geometric and performance considerations, but factors such as material selection, manufacturing considerations, and field service issues. While focusing on the CAE aspects of design, PDA is addressing design optimization from a number of perspectives: through expanded technology offerings, through partnering relationships to address integration, and through open system architecture to facilitate implementation.

PDA's offerings that play a specific role in the design process include a variety of products. For material selection, the M/VISION material information management system and material databases provide the only true access to material information for design, analysis, and test. This system provides an electronic means for studying and selecting materials that fit the designer's requirements and then providing consistent and reliable information for the rest of the design process.

In the analysis arena, P/FEA will compute design sensitivity information important in determining the influences various parameters play relative to performance optimization. With the PDA Trimmed Element Analysis Method (TEAM), there is the potential of directly coupling shape optimization to the original design geometry because the TEAM "elements" are the CAD geometry as represented in their original forms.

PDA offers analysis products for thermal and computational fluids as well. In the area of fatigue evaluation, the cooperative relationship between n-Code and PDA to produce the P/FATIGUE product allows fatigue prediction capabilities and FEA to be directly coupled. Other partnerships such as those with Dassault Systemes (CATIA), Electronic Data Systems (EDS/Unigraphics), Matra Datavision (EUCLID), and Parametric Technologies (Pro/ENGINEER), help form the foundations required for integrated technologies to address the broad picture of design optimization.

We believe that it is possible to integrate many of the aspects of the design process in such a way that automated design optimization is achievable. The collective efforts of a number of technology developers and suppliers will be required. Design optimization will serve as both a motivator and as a natural fall-out of cooperative relationships currently driving the CAD/CAM/CAE industry.

Rasna Corporation

Rasna is the leading developer of shape optimization and analysis tools for mechanical engineering. These tools enable mechanical engineers and analysts to use their *existing* CAD geometry, without building traditional finite element models, to optimize the shape of their component and assembly designs. The user builds one parameterized mesh on the existing geometry. The program automatically recalculates and converges to an accurate mathematical solution and then uses the solution geometry to optimize a product's shape.

Rasna is pioneering the most recent developments in geometric element modeling, based on adaptive P-technology, as an alternative to the problems with traditional finite element modeling and analysis (FEM/FEA). This new technology makes design optimization tools easier to use and provides more accurate analysis results.

Rasna products include Applied Structures for structural optimization and analysis requirements and Applied Motion for mechanism optimization and analysis requirements. Both products include interfaces to the leading CAD packages.

Schlumberger Ltd.

Schlumberger Ltd. CAD/CAM has long recognized the end-user benefits of providing an integrated set of tools covering design-through-analysis and simulation-through manufacturing. The Bravo3 product line is used by a large base of customers to shorten their product development cycle while simultaneously lowering their end-product costs and significantly improving end-product quality. In addition to the capabilities provided directly by Bravo3, Schlumberger CAD/CAM has entered into several partnerships to help provide an even more comprehensive set of solutions.

As the smoke clears and the leaders emerge in supplying this exciting technology, design optimization will emerge as the premier buying decision factor in the mid-1990s.

A key aspect of this design-through-manufacturing cycle is "software prototyping," which lets a customer evaluate its end product by simulating its performance in the environment in which it will ultimately operate. Many characteristics of a component or an entire system can be optimized prior to committing a design to manufacturing, such as meeting strength requirements while minimizing weight.

Synthesis of spatial linkages is one of several areas of optimization in which Schlumberger CAD/CAM is investing. Linkages are found in a wide range of products, such as automobile suspension assemblies and tape-feeding mechanisms in consumer electronics products. The Bravo3 family of solutions includes BravoMOST, which is specifically targeted at these types of systems. Designers can use an integral modeling capability to create a preliminary mechanical

design of the mechanism. Then, using BravoMOST, designers can establish target objective functions and define constraints that must be met for the system to operate correctly. To complete the process, BravoMOST uses automated algorithms to perform dimensional synthesis, resulting in an optimal system.

Schlumberger CAD/CAM strongly believes that end users want capabilities to perform both component optimization as well as mechanism optimization, and that these capabilities must work as an integral part of their overall CAD/CAM capabilities. It is only through this systems approach that end users will truly be able to take the next step in mechanical design automation.

Structural Dynamics Research Corporation (SDRC)

SDRC views design optimization as an extremely important component of its current product offering and future product direction. The company realizes that manufacturers worldwide are faced with stringent requirements for superior product quality and shortened time to market. They are searching for design optimization capabilities in their CAE/CAD/CAM systems that will not only confirm whether a design is good or bad but that will also provide some insight as to how to make it better, whether for a single component or a complex assembly. The most powerful software products will provide fully integrated design and analysis tools in an easy-to-use system that will allow engineers to quickly create multiple design revisions and optimize product designs.

Design optimization has recently become more practical as an application because of the combination of available computational power and advances in algorithm development. By the mid-1980s, SDRC began providing analysis tools that could affect design decisions. In 1986, with I-DEAS level IV, it implemented a sizing optimization capability that helps the engineer achieve a minimum weight design given stress, deflection, and natural frequency constraints. The initial structure is then changed, or improved, through finite physical properties. Use of second-order sensitivities and integration with the finite element solver allow significant insight and optimization of the design within three or four iterations.

Ultimately, full design optimization will be achieved when all analysis results can be directly integrated and automatically reflected in

the solid model geometry. The increased use of variational design technology will provide the future ability to control dimensional changes to the solid model. In addition, it will be critical that the optimized design geometry become the core technology to be used for further downstream applications in manufacturing.

Swanson Analysis

Design optimization capabilities have existed in the company's ANSYS program since 1984. During that time, engineers have used ANSYS for optimization problems as diverse as minimizing the weight of a solenoid (a magnetic analysis where a specific force level was required) to minimizing the change in equivalent stress throughout a clutch disk.

ANSYS design optimization is a computer technique that generates a series of designs in order to obtain an improved design; complete shape optimization is included. The engineer defines the criteria and bounds of the design and sets up the model parametrically. The optimization routine controls and executes the design cycle, supplying new values for the parameters to be used in each trial design. ANSYS design optimization permits virtually any aspect of a design to be optimized—such as shape, stress, natural frequencies, temperature, magnetic potential, or discrete quantities—not just cost or weight. In the solenoid example, the optimized reduced solenoid dimensions; the lower volume resulted in reduced weight. In the clutch example, the optimized changed the shape of various cutouts to obtain more uniform stress levels. Any analysis or combination of analyses can be used.

Most ANSYS design optimization problems have been solved by defining the solid model in the ANSYS program using parameters. Engineers also want to be able to optimize geometries created in CAD systems. Swanson Analysis is working with many CAD vendors to accurately transfer geometry in such a way that the full range of optimization problems can be solved.

Wisdom Systems Inc.

Optimization of product designs in enterprise-wide simulation has been the focus of Wisdom Systems since its inception. The technical obstacles to achieving this objective were the first to be torn down. The perceived risk of embarking on and persevering in a comprehensive development program, and organizational resistance to change, have been much more formidable obstacles.

Wisdom Systems develops and markets a knowledge-based engineering system called the Concept Modeller, an object-oriented design system shell that permits the capture and interaction of geometric and nongeometric knowledge. Its ability to accommodate a large number of assemblies and parts in a dynamic hierarchical structure makes the Concept Modeller an ideal environment for building intelligent design systems. The Concept Modeller's support for multiple views of every part and assembly in a product model and its support for interaction among models facilitates enterprisewide optimization.

The Concept Modeller is an open system, permitting the integration of existing programs, data repositories, and proven methodologies into a product knowledge base. The ability to reuse the results of previous automation efforts and integrate industry-standard programs has significantly reduced development spans.

Concept Modeller applications are extensible. The development and delivery of incremental design systems track a clear migration path from existing design methodologies and processes to complete integration. This incremental approach to automation provides management the periodic reassurance through measurable return on investment and ensures acceptance by involving end users early in the development cycle.

Dataquest Perspective

The ability of users to assimilate new technology and adopt it into a baseline expectation in system use can be demonstrated in the rapid growth of parametric input. Anything that makes the system easier to use, easier to get the job done, and improves the quality of the result will be greeted with open purchase orders.

It is easy to discern from the preceding discussion that there is a wide range of proposed solutions or partial solutions to the design optimization problem. As the smoke clears and the leaders emerge in supplying this exciting technology, design optimization will emerge as the premier buying decision factor in the mid-1990s. It is just a matter of time before all mechanical CAD/CAM/CAE systems will be required to have strong design optimization capability. ■

By Michael J. Seely

End-User Survey

Product Data Management

Product data management is the single most challenging issue in CAD/CAM/CAE. The issues of geometry construction can be complex and the issues of interface between applications can cause inefficiencies, but no single issue touches everyone and every aspect of the engineering environment as does product data management. Every piece of data generated must be tracked and stored in a safe place for rapid update if necessary. In some government and aerospace businesses this tracking of data is mandatory.

End-User Survey Results

The CAD/CAM/CAE group has performed several end-user-focused surveys in the last 12 months. The following extracts from that work give a profile of the current problem and status of the data management process, for user sites primarily oriented to mechanical applications:

The Problem: Which aspect of design or documentation management is causing the worst problem for your site?

The replies, in rank order, are as follows:

- **Engineering Change Management**—Almost half of the sites surveyed chose engineering change management as the most significant problem. Engineering change management is defined as tracking changes in the approval cycle, updating engineering drawing/documentation, and tracking release status. The most commonly suggested solution to this problem, not surprisingly, was to implement a software management program. Other suggestions were mostly process or organizational: implement better training, better interface with manufacturing, implement a 100 percent solution—eliminate a dual process. Perhaps the most eloquent solution was to eliminate changes. This implies doing it right the first time, which would in fact be the best solution.
- **Access to Data and File Management**—The next two highest ranked problems were related; finding and providing access to the right person at the right time. Improvements called for better organization of existing systems,

getting the right people together to work through solutions to problems, and using standards and translators to move data from one system to another.

- Configuration or Product Structure Management—Configuration management was seen as the least significant problem. An interface to MIS from the CAD system was a recommended solution.

The Obvious Solution: Has your site adopted a commercial database management system (such as Ingres or Oracle)? If not, do you think it will in the next year?

Thirty percent of the respondents answered yes to this question; 70 percent answered no. Of this latter group, 35 percent—almost an 80 percent growth rate—said that they would in the next year.

A tremendous amount of CAD/CAM/CAE data is being produced at an exponential rate.

Such data would suggest that the commercial database management solution is taking off like crazy. The growth rate of a technology or an application solution, however, is only part of the story. The next question in the survey compared commercial solutions to other solutions.

The Rest of the Story: What is the current process for managing design documentation and data in terms of work done? Now and in one year?

A majority of sites use more than one process for design and data management (see Table 1). Not surprising is the fact that the most common means of managing engineering data is on paper. The year 1991 should be noted as a major turning point. However, for the first time more engineering data will be stored and managed in electronic format than on paper. The transition is slow. Only 36 percent of the sites are expecting to make any significant change in data management methodologies. However, the trends are clear: more use of tools supplied with CAD systems and third-party management tools, and less use of paper and in-house-developed systems.

Dataquest Perspective

It is useful to consider that the commercial CAD/CAM/CAE market has been in existence

Table 1
Distribution of Engineering Data Management, by Type (Percentage)

	Now	In One Year
Paper	51	44
Tools Supplied with CAD System	16	21
In-House Developed Software	32	30
Third-Party Management System	1	5

Source: Dataquest (December 1991)

since 1969. In the first 18 years of this business activity, just over 660,000 PCs, workstations, and host-based terminals were installed. In the next two years, this installed base doubled. In the next two years, ending this year, more than another 1 million seats were shipped. We forecast that another 1.5 million seats will be shipped in the next two years.

The mathematics of this situation have not escaped the database management vendors or the users. A tremendous amount of CAD/CAM/CAE data is being produced at an exponential rate. The time to implement a well-functioning solution for most users is critical.

The business opportunity to solve the database management and distribution problem is not as obvious. Some users believe that every system should have this capability built in, not providing much of an incremental business opportunity. A number of vendors are building well-integrated solutions that operate in the group or department level. They can prove value and stay away from the corporate committee that has been studying this problem for years.

The more structured approach will challenge the big system integrators now and a long time into the future. Whether it be a large SI vendor or an internal corporate resource, the big bucks will go to the group building the data-management solution into the "system." The enterprisewide solution that forms the backbone of the engineering and business data communications system will own the data and the access to the data and will define the applications that use the data. This is not a mainframe world; it is a networked distributed environment including notebook computers to supercomputers. The effective design of these environments will determine the ability of these corporations to be competitive in their businesses. ■

By Michael J. Seely

In Future Issues

Watch for reports on the following topics of interest in future issues of *Dataquest Perspective*:

- Concurrent engineering for CAD/CAM/CAE, including a review of knowledge-based tools and vertical markets
- An analysis of the latest finite element analysis technologies, including P-method, coupled analysis, and boundary representation
- A knowledge-based engineering case study with a large aerospace company

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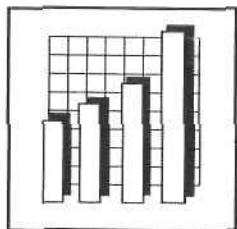
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Mechanical Applications

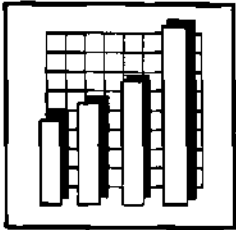


MarketTrends

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Mechanical Applications
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Chapter 1

Report Overview ---

Report Objectives

The Mechanical CAD/CAM/CAE 1992 Market Trends Report presents the results of Dataquest's research and analysis of the 1991 mechanical CAD/CAM/CAE market. This comprehensive analysis of the market provides the following:

- **Executive Overview**—This is a bulleted summary of the major findings of the report.
- **Trends Analysis**—The major trends and issues driving the market are defined, discussed, and analyzed.
- **Market Analysis**—A methodology and definitions are presented before the market results of 1991 are analyzed by looking at the market by region and by platform. A top 10 analysis is given that identifies all of the top 10 vendors in all the major and several selected market segments. Leading vendor profiles identify the products and highlights in various hot software market areas.
- **Forecast Analysis**—Based on the major trends and forces in the market, Dataquest makes a five-year forecast in all the major market segments. This forecast includes factory revenue and software revenue by region, platform, and subapplication.
- **Appendix**—Includes detailed market share tables showing revenue and unit shipments.

Methodology

The market and trends analysis is based on more than 50 years of industry experience in the CAD/CAM/CAE group. We use the results of primary research to define, measure, and estimate the significant parameters of the market. Vendor and end-user-based surveys are conducted to gain further insight into significant market dynamics. First-hand discussions with end users, investors, and vendors are used to verify assumptions and to check analysis results.

Project Analyst: Michael J. Seely

Chapter 2

Executive Summary

"Mechanical" is the largest application area in the CAD/CAM/CAE market, representing around 60 percent of the total. The mechanical application area comprises electronic design automation (EDA), architectural, engineering and construction (AEC), and geographic information systems (GIS). The following bullets are intended to provide a high-level overview of the major trends and issues and market analysis that will be covered more fully in Chapters 3 and 4 of this report.

Major Trends and Issues

- The level of indispensability is on the rise, which is increasing demand for mechanical CAD/CAM/CAE products around the world.
- Expect hardware price erosion to continue at a slowing rate as package complexity increases for mechanical CAD/CAM/CAE applications.
- Expect software prices to stabilize or increase slightly for leading products.
- Expect second-tier products with stale technology to fight price erosion.
- Full implementation of automation technology in the engineering environment will take more than 10 years. The replacement market is gaining importance as the potential seat count approaches 50 percent saturation.
- The most aggressive companies will derive benefits of integrated CAD/CAM/CAE as a required strategic business decision.
- For the foreseeable future, computing performance will continue to improve at an exponential rate. This enabling resource will fuel the next-generation software tools, which are focused on integrated solutions at the enterprise level.
- Core-modeling technologies will evolve slowly to support a product data structure that is growing in complexity. Three-dimensional solutions are replacing two-dimensional solutions. Next-generation solid-modeling-based solutions will replace three-dimensional solutions.

- Knowledge-based engineering is a dream becoming a reality. The technology works well if implemented with careful planning. The success stories are growing. The cost and ease of implementation will improve.
- Virtual reality and multimedia are both important to mechanical CAD/CAM/CAE. These technologies are growing quickly in mass market applications and will bring revolutionary benefits to the engineer and designer as they continue to improve.
- The users are becoming fully dependent upon this technology. As the general business operations gain the efficiency of shared data and electronic communications, the users can focus on the simulation of better product design and manufacturing procedures.
- The growth opportunity in each country is dependent upon the success and health of the local manufacturing industries. Multinational corporations will fuel the growth in newly industrialized countries.

Market Analysis

- Overall, the mechanical CAD/CAM/CAE market grew 0.9 percent in 1991, reaching \$7.238 billion for total factory revenue.
- The U.S.-based vendors shipped almost 75 percent of the world-wide total; Asian vendors shipped 16 percent, and European vendors shipped only 9 percent. The vast amount of products developed in Asia were sold only in Asia. The European market is much more international with many local and overseas vendors/developers. A few vendors/developers such as IBM's Catia, Computervision's Medusa, Parasolid from EDS, and Euclid-IS from Matra Datavision are developed in Europe and sold successfully around the world.
- As a group, the worldwide top 10 lost ground in 1991. They had 57.5 percent of total market in 1990. This share dropped to 56 percent, representing slightly more than \$4 billion of the total market.
- Two shining stars on the top 10 list are Silicon Graphics and Hewlett-Packard with a 22.5 percent and 19.0 percent revenue growth rate, respectively.
- The other vendors experienced lower growth, with half of the top 10 showing negative growth.
- IBM continues to lead the market in all regions for total factory, host-based, and server revenue for both hardware and software. This represented \$1.339 billion in total mechanical CAD/CAM/CAE revenue.
- Computervision maintained its lead with top revenue share in total factory revenue and software revenue on the technical workstation in the North American, European, and worldwide markets. This represented \$730 million in total mechanical CAD/CAM/CAE revenue.

- Autodesk has the No. 1 position in personal-computer-based software everywhere except in Asia. This represented \$94 million in total mechanical CAD/CAM/CAE revenue.
- A revenue growth of 78 percent in 1991 pushes Parametric Technology Corporation (PTC) past the \$47 million mark. If PTC can maintain this growth rate for two more years, they could soon become the largest mechanical CAD/CAM/CAE software vendor in the world.
- The software-only segment grew at 6.8 percent rate, reaching \$2.040 billion in worldwide vendor revenue.
- A regional view of the mechanical CAD/CAM/CAE market finds Europe taking the leading position with 40.4 percent of the world market. Despite poor economic conditions in the United Kingdom and Scandinavia, overall conditions in all of Europe supported the modest growth.
- Asia, in particular, showed dramatically slower growth—a 2.1 percent rate, to \$2.150 billion.
- The North American market actually dropped (4.7 percent) to \$2.051 billion.
- A view of the mechanical CAD/CAM/CAE market by platform shows the importance of the technical workstation in this market. Almost 50 percent of the total revenue, 50 percent of the service revenue, and almost 60 percent of the total software revenue is represented by technical workstations.
- The market perception of the PC as a more serious design and analysis tool has progressed slowly, but virtually all applications running on workstations or host-based systems are now available on the PC.
- Host-based systems—once the basis for the entire mechanical CAD/CAM/CAE market—have evolved to focus on a single, dominate force in the market. IBM owns a 42 percent market share. Unfortunately, this whole market segment dropped 23 percent from 1990 revenue levels.

Chapter 3

Trends Analysis

Introduction

Time-to-market for most market-driven products is a good indicator of the productivity or efficiency of the enterprise in question. The ability to react to changes in the market place, to assess the change in opportunity, and to make the necessary corrections to remain competitive is fundamental in a successful operation. CAD/CAM/CAE is an enabling technology, leveraging the abilities of the organization to make these changes. While this view is common at a corporate level, it is interesting to consider the larger view of operation at the industry or global level. This is, in fact, where CAD/CAM/CAE is being implemented. Many trade and industry organizations are implementing standards to promote the sharing of product design and manufacturing information using CAD/CAM/CAE. This facilitates design and manufacturing anywhere in the world. General Motors, Ford, and Toyota are good examples using this strategy. Instant communications with a worldwide integrated work force is the reality of today. Since CAD/CAM/CAE is the language of change in an engineering environment, this technology has become a strategic weapon in global competition.

Several interesting observations can be made that position this technology in the context of global competition and what to expect in the future. CAD/CAM/CAE tools are created to be used to design, simulate, and document the product development process. This applies to every consumer and commercial application. All cars, appliances, clothing, and utensils are produced—or will be someday—with the benefit of CAD/CAM/CAE tools. While the productivity and quality improvements are well understood, the commercial applications of CAD/CAM/CAE are somewhat more sophisticated. These industries have been using CAD/CAM/CAE for more than 20 years with good results. The transportation, construction, and chemical industries are leading in the application of these tools in the commercial sector.

Another fact of application focuses on the designing of faster and more complex computers. These computers, in turn, will be used to support more complex software and design/simulation algorithms that will be used to design even faster computers. This cycle has resulted in the common availability of computing resources that would have been unimaginable only a decade ago. The exciting reality is that this trend is increasing at an accelerating rate. What the mass market does with this plethora of MIPS, MFLOPS, and gigabytes remains to be

seen. Whatever the result, you can be sure that the latest and fastest computer will always be used by some engineer or designer to create the next mode of transportation, communication device, and appliance.

Any evening news program will demonstrate the fundamental changes taking place in the global economic, environmental and political arenas. Public awareness of the impact of these changes is increasing. The expectations for further change are increasing even more. The amazing advances in telecommunications and computing are moving everyone as close as their telephone, terminal, or modem. The CAD/CAM/CAE market exists in the center of much of this turmoil. CAD/CAM/CAE is a tool to be used in building the infrastructure of our global society.

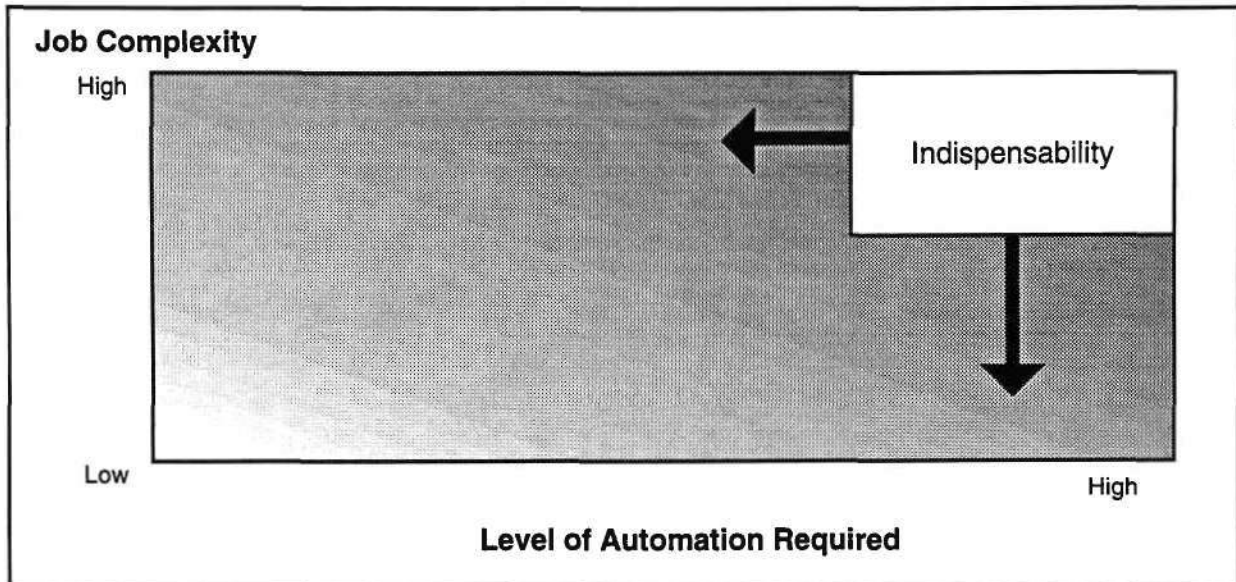
General Overview

The Level of Indispensability Is on the Rise

Drawing an accurate picture of indispensability for mechanical CAD/CAM/CAE is difficult. If a required task can only be accomplished using mechanical CAD/CAM/CAE, then obviously its use is indispensable. A means of illustrating the issue considers the level of job complexity for an individual task and the current level of automation required. In general, easy/simple tasks are usually accomplished quickly using manual or low-tech solutions. Changing a number on a drawing can take less than a minute with an eraser and pencil. Making the same change in a CAD system may take hours if the data is not well organized. The ingenuity of the typical engineer or designer can replace millions of dollars worth of computing equipment with a sketch and a bent wire—sometimes. As the complexity of the design increases, the need to share information increases. The benefits of automation, in turn, improve dramatically, and the level of indispensability goes up. Coupled with market pressures to produce higher quality, ergonomically correct designs with shorter production cycles is making mechanical CAD/CAM/CAE a necessity in all manufacturing industries (refer to Figure 3-1).

A hidden benefit when full implementation is accomplished comes from the elimination of redundant process or systems. Unfortunately, this is difficult to accomplish in a mechanical design and manufacturing environment. So many people need access to some part of the engineering database, it is difficult to identify everyone, let alone to actually set up a system that totally replaces the manual operation. A common mistake in this process is the goal of "doing-it-right-the-first-time." This requires an unreasonable amount of planning and assuming it could be done right. In several months, something surely would change, requiring a modification in the "right" system. The only methodology that will work over time is to expect changes and build into the process an easy means of accommodating any update.

Figure 3-1
Level of Indispensability in Mechanical Applications



Source: Dataquest (October 1992)

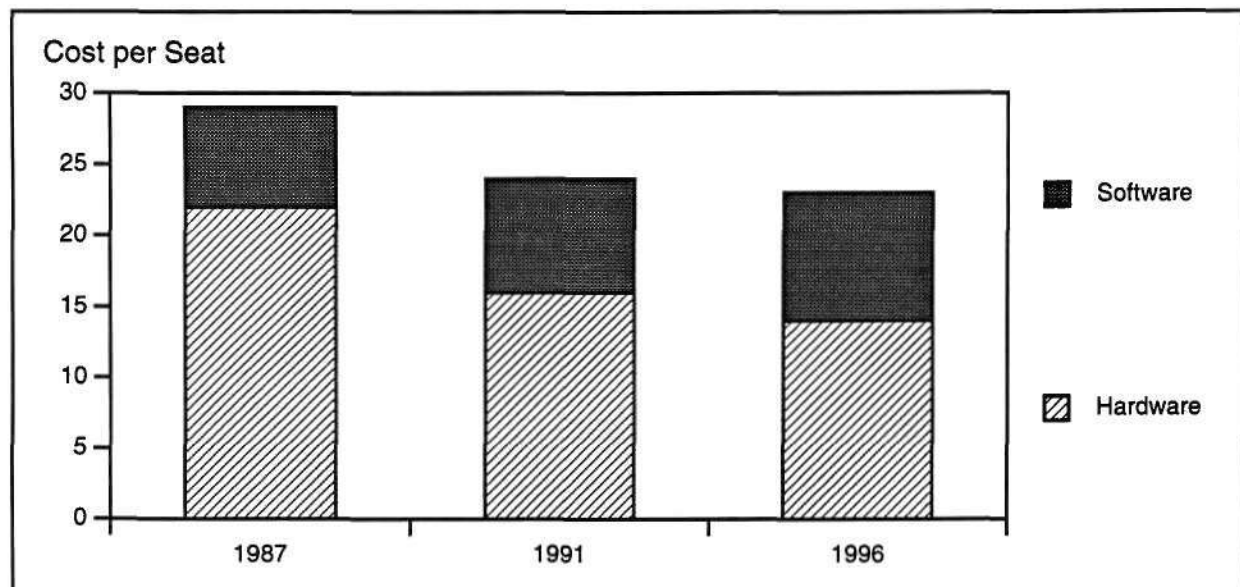
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Cheaper and Faster Is the Law of the Land Regarding Hardware

Software is another issue. The average value of software shipped per seat has increased slowly. An indicator of this trend shows total software revenue divided by total number of new hardware seats shipped. In 1987, this average value was \$6,740. It has risen to \$7,667 in 1991. The corresponding amount for technical-workstation-based software is \$16,640; for the PC, the amount is \$2,360; and \$15,020 is the amount on host-based terminals. Many leading software vendors on all platforms have been raising prices directly or indirectly with new pricing structures for network licensing or site licensing. Price cutting is rampant for second-tier vendors trying to build or maintain market share. Older software technology is seeing strong price-erosion pressure particularly on the PC platform (refer to Figure 3-2).

Dataquest expects the average value of software per seat to continue to rise as more sophisticated applications and more integrated solutions are implemented. A related trend may see a slowing or even reversal in the price erosion of the typical hardware platform. Many of the seats installed have been purchased to run basic design and documentation applications. These platforms will not run the next generation of design optimization software in an effective manner. Users will plan to upgrade or replace these systems when the economics or new baseline requirements become compelling.

Figure 3-2
Distribution of Cost per Seat, by Hardware and Software



Source: Dataquest (October 1992)

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Market Penetration—The Race Toward a Replacement Market

The next five years will see the mechanical CAD/CAM/CAE market evolve toward a replacement market where the new unit sales will be balanced by system retirements. This trend is inevitable. The remaining question is when. Figure 3-3 forecasts 1997 or 1998 as the balance point. Considering the plethora of forces at work in emerging technologies, world economics, competitive issues, and new applications, this should be considered a rough estimate. From the user standpoint, this should be viewed as a desirable situation where everyone who accesses the engineering database uses an electronic format. This implies that many parallel manual systems can be eliminated, as well as the development of many new applications, knowing that everyone in a company will be using the system. The savings potential for this future scenario is tremendous.

Many examples can be found of full CAD/CAM/CAE automation in specific design or manufacturing tasks for a certain family of parts or a common design. Few, if any, companies have taken the leap of faith, automating the entire operation from concept to manufacturing. Many companies, large and small, have automated parts of the operation. Large enterprises will proceed with careful planning to accomplish this result, but it will take longer since they are, in effect, rewiring the house with all the lights on. Smaller operations can make the leap sooner since the problem set may be less complex with all of the automation tools available to make the switch.

This evolutionary trend will occur sooner or later. Those that are slow to make the leap when all the pieces of the implementation puzzle are available will become noncompetitive in a few years. Those that get it right can reap the rewards in better product quality, faster time-to-market, and lower operational cost. Once a strategic automation plan is in place, the business can focus on the incremental enhancements that will maintain the high performance of the operation. The concept of *computer-aided* design then fades, since it can be done no other way.

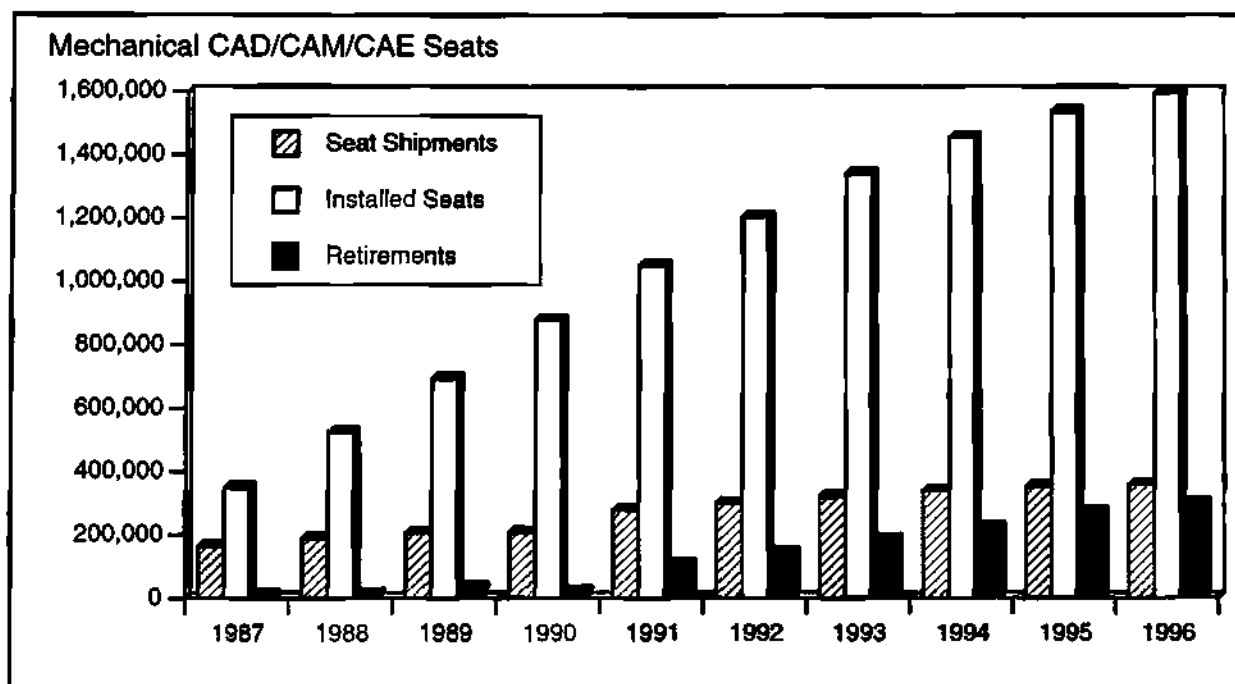
Technology

Computing and Graphics Performance, by Task

The expected improvements in computing and graphics performance are fueling a dramatic growth in software development. As can be seen in Figure 3-4, what can be accomplished with reasonable interactive performance on a \$20,000 workstation is evolving.

In 1987, a \$20,000 workstation could support only the basic applications of 2-D drafting and assembly design. Now, what is shown is the growth in user expectation for baseline functionality. These new requirements for complexity and performance would not be suitable for the "old" \$20,000 seat.

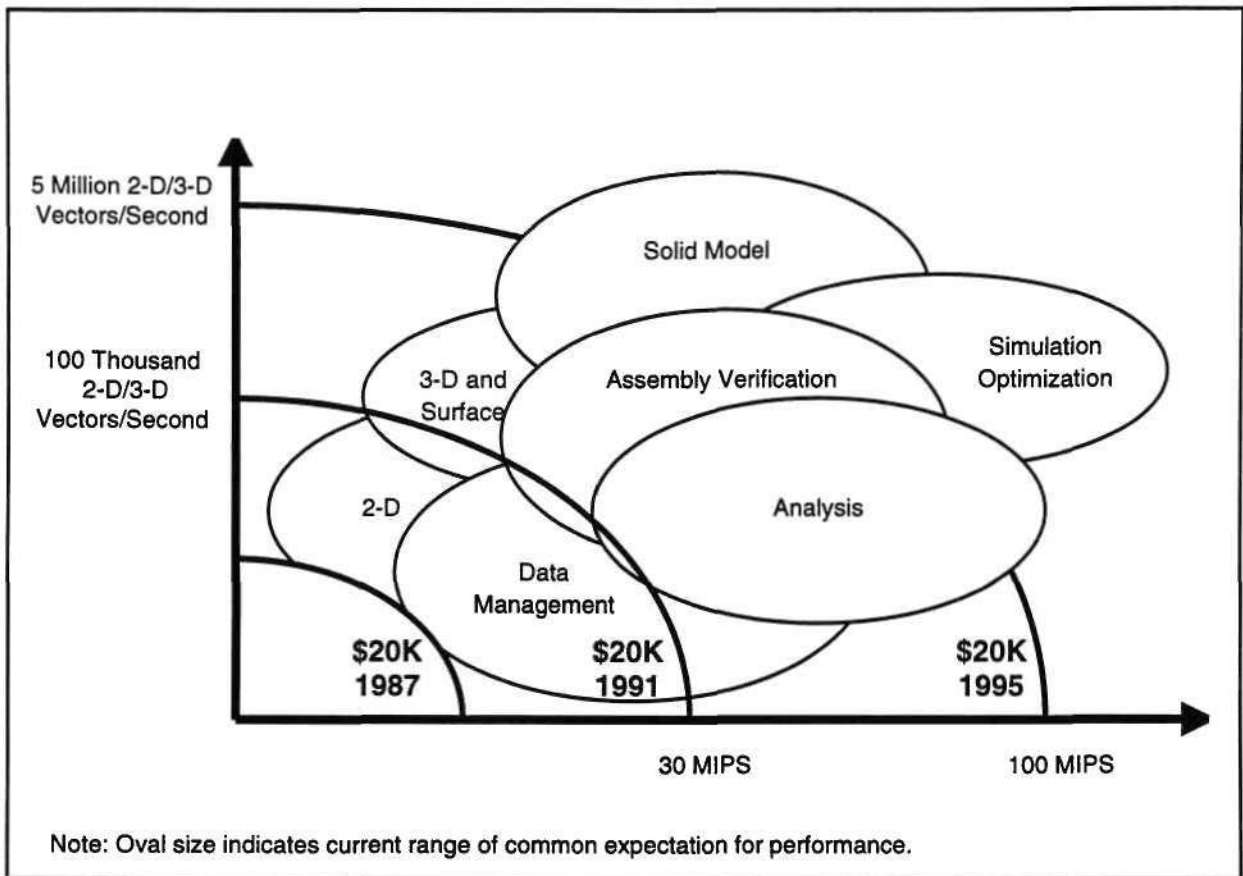
Figure 3-3
Mechanical CAD/CAM/CAE Installed Base



Source: Dataquest (October 1992)

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Figure 3-4
Applications Performance Spectrum



Source: Dataquest (October 1992)

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In 1991, all of the basic and many of the advanced applications in mechanical CAD/CAM/CAE could be used effectively on a \$20,000 workstation. As the performance improves, the 1996 version will handle all that and more. The important issue here is the accurate tracking of application growth in complexity and what is required for user-perceived acceptable performance. New applications will also evolve that will require more computing and graphics performance. The widespread interest in design optimization is a prime example of this trend. New user interfaces developed for virtual reality products coupled with styling and conceptual-design applications will thrive in the new high-performance market.

Amazing Growth in MIPS

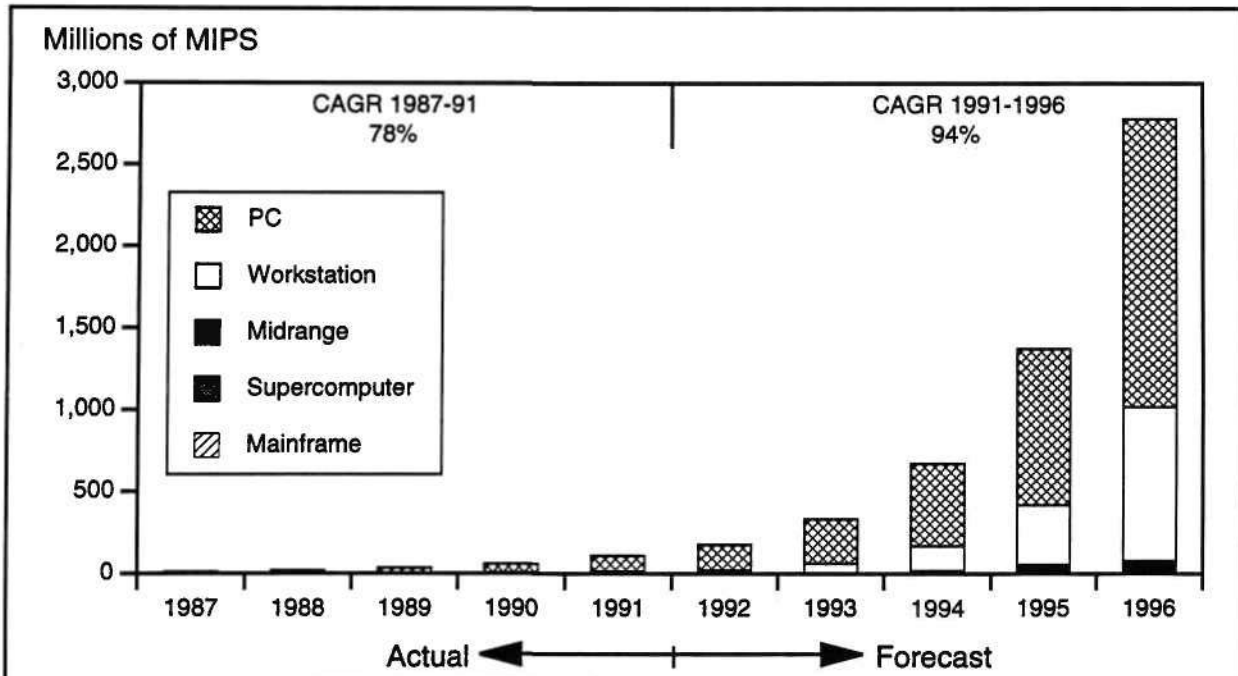
The war over millions of instructions per second (MIPS) are continuing with greater urgency. Lucky for mechanical designers and engineers everywhere, this provides a developing arsenal of computing resources for a growing list of applications. The Dataquest Technical Computing Group has forecast the growth in MIPS shipments for all applications. An amazing revelation comes from

the forecast that the total MIPS shipped in history up to and including 1992 will be matched by the shipments in 1993. In other words, the total MIPS shipped will double in 1993, and almost double again in 1993, and double again in 1994 (refer to Figure 3-5). The changes this can bring about during the next ten years are mind boggling. The software vendors can redefine the concept of interactive design. Designers will literally be able to simulate the crash of one car into another and see if the doors still open. The value of this level of computing will change the nature of mechanical CAD/CAM/CAE. The result will allow anyone in the design and manufacturing process to simulate real problems, evaluate potential solutions, and choose the best solution. They then can communicate the change instantly to all involved.

Modeling Technologies

The revenue of applications software sold in Mechanical CAD/CAM/CAE totaled \$2.04 billion in 1991. We asked the vendors what modeling technology is used as the core technology for each of their application packages. This survey data was combined with end-user implementation data to understand how these systems are being used. The results of this analysis is the forecast shown below. Systems that are 2-D-only are on a steady decline. Three-D capability is available for a minimal cost premium. Even if

Figure 3-5
Forecast of MIPS Shipments in Worldwide Computing, by All Applications



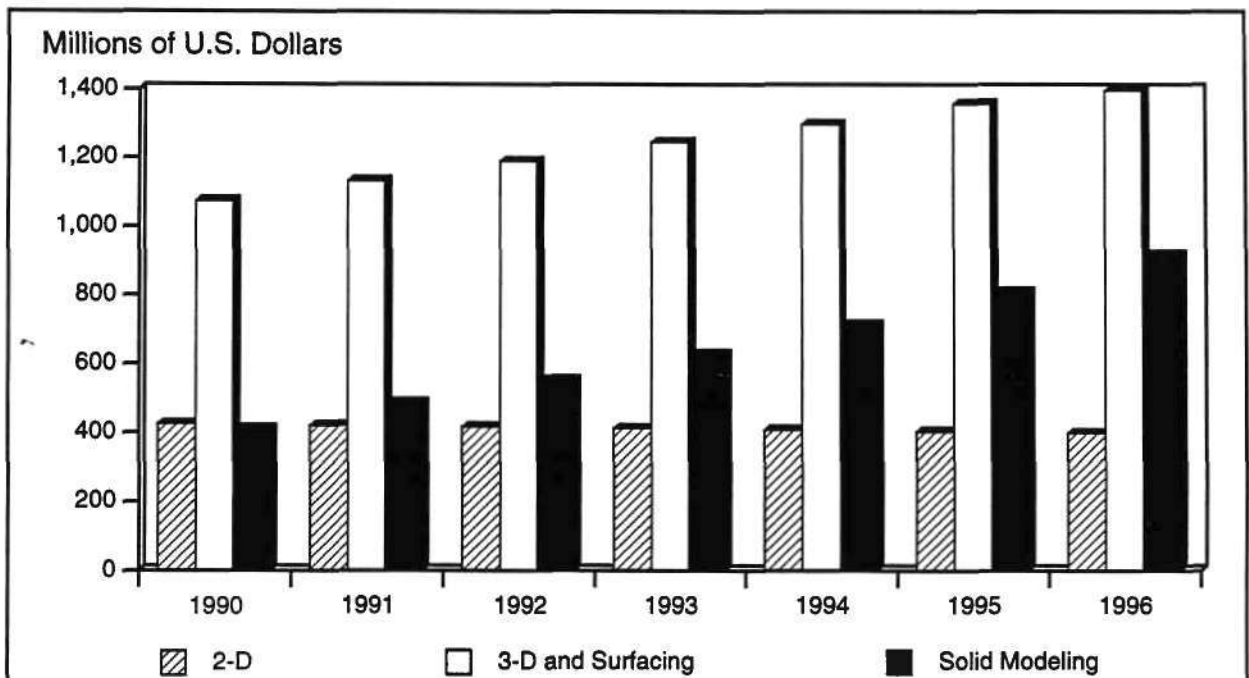
Source: Dataquest (October 1992)

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a user has few occasions for a 3-D application, the minimal expense and common availability on all platform types makes a 3-D-based product a reasonable alternative to 2-D. Only a few, recent 2-D-only products have added a significant amount of enhancements for parametric user input and constraint-based modeling, that may keep a significant market presence. This discussion does not intend to minimize the value or necessity of providing high-performance production drafting capabilities; however, the general message is that the vendor revenue from this application is on the decline.

Solid modeling has been promised for many years as the panacea for the design environment. The more complete data structure with improvements in performance are rapidly building a strong following. Add-on applications that use part or assembly information are still less than optimal, but progress is being made in integration between the model and analysis applications, also between the model and documentation, and further into manufacturing applications. Ease of use, performance, and the ability to accurately model any object independent of shape or manufacturing process continue to challenge all in this business. Significant progress has been made and the systems available today are very usable. Ten years from now at the Detroit Autofact Show of 2002, the corner pub may buzz with tales of a new solid modeler that can automatically build a mold cavity from the part model. Solid modeling can always be better (see Figure 3-6).

Figure 3-6
Revenue Forecast, by Modeling Technology



Source: Dataquest (October 1992)

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Knowledge-Based Engineering

Knowledge-based engineering (KBE) is a productivity multiplier for any mechanical CAD/CAM/CAE system. The rules developed can drive automated applications, capture design intent, and automate sharing of data between applications and departments. Every production operation has task and procedural structures that can be automated and optimized with KBE. The needed improvements in ease of use, cost of implementation, and availability of interface to a variety of mechanical CAD/CAM/CAE software products will improve with time. Two years ago, our first in-depth look at KBE made some wild predictions. We expected the market to grow by a factor of four in the next two years. A preliminary analysis now shows that to be a bit optimistic. A two-times growth in two years would be closer to the truth. The general market softness has had an impact, but the underlying market dynamics are unchanged. In fact, the applications earmarked for early implementation are proving to be more successful than previously imagined.

Virtual Reality and Multimedia

These buzz words bring to mind a dusty trail and a derby coifed huckster plying his trade to the unwary. The magic elixir will cure most general maladies—from short attention span to lack of motivation. Improvements in training techniques, enhanced information flow, and a general well being should be expected. The allure is real. The promised benefits are compelling and needed. The proof of delivery as promised is difficult to find. Enthusiasm for new technologies, especially those with remarkable potential, is difficult to ignore. In the case of virtual reality (VR) and multimedia, mainstream development is targeted in the consumer market. These technologies will progress quickly and will be available at a reasonable price. The clever will find a way to bring the best of this technology into the CAD/CAM/CAE world.

A brief scenario can highlight a potential application. A designer responsible for a die design for an aluminum casting is having a problem. The parts are not being formed correctly; porosity and incomplete filling of the mold is the problem. Using VR techniques with real-time interactive simulation, the designer can shrink himself and walk inside the mold. The simulation can dynamically represent the flow of the molten aluminum. As it moves into the passage in question, the designer can see and hear a synthesized analysis of the process. He can hear or even feel the fluid velocity and decide to modify the shape of the mold, then run the simulation again. A real design problem exists. One that could be solved today, in a few weeks. VR combined with the next generation computing resource should reduce that design time down to minutes.

The promise of VR and multimedia in an engineering environment is real. The practical applications are many. The time for implementation will evolve during the next decade.

End Users

The fundamental driving force in the market comes from the users. The need for additional features and functions is a never-ending dialog between the vendor and the user. The necessary and typical focus on the next release forces the users and vendor into baby steps of significant improvement. Truly dramatic change is needed in some products to bring the functionality up to today's standards. For some, starting over from a clean sheet might be more effective.

The Cost of Product Life Cycle

The major applications in mechanical CAD/CAM/CAE have been defined. Product conception, development, production, operation, and support will be necessary application areas a hundred years from now. What will change is execution. The pressure for change is directly related to the product development cycle. All significant elements for change will come from an intimate understanding of the flow of information in each of these departments of application areas. Figure 3-7 illustrates the concept of cost commitment in new product production that highlights the importance of high-quality design. An internal study attributed to British Aerospace several years ago estimated that 85 percent of a product life-cycle cost is committed prior to engineering release. This is not necessarily bad, as long as the design is accurate. Making the design commitment, ordering tooling, and then discovering the need for a major engineering change is costly. A major change after product shipment summons the dreaded specter of recall. The cost of such things in lost-market confidence is immense.

The value of automation in evaluating product life-cycle cost will increase product quality and improve time-to-market. The improved automated processes will typically share and reuse information, use multistep analysis with optimization, and drive production directly from the database. Vendors can package vertical and horizontal application tools to make the process more modular and to aid training.

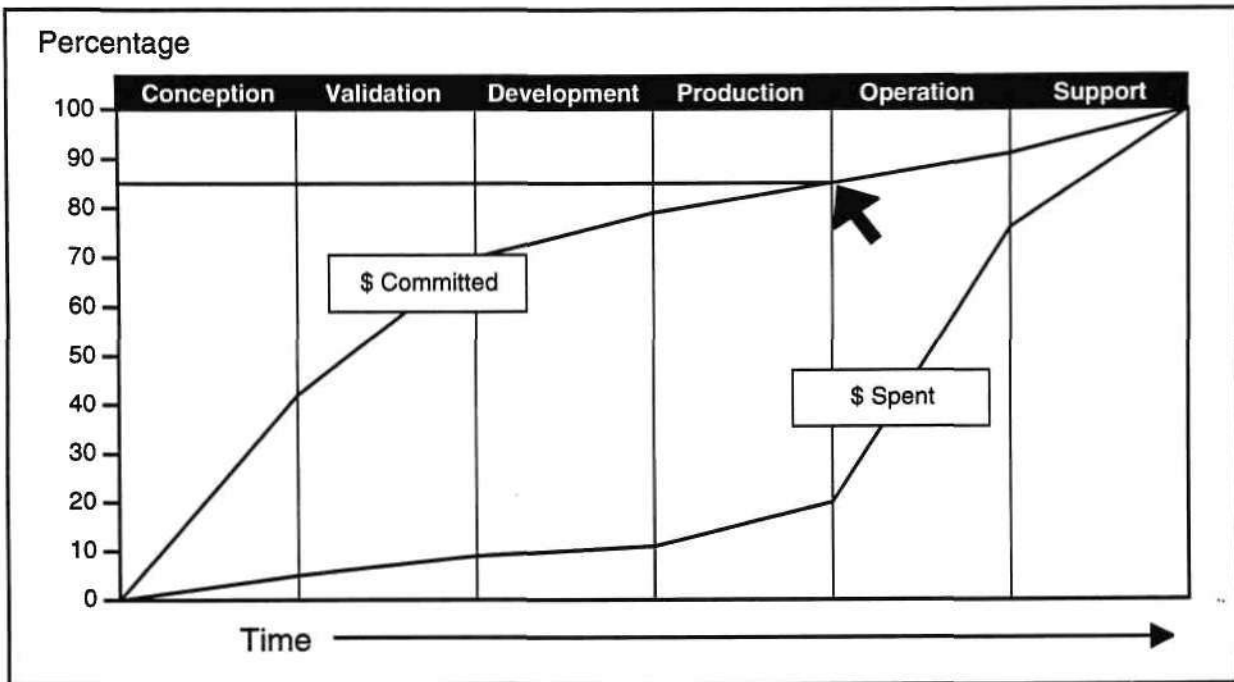
A Shrinking Business Environment

Competitive pressures from every country are forcing improvements in product quality, time-to-market, reduced expenses, and improvements in shortening time-to-market. The supporting automation environment can provide a full range of tools and structure to address each of these issues. In addition, these tools can provide direct communication to remote design and manufacturing facilities. This opens the door for business relationships with the same efficiency as the company next door. Expect more interwoven business partners, organized by industry and synergistic relationships.

Regional CAM/CAM/CAE Growth

The forces at work in steering the development of CAD/CAM/CAE are universal. Drafting and design are the same in Spain, California, or Singapore. The evolution of user demands are similar, as well. Usually, the first application mastered produces drawings faster. Next

Figure 3-7
Product Life-Cycle Costs



Source: Dataquest (October 1992)

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application finds progress toward more sophisticated uses of design, analysis, and manufacturing applications.

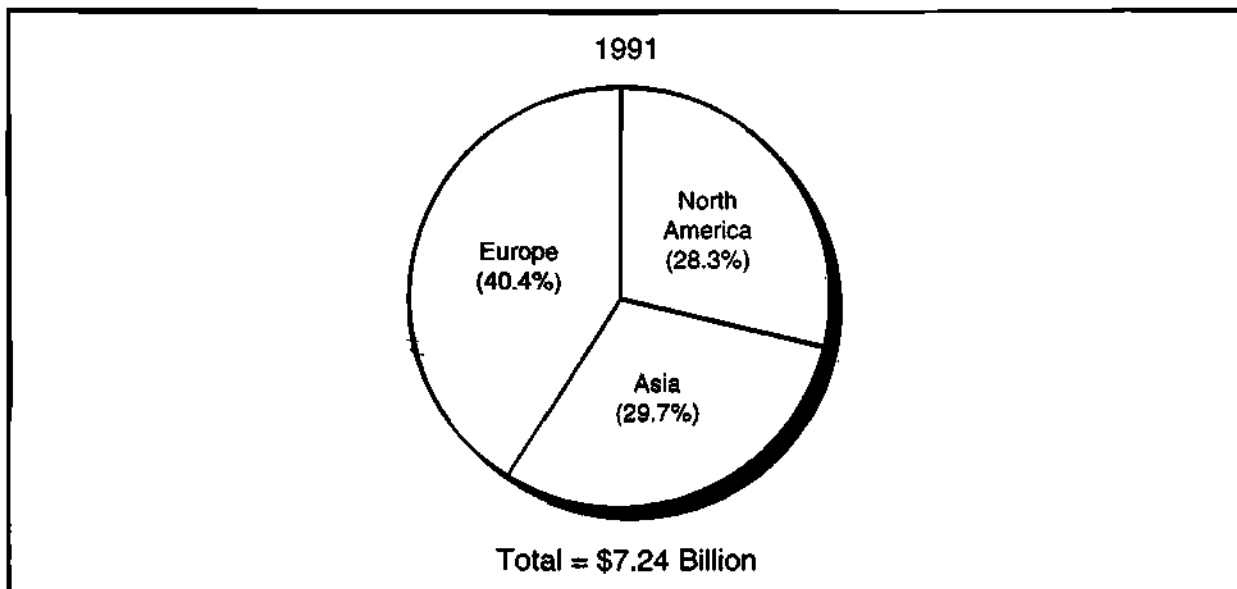
Standards work in ANSI, SET, DIN, and other national and international committees has paved the way for sharing of engineering data at the international level. These programs are used for standards at the documentation level. These same standards are evolving to accommodate engineering information in electronic form.

CALS, STEP - PDES

Each country has a dominant industry or market segment that sets the tone for CAD/CAM/CAE use. The evolution of these industries has had an important impact on the growth of the CAD/CAM/CAE market in each region and has directed the success of many vendors trying to serve these markets. The automotive industries in Japan, United States, Germany, Italy, and France have a major influence on the local CAD/CAM/CAE market. Aerospace, a major force in the United States and France, is less of a force in other regions and a minor but growing interest in Japan. All of the other manufacturing industries such as fabricated metal, machinery, and consumer products have strongholds in various locations around the world. Specifically, the machinery industry in Japan and Germany represent a significant local CAD/CAM/CAE opportunity.

The shipments of mechanical CAD/CAM/CAE products reflect the global nature of the business (see Figure 3-8). The major regions of the world are nearly balanced for revenue shipments, with Europe being

Figure 3-8
Distribution of Mechanical CAD/CAM/CAE Total Revenue, by Region



Source: Dataquest (October 1992)

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the largest, then Asia, and North America. This trend is expected to continue for the foreseeable future. An interesting reference point comes from our worldwide analysis. This compares the total CAD/CAM/CAE consumption to the total sales volume of the manufacturing companies. This ratio is 0.3 percent. In other words, for every \$100 of sales revenue to manufacturing companies, 30 cents per year is spent for the purchase of mechanical CAD/CAM/CAE.

Dataquest Perspective

The major trends in the mechanical CAD/CAM/CAE arena have forced the market to a crossroads. The pressure to use automation tools is higher than ever. The quality and productivity of the tools available is also at an all-time high. The cost of implementation is lower than ever with productivity payback in less than two years. So what's the problem? It depends on the point of view. If the "glass is half empty" attitude is taken, then the tools are difficult to use, too slow, too costly, and unreliable, and the overhead is not worth the effort to get the simple things done—too complicated. Why bother? If a positive attitude is taken, amazing things happen. The whole PC-based CAD/CAM/CAE market explosion can be explained by the fact that the people making it happen did not know they could not do it. CAD/CAM/CAE tools can be used with dramatic success, if used properly.

Unfortunately, misusing tools is a problem, too. If a painful project of implementation has finally been organized to yield the benefits expected, it will be difficult to change this process. The users and developers

will reluctantly move to a new platform or core software only if compelled with strong incentives. Fortunately, some of these incentives are in place. A fundamental change in perception needs to take place in the market. As long as CAD/CAM/CAE is positioned as a tool to make a drawing faster, to make an analysis faster, the real opportunity is lost. The crossroads decision will change the tool focus away from tools and accomplishing a task faster and will move to a understanding that CAD/CAM/CAE is a communication medium.

RP
increased in the core
processes in the
company operation.

When everyone in an organization has access to the information in an organized, managed, and reliable system, great economies can take place. In a very real sense, the engineering drawing is the language of design and manufacturing. It is very common for dozens and dozens of translations of this information to take place as the design intent travels from concept to production to purchasing to the shipping dock. The translations can be automated. The enhanced value will come from a system that lets the individuals focus on their value added in the process as the design intent travels through the company. This is the fundamental issue to be reconciled. The challenge of the next decade will organize the efforts of many, to take the value-added input, to eliminate the manual translation of data for the individual to use, and to take the engineering drawing, the 3-D models, the bill of materials, material specifications, process plans, and a hundred other things, and form it into a usable flow of information. The sooner the users can get control of their data, the sooner they can optimize and reoptimize the process, the sooner they will increase the profitability of the enterprise.

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Chapter 4

Market Analysis

Methodology

Every year, the Dataquest CAD/CAM/CAE group builds two vendor surveys to help define the market performance for the previous year. In the fourth quarter, the process begins with direct contact with more than 400 vendors worldwide. This information drives the preliminary market share published in February. During the first and second quarter, additional survey work is completed that qualifies that published preliminary data. This results in a final market share publication in July. The information described resides in a multidimensional database as illustrated in Figure 4-1.

Having the benefit of detailed historical data, the analyst generates a preliminary and final forecast using the market share results to sanity check earlier assumptions. These final reports are distributed in May and October. This report describes the 1991 market performance based on published data and the most recent updates available.

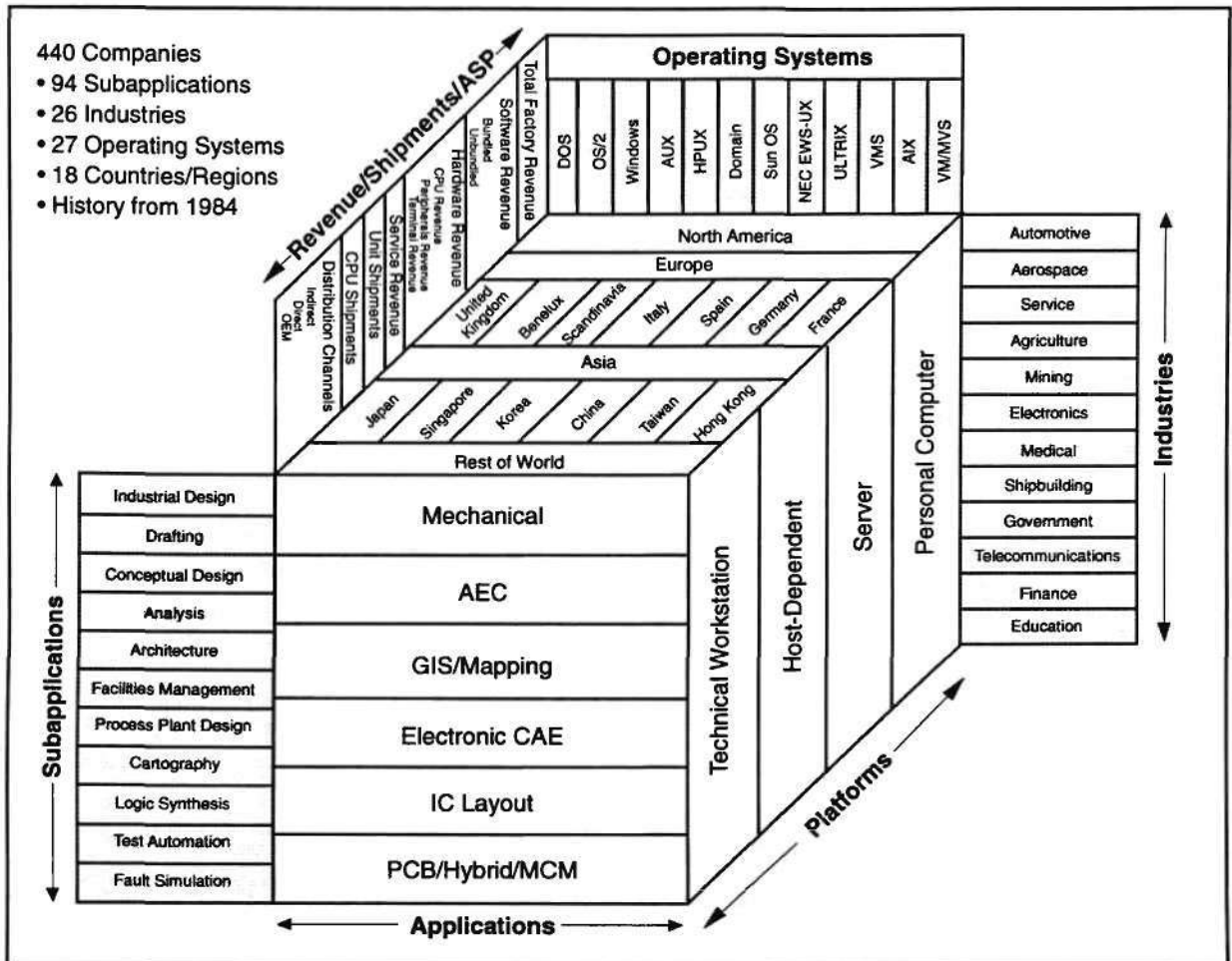
Definitions

Subapplications

Dataquest defines the Mechanical CAD/CAM/CAE market where a set of computer-aided applications are used to design, analyze, document, and manufacture discrete parts, components and assemblies. The computer applications used to accomplish these tasks are segmented into several functional areas. Specifically, the mechanical application set includes:

- **Documentation and Drafting**—comprised of a related set of applications that together define the documentation and drafting application. These include detail drafting, schematics, technical illustration and charting applications.
- **Conceptual Design**—includes industrial layout, design layout, and styling applications.
- **Functional Design**—includes component design, assembly verification, and linkage/mechanism design applications.
- **Analysis**—includes mass properties calculations, stack up, fatigue, structural, thermal, vibration, magnetic, composite, and quality control applications.

Figure 4-1
CAD/CAM/CAE Market Database



Source: Dataquest (October 1992)

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- **Manufacturing Engineering**—includes tool design, fixture design, and part processing design applications.
- **Manufacturing Process Simulation**—includes numerical control part programming, coordinated measuring machines, and offline robotics applications.
- **System Management and Tools**—includes product structure or configuration management, engineering change management, network file management, user application tools, knowledge-based tools, and training tools applications.

Most of the users of these applications are found in the discrete manufacturing industries. These industries, such as automotive, aerospace, and machinery, represent about 80 percent of the total revenue of the market. The *other* category literally spans the full range of industry possibilities. Mechanical engineers can be found

everywhere supporting the design activities of products and manufacturing processes in everything from tooth paste to billboard signs.

Computing Platforms

The computing platforms used for mechanical CAD/CAM/CAE include everything from notebooks to supercomputers. The Dataquest CAD/CAM/CAE database uses four platform designations to track the market: technical workstations, host-dependent systems, servers, and personal computers.

- Technical workstations operate as a single-user computer with a large range of performance options; this includes a virtual, multitasking operating system (UNIX, VMS, Domain); and built-in functions for networking, high-performance graphics.
- Host-dependent systems are a shared-logic device with external workstations/terminals that are dependent on the host for operation.
- Servers can be used for a variety of services that operate transparently for the user. Functions include file storage, database access, compute capability, and others.
- Personal computers are defined as single-user computers that have features similar to a technical workstation but are optional in the package, such as, virtual operating system, networking, and high-performance graphics. Overall performance characteristics are generally positioned lower than a workstation.

Regions

The regions covered in the service database are defined as follows:

North America—includes United States and Canada

Europe—includes United Kingdom, Scandinavia, Benelux Region, France, Germany, Italy, Spain, and the Rest of Europe

Asia—includes Japan, Singapore, Taiwan, Korea, China, and Hong Kong

Rest of World—all other countries including Australia, New Zealand, Oceania, Africa, Central America, South America, and the Middle East

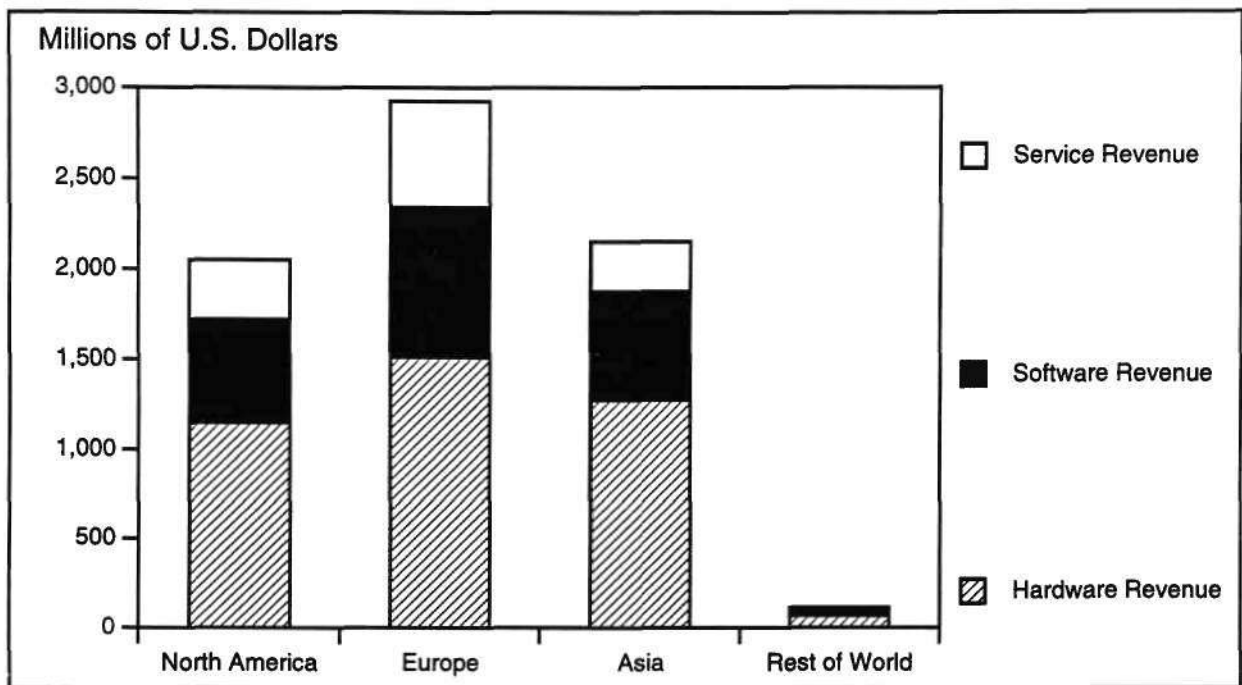
The Mechanical CAD/CAM/CAE Market: 1991

Overall, the mechanical CAD/CAM/CAE market grew 0.9 percent in 1991, reaching \$7.238 billion for total factory revenue. The software segment grew at a higher 6.8 percentage rate, reaching \$2.040 billion in worldwide shipments.

Mechanical CAD/CAM/CAE Market, by Region

A regional view of the mechanical CAD/CAM/CAE market finds Europe taking the leading position with 40.7 percent of the world market (refer to Figure 4-2). The relatively stronger economy in

Figure 4-2
Mechanical CAD/CAM/CAE Market, by Region



Source: Dataquest (October 1992)

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Europe has supported this growth. Proportionally, a higher percent of service revenue is paid in Europe, due primarily to the import of U.S.-based products into the region. Germany has the largest country market share in Europe with a typical strong interest in using mechanical CAD/CAM/CAE tools in both product design and manufacturing applications. Total factory revenue in Europe grew 3.8 percent—to \$2.925 billion. All regions have reported lower than expected growth rates compared to the preliminary market share report in May.

Currency exchange rate fluctuations affect apparent growth (Dataquest's CAD/CAM/CAE data is expressed in U.S. dollars). Dataquest's European exchange rate tables include data from all Western European countries, each of which have different and variable exchanges rates against the U.S. dollar. To cite a specific example, in 1989, 1990, and 1991, Matra Datavision grew 7.3 percent, 0.2 percent and 8.9 percent, respectively, in French francs. This growth, when converted to U.S. dollars, looks quite different—2.4 percent, 17.8 percent, and 4.9 percent, respectively.

Asia, in particular, slowed dramatically, growing only at a 2.1 percent rate to \$2.150 billion. Japan represents more than 90 percent of the total Asian market and is expected to continue to dominate this market. The North American market actually dropped (4.7 percent) to \$2.051 billion. Overall, this brought down the total factory revenue growth rate—from the preliminary estimate of

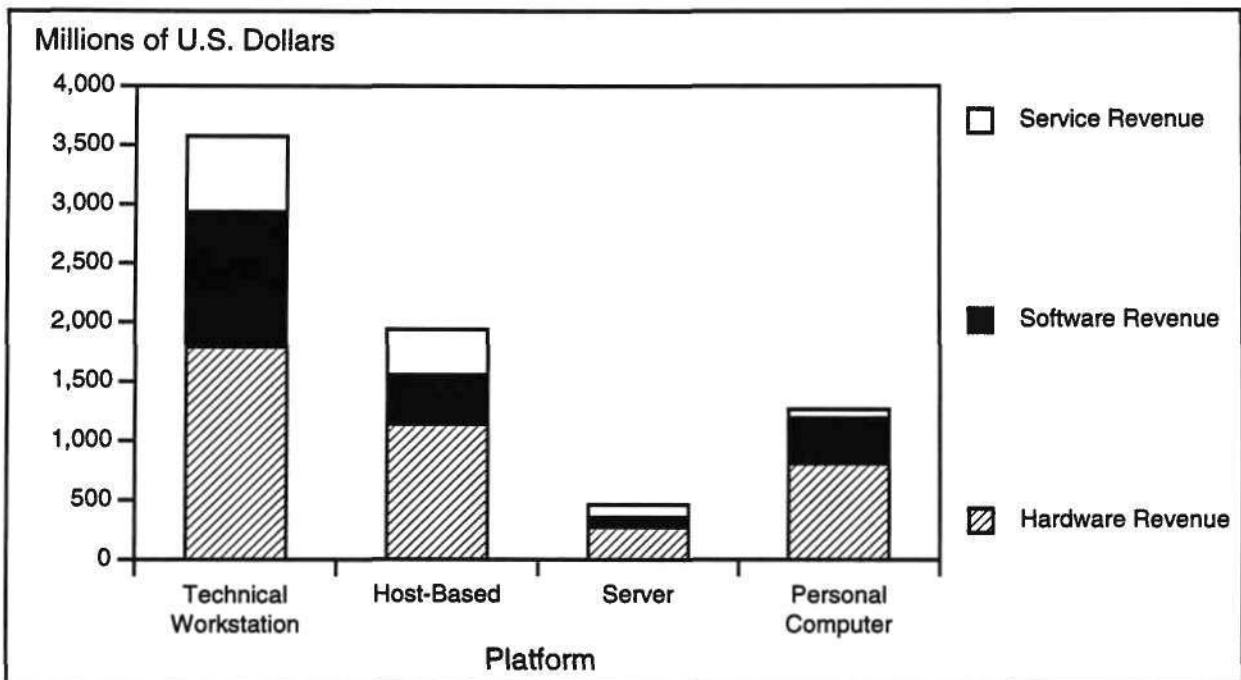
8 percent to the current 0.9 percent actual—for the 1991 worldwide mechanical CAD/CAM/CAE market.

Mechanical CAD/CAM/CAE Market, by Platform

The mechanical CAD/CAM/CAE market has embraced the technical workstation as the platform of choice. Almost half of the total revenue and service revenue and almost 60 percent of the total software revenue is represented by technical workstations. Most of the leading vendors are now first developing in a technical workstation environment. Computervision dominates the worldwide technical workstation market with a 17.6 percent market share in total revenue (see Figure 4-3).

The personal computer has experienced rapid growth and wide acceptance since the first product offerings supplied a low-cost drafting solution. The market perception of the PC as a more serious design and analysis tool has progressed slowly. Virtually all applications running on workstations or host-based systems are now available on the PC. Many manufacturing applications have been implemented on the PC with good results. Numerical-control part programming is probably the best example. The combination of low cost and focused application fit well in the laboratory/shop floor environment. We expect the PC and workstation to continue to

Figure 4-3
1991 Worldwide Mechanical CAD/CAM/CAE Market, by Platform



Source: Dataquest (October 1992)

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battle for the engineering desktop. Autodesk and Compaq are leading the charge for market share for software and hardware revenue, respectively.

Host-based systems, once the basis for the entire mechanical CAD/CAM/CAE market, has evolved to a single, dominate force in the market. IBM owns a 42 percent market share. Digital and Control Data are important suppliers in this market, but together they are less than 50 percent of IBM revenue in hardware and 7 percent of the software revenue. Several Japanese vendors show considerable strength in the Japanese market with host-based offerings, but even in Japan, the trend is the same. Revenue is flat-to-down. This bad news finds the whole market segment dropping 23 percent from 1990 revenue levels. IBM dropped more than 28 percent alone. Dataquest expects the mainframe solution to continue to lose ground to the workstation and PC offerings. The server market along with host-based solutions will continue to supply the large system support and maintenance security blanket that is needed in some industries. The trend, however, is clear; host-based products will represent only 15 to 20 percent of the market total by 1996.

The Top 10 Market Share

Total Revenue

The total revenue for the worldwide market in 1991 was \$7.238 billion. The U.S.-based vendors shipped almost 75 percent of the total; Asian vendors shipped 16 percent; and European vendors shipped only 9 percent. The vast amount of products developed in Asia were sold in Asia.

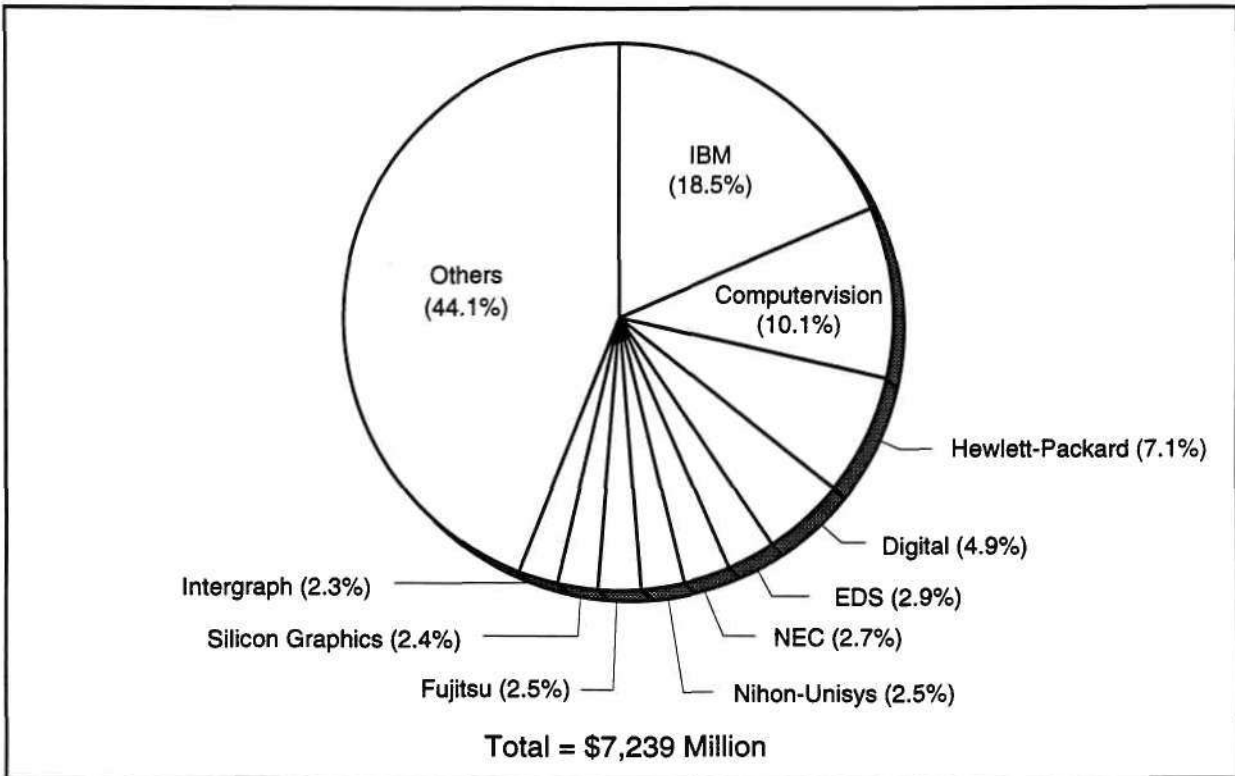
As a group, the worldwide top 10 lost ground in 1991 (refer to Figures 4-4 and 4-5). In 1990, they had 57.5 percent of total market; in 1991, total market share dropped to 56 percent, representing slightly more than \$4 billion of the market. The names and positions on the list have not changed significantly. Two shining stars on the top 10 list are Silicon Graphics with a 22.5 percent revenue growth rate and Hewlett-Packard with a 19.0 percent revenue growth rate. The other vendors experienced lower growth with about 50 percent of the top 10 showing negative growth.

Software Revenue

Leading Vendors

IBM. IBM continues to lead the market with its CATIA, CADAM, and CAEDS product offerings. It leads the market in all regions for total factory revenue, host-based revenue, and server revenue for both hardware and software. Strategic investments in a variety of software companies in mechanical CAD/CAM/CAE and other industrial applications almost guarantee this leading position in the future. Last year saw IBM deepening its relationship with Dassault, the developers of CATIA, the flagship design and manufacturing

Figure 4-4
1991 Worldwide Top 10 Market Share, by Total Revenue (All Platforms)



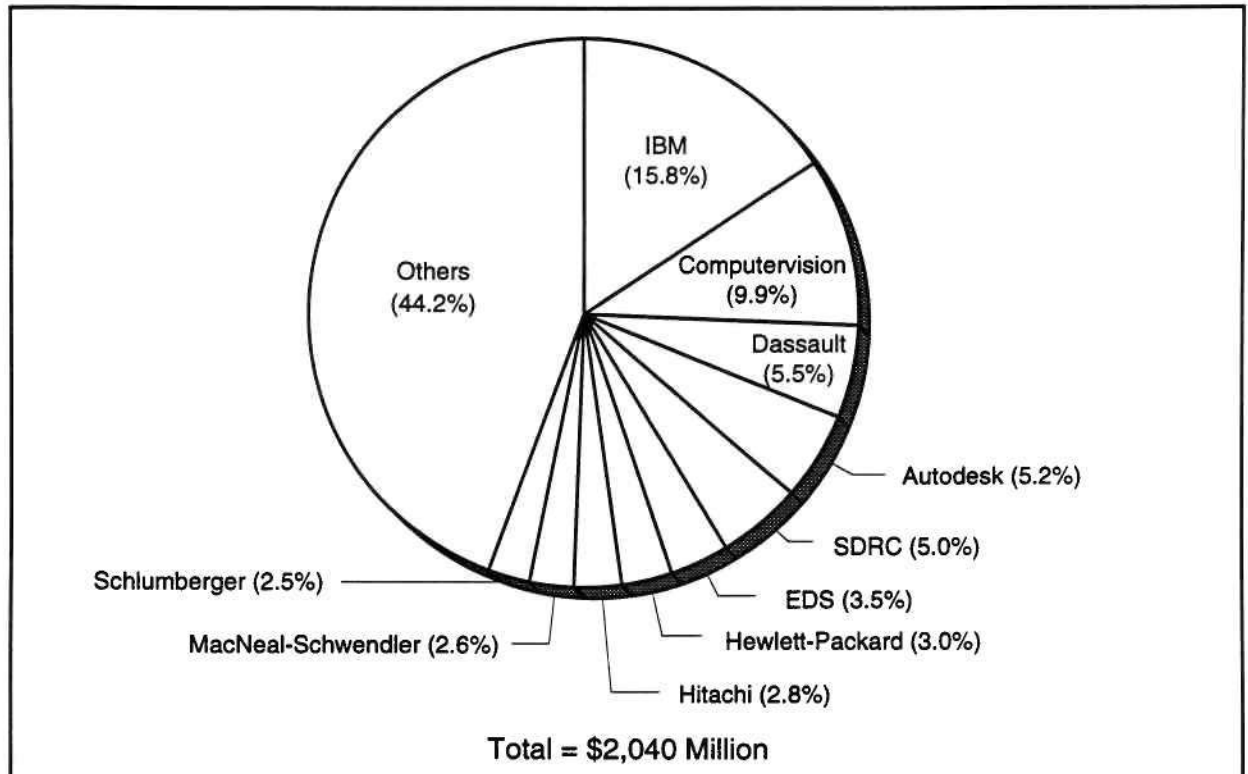
Source: Dataquest (October 1992)

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product offering. This business deal traded some of the development resources in CADAM, a wholly owned subsidiary, for a minor share of the Dassault CAD/CAM/CAE software business. This action cemented the already tight relationship between Dassault and its only distribution partner. IBM continues to make strategic investments in software companies to expand its influence and to add leading-edge software offerings around the CATIA core.

Computervision. Computervision maintained its lead with top revenue share in total factory revenue and software revenue on the technical workstation in the North American, European, and worldwide market. The strength of the product reputation in Europe, along with the higher-than-average market growth in Europe helped Computervision maintain this No. 1 position. The release late in 1991 of CADD55, a major update, had some positive affect on revenue. The year 1992 promises to see the full benefit of this significant enhancement. A separate issue in positioning Computervision for a public stock offering this year should reduce the debt overhead formed after the Prime and DR Holdings acquisition in August of 1989. Assuming a successful result in the current financial deals, the company should remain in a strong position for the foreseeable future.

Figure 4-5
1991 Worldwide Top 10 Market Share, by Software Revenue (All Platforms)



Source: Dataquest (October 1992)

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Autodesk. Autodesk has the No. 1 position in personal-computer-based software everywhere, except in Asia. A few of the local Asian products have edged them out of the lead; in Europe and the United States, Autodesk dominates this market segment. The strength of the company is in its market share and distribution channel. The recent shakeup in the company—bringing in a new president and several senior vice presidents—should leverage this strength to a new generation of product offering. The latest release of AutoCAD revision 12 has many of the most sought after features in a 3-D system. Recent business activity suggests a more active role for the company in helping the channel be successful in selling to the Fortune 500 accounts. Autodesk's role of systems integrator can help the company leverage potential synergies between software VARs for the benefit of the large strategic accounts and many of the smaller accounts as well.

SDRC. SDRC isn't No. 1 on any of the market share charts, although this does not slow them down. SDRC has strung together 24 consecutive months of profitable business—an accomplishment that is very rare in this business. The users are loyal, enhancements have occurred on a regular basis, and the price/performance of the

software keeps getting better. With the IDEAS product family, SDRC has focused on the MCAE market providing conceptual, detail, and analysis tools for the designer. All the major automotive and aerospace companies use the software with reasonable success.

EDS. EDS is a new comer to the top 10 list. Although the name is new, the products are well-established. McDonnell Douglas sold the Unigraphics product line to EDS in November of 1991. The transaction took several months longer than expected, which may have had a negative impact on the growth in 1991. Revenue was down, 15.9 percent to \$208 million in total factory revenue. Market softness for the mainstream Unigraphics end users contributed to the less-than-stellar performance. Automotive, and part of the aerospace industries, particularly in this country, obviously were not in a buying mood.

Hewlett-Packard. Hewlett-Packard saw more than a 19 and 27 percent growth in total revenue and in software, respectively. The ME series software for mechanical design and drafting are growing in popularity. The recent enhancements in adding parametric input to the ME 10 product moves it into the mainstream of current technology. The Elan product, the solid-modeling-based next-generation product, is soon to be released. If it advances the industrial strength capabilities of the ME series products, it will meet with above-average success. Delays in release, however, will caution the potential users to test beyond demonstration functionality.

MacNeal-Schwendler. MacNeal-Schwendler had flat revenue growth in 1991. The \$53 million company is well recognized for the depth of application base in the finite-element analysis world. The evolutionary approach to product development has well served a large installed base. More revolutionary tactics may be needed to incite the casual user to take the analytical plunge.

Schlumberger Technologies. Schlumberger Technologies could provide a blueprint for other mechanical CAD/CAM/CAE companies with an established installed base. End-user surveys suggest a strong support organization. The next major product release is a bit overdue, but the unique features of Bravo are keeping the current users happy.

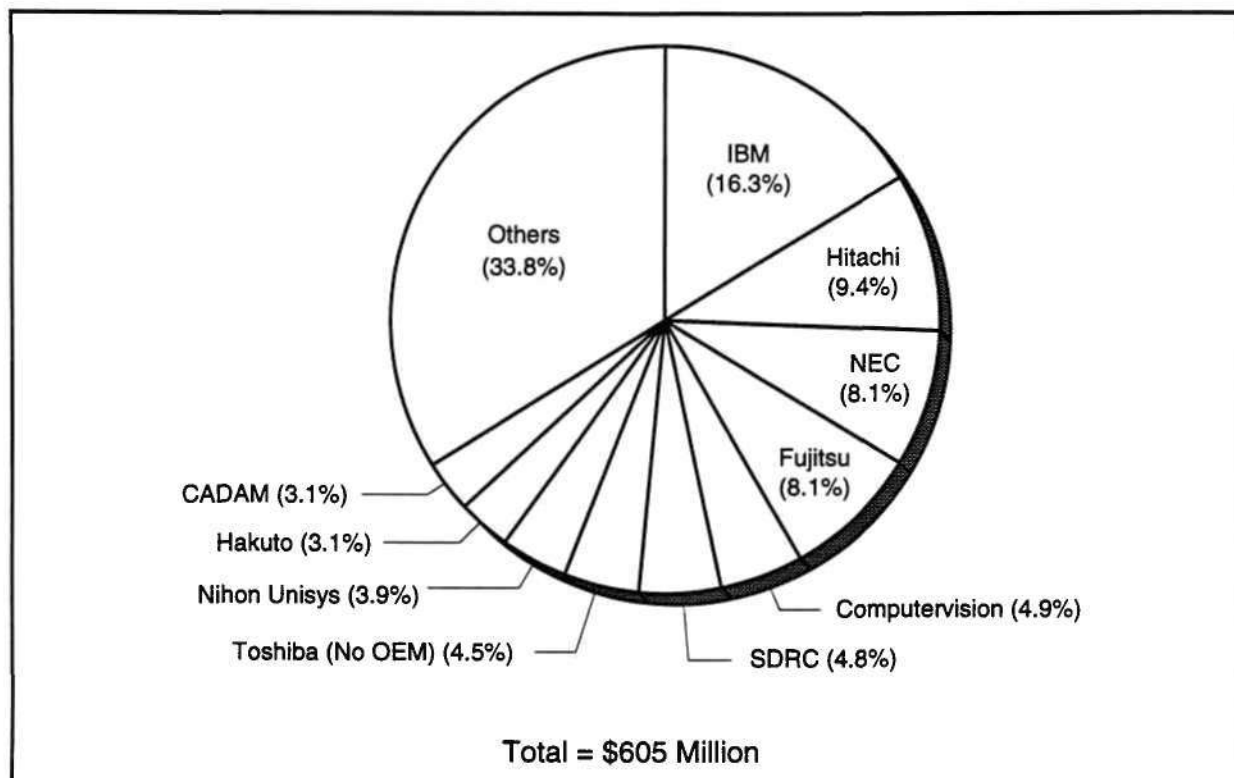
Parametric Technology Corporation. Every once in a while, a company comes along that seems too good to be true. For Parametric Technology Corporation (PTC) a revenue growth of 78 percent in 1991 pushes PTC past the \$43 million mark. If PTC can maintain this growth rate for two more years, they could become the largest mechanical CAD/CAM/CAE software vendor in the world. The success of PTC should eliminate any doubt about the market value of solid modeling with a good user interface.

Major Market Segments

The following set of figures highlight and recognize the leading vendors around the world in each major market segment and in several selected segments of special interest:

- Asia software revenue—all platforms
- Asia hardware revenue—all platforms
- Europe software revenue—all platforms
- Europe software revenue—technical workstations
- Europe hardware revenue—technical workstations
- North America software revenue—all platforms
- North America software revenue—technical workstations
- North America hardware revenue—technical workstations
- Worldwide software revenue—technical workstations
- Worldwide software revenue—personal computers
- Worldwide total hardware revenue—all platforms

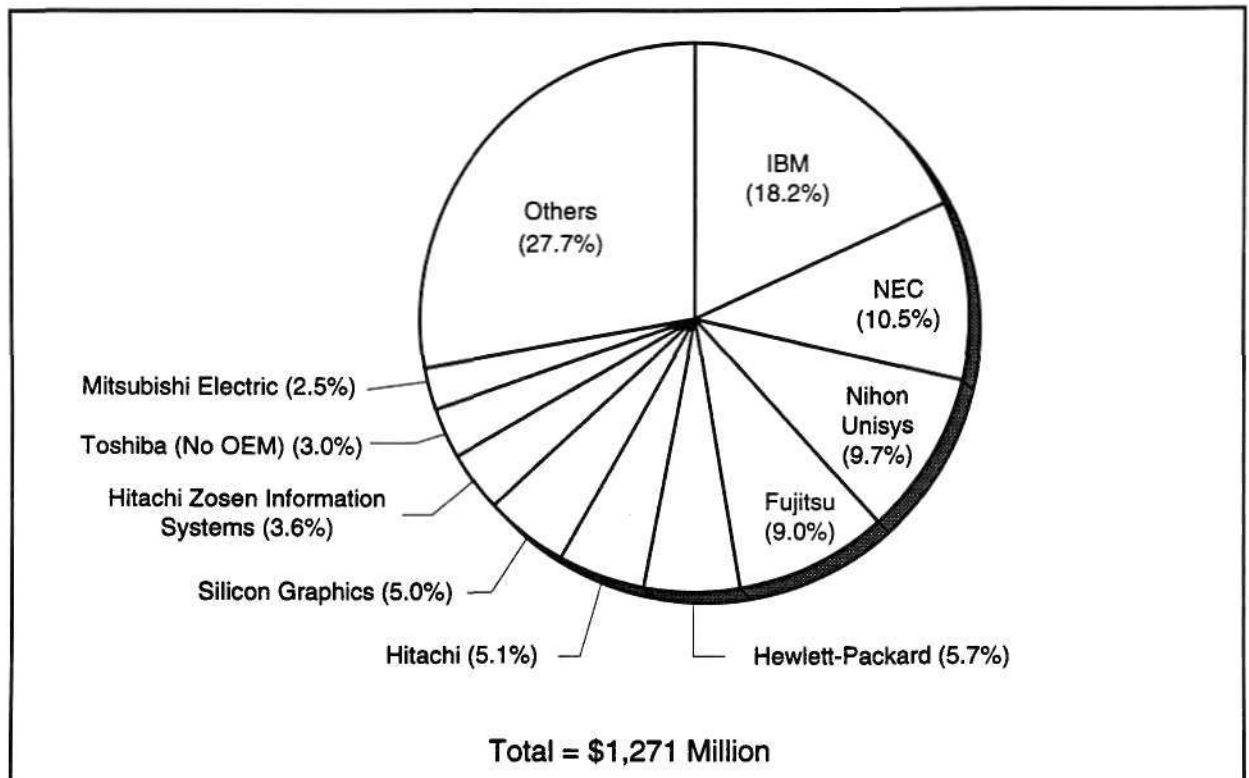
Figure 4-6
1991 Asia Top 10 Market Share, by Software Revenue (All Platforms)



Source: Dataquest (October 1992)

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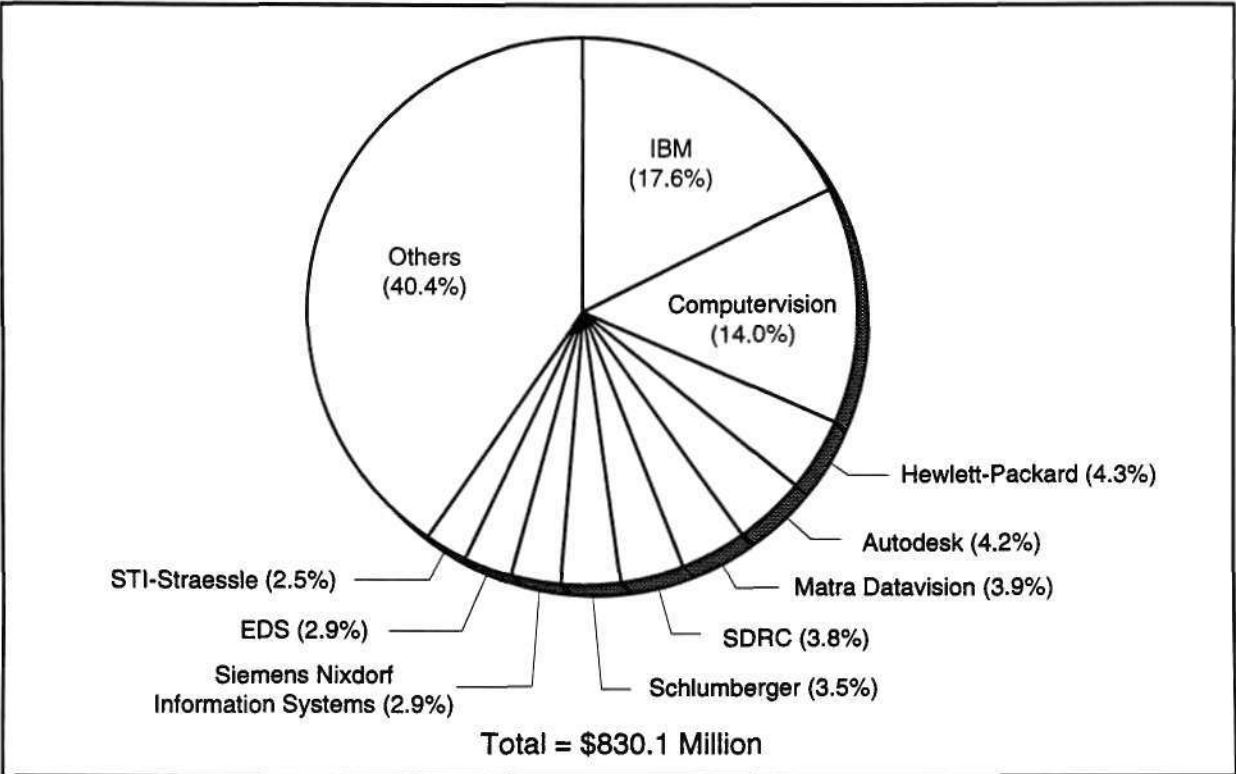
Figure 4-7
1991 Asia Top 10 Market Share, by Hardware Revenue (All Platforms)



Source: Dataquest (October 1992)

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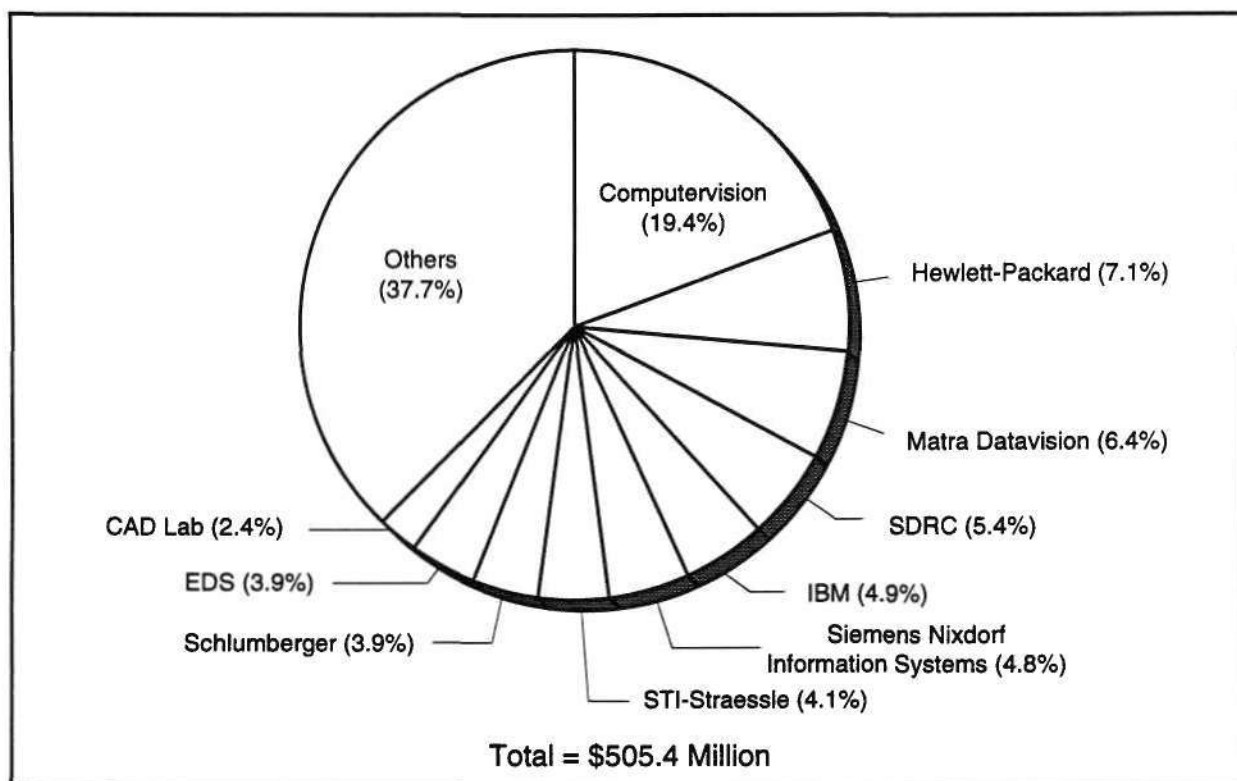
Figure 4-8
1991 Europe Top 10 Market Share, by Software Revenue (All Platforms)



Source: Dataquest (October 1992)

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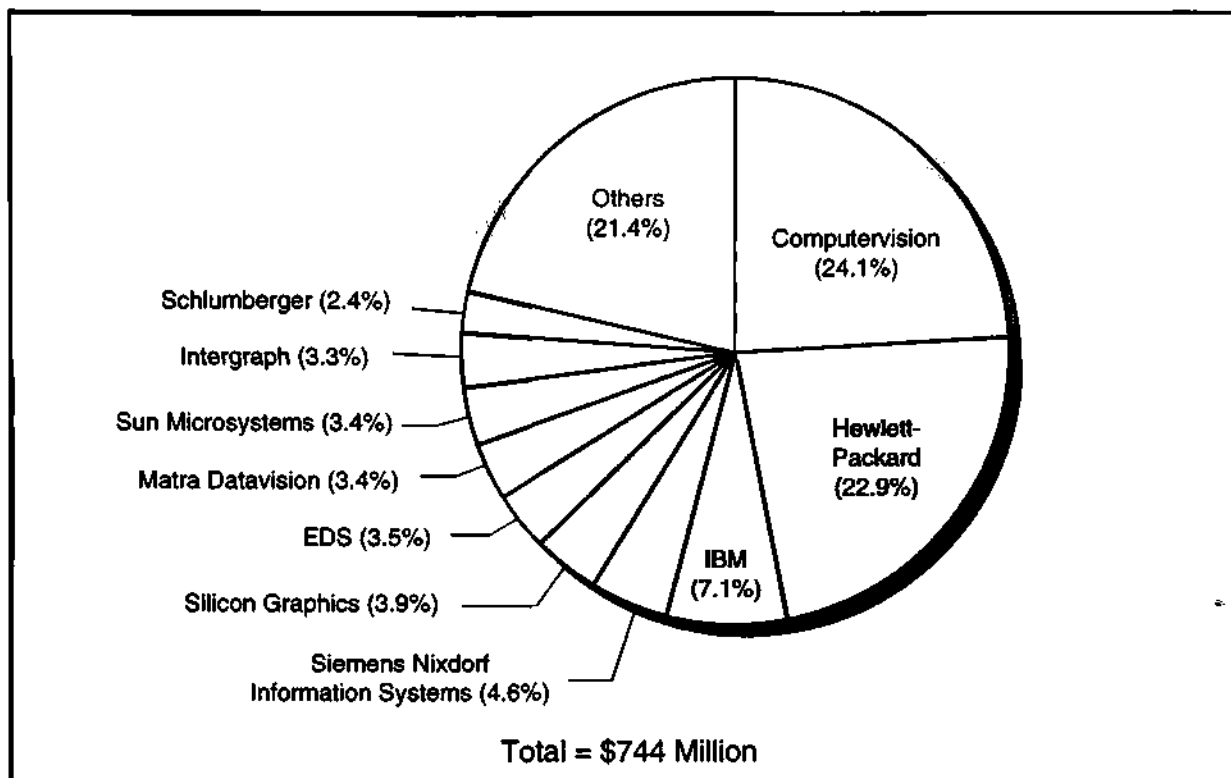
Figure 4-9
1991 Europe Top 10 Market Share, by Software Revenue (Technical Workstations)



Source: Dataquest (October 1992)

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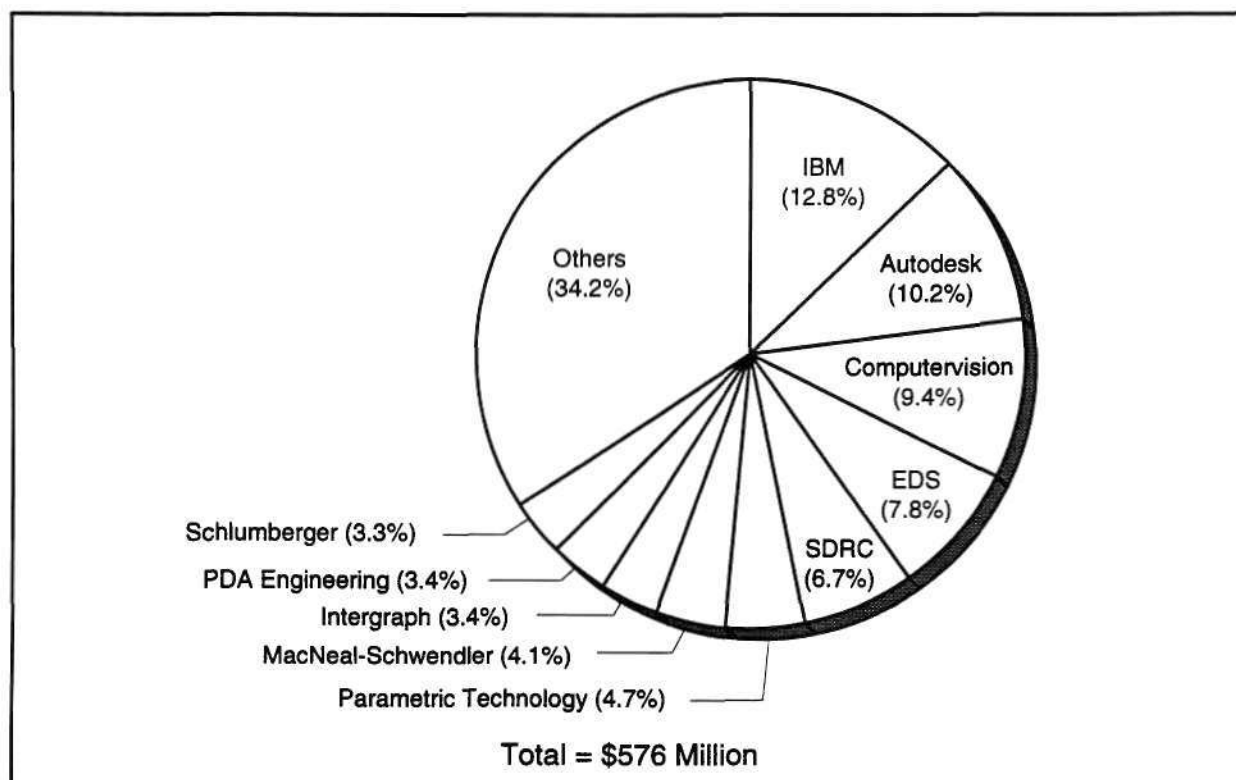
Figure 4-10
1991 Europe Top 10 Market Share, by Hardware Revenue (Technical Workstations)



Source: Dataquest (October 1992)

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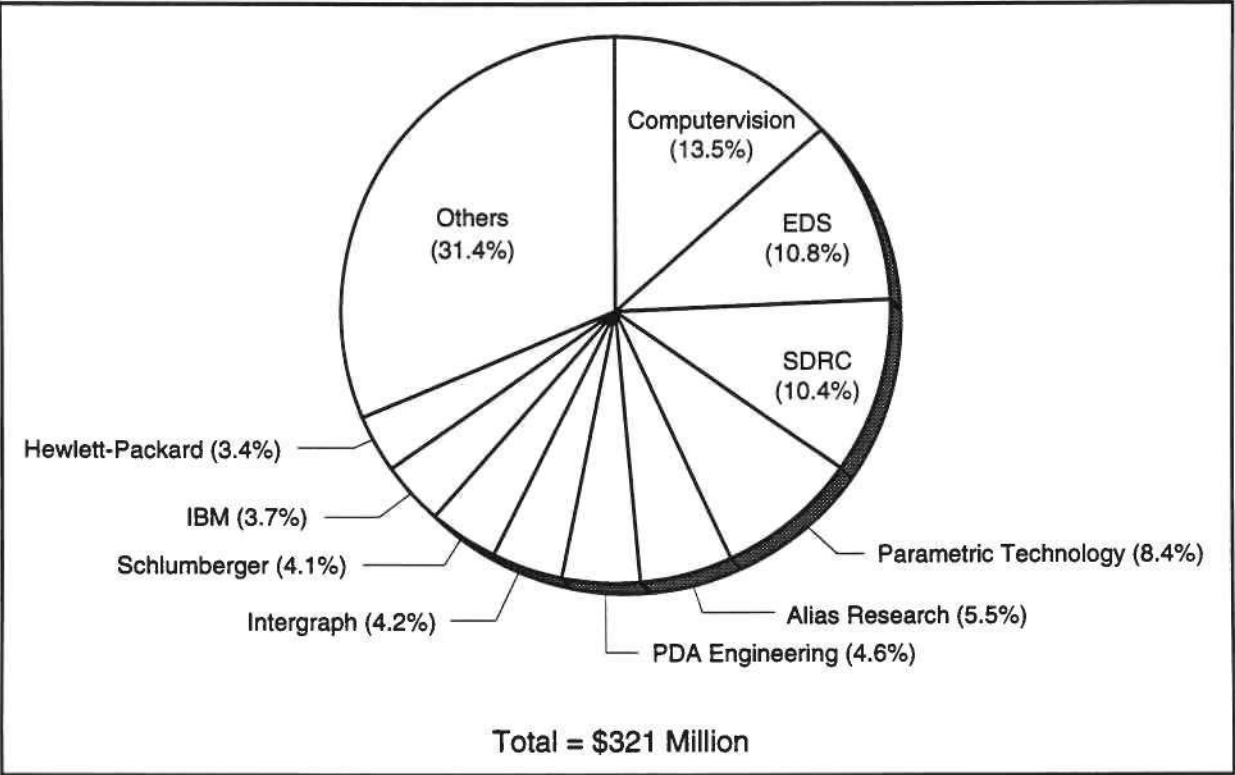
Figure 4-11
1991 North America Top 10 Market Share, by Software Revenue (All Platforms)



Source: Dataquest (October 1992)

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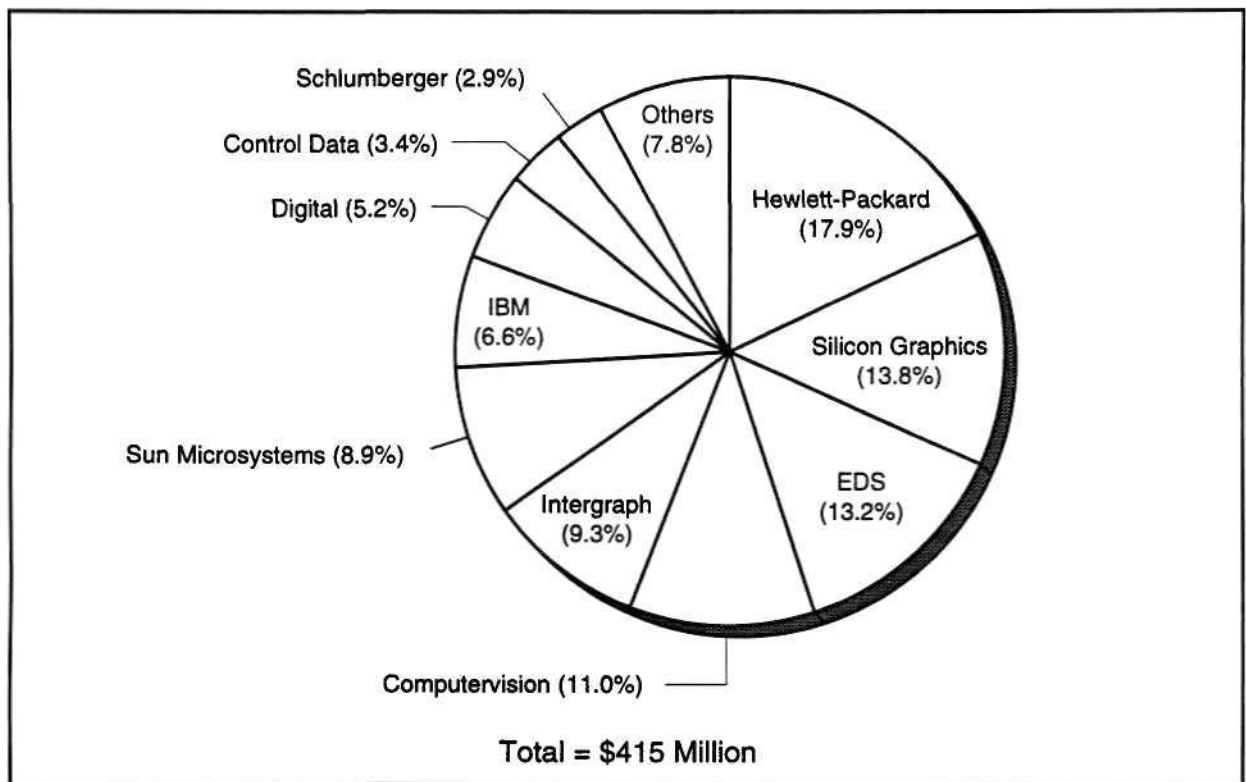
Figure 4-12
1991 North America Top 10 Market Share, by Software Revenue
(Technical Workstations)



Source: Dataquest (October 1992)

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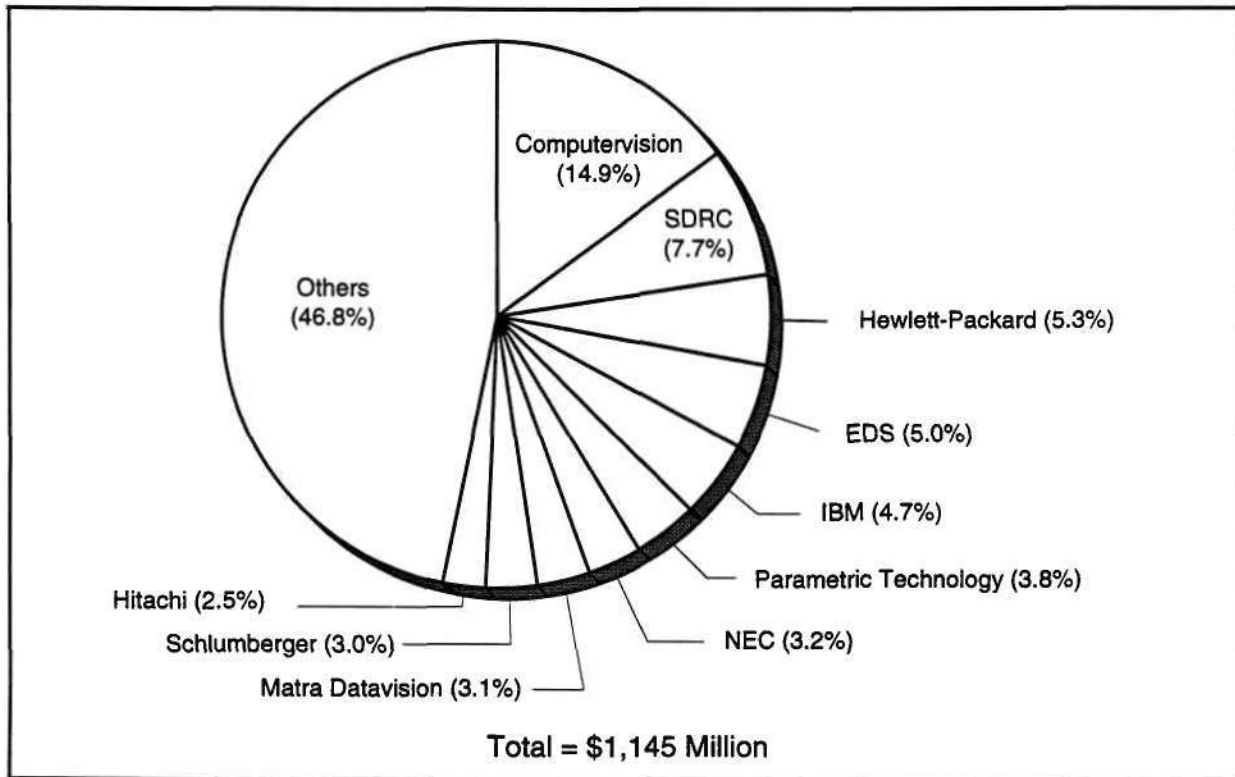
Figure 4-13
1991 North America Top 10 Market Share, by Hardware Revenue
(Technical Workstations)



Source: Dataquest (October 1992)

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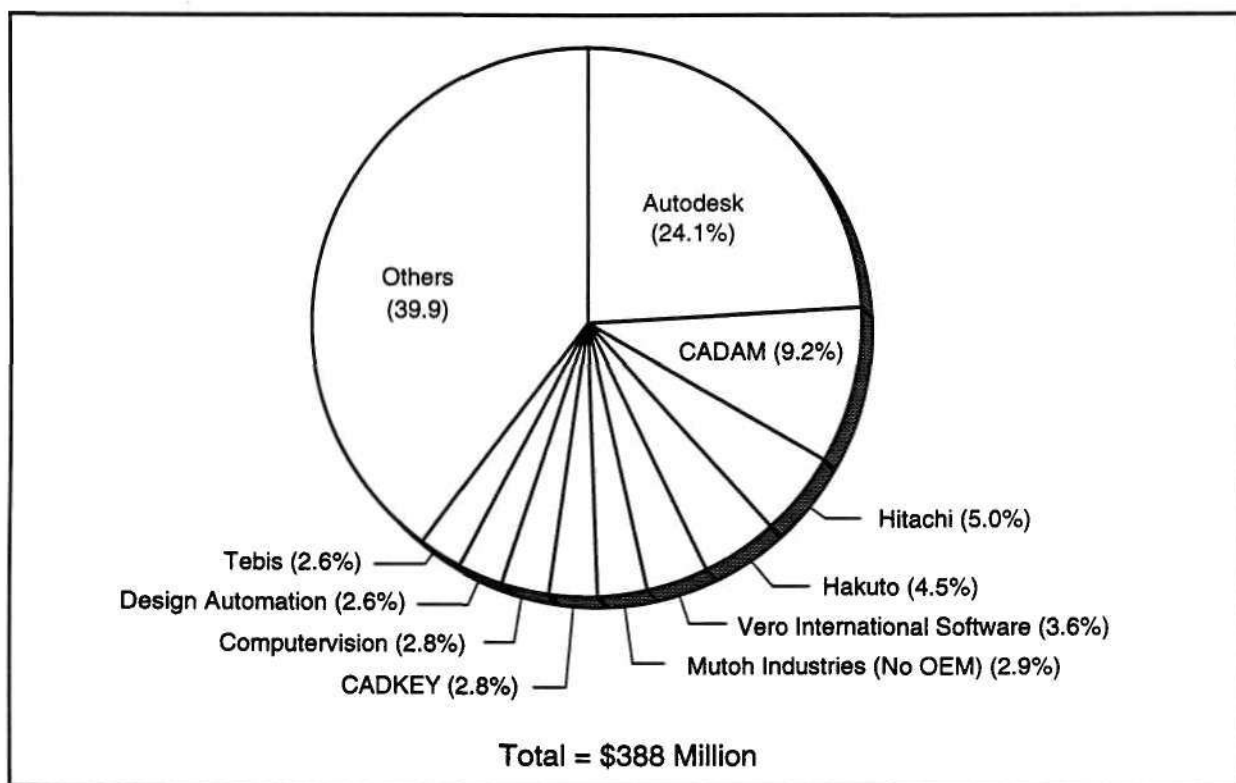
Figure 4-14
1991 Worldwide Top 10 Market Share, by Software Revenue
(Technical Workstations)



Source: Dataquest (October 1992)

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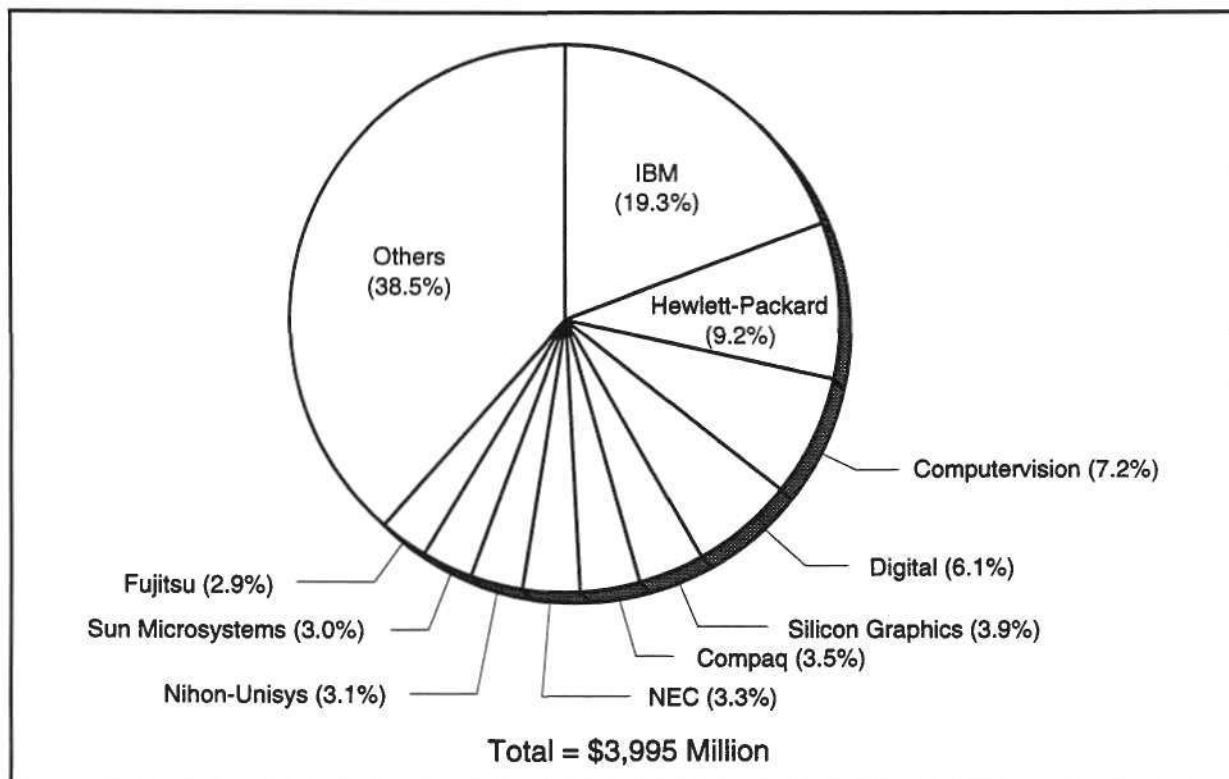
Figure 4-15
1991 Worldwide Top 10 Market Share, by Software Revenue (Personal Computer)



Source: Dataquest (October 1992)

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Figure 4-16
1991 Worldwide Top 10 Market Share, by Hardware Revenue (All Platforms)



Source: Dataquest (October 1992)

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Appendix A
Market Statistics—Mechanical
CAD/CAM/CAE

Table A-1 Worldwide—All Platforms

Company	Total		Market Share					Hardware Units Shipped	Hardware			Software Revenue	Software Revenue	Software Revenue	Hardware Units Shipped
	Factory Revenue	Hardware Revenue	Software Revenue	Hardware Revenue	Software Revenue	Hardware Revenue	Total Factory Revenue		Hardware Revenue	Software Revenue	Hardware Revenue	Software Revenue	Software Revenue	Software Revenue	Hardware Units Shipped
IBM	1,339.6	770.9	321.7	40,515	18.5%	15.8%	15.2%								
Computervision	729.8	287.1	202.3	7,216	10.1%	9.9%	2.7%								
Hewlett-Packard	517.4	367.4	61.0	31,039	7.1%	3.0%	11.7%								
Digital	353.3	243.7	.0	3,494	4.9%	.0%	1.3%								
EDS	208.2	106.7	71.9	3,654	2.9%	3.5%	1.4%								
NEC	198.6	133.7	49.0	9,679	2.7%	2.4%	3.6%								
Nihon Unisys	183.5	122.9	23.9	1,761	2.5%	1.2%	.7%								
Fujitsu	181.6	114.4	49.0	4,086	2.5%	2.4%	1.5%								
Silicon Graphics	171.0	154.8	.0	4,002	2.4%	.0%	1.5%								
Intergraph	168.4	86.1	36.7	2,508	2.3%	1.8%	.9%								
Control Data	166.4	80.1	27.3	1,132	2.3%	1.3%	.4%								
Sun Microsystems	142.0	120.7	.0	7,582	2.0%	.0%	2.8%								
Compaq	141.2	141.2	.0	27,529	2.0%	.0%	10.3%								
Hitachi	135.0	64.8	56.7	3,966	1.9%	2.8%	1.5%								
Schlumberger	131.3	44.1	50.9	1,600	1.8%	2.5%	.6%								
Autodesk	106.2	.0	106.2	0	1.5%	.0%	.0%								
SDRC	101.1	.0	101.1	0	1.4%	.0%	.0%								
Apple Computer	94.9	83.5	.0	19,887	1.3%	.0%	7.5%								
Matra Datavision	79.3	27.9	35.8	757	1.1%	1.8%	.3%								
Toshiba—NO OEM	72.5	38.2	27.0	2,431	1.0%	1.3%	.9%								
Siemens Nixdorf Info systems	71.1	35.6	24.9	1,045	1.0%	1.2%	.4%								
CADAM	64.5	22.5	35.7	4,500	.9%	1.7%	1.7%								
Hitachi Zosen Info Systems	59.1	45.6	1.7	606	.8%	.1%	.2%								

(Continued)

Table A-1 Worldwide—All Platforms (Continued)

Company	Market Share					Hardware Units Shipped	Total			Hardware Revenue	Software Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Revenue	Software Revenue		Factory Revenue	Hardware Revenue	Software Revenue					
MacNeal-Schwendler	55.6	.0	53.4	.0	53.4	0	.8	.0	53.4	.0	53.4	.0	53.4	.0
Mutoh Industries—NO OEM	48.5	26.3	17.7	26.3	17.7	1,332	.7	.7	17.7	.7	17.7	.7	17.7	.5
Parametric Technology	47.2	.0	43.4	.0	43.4	0	.7	.0	43.4	.0	43.4	.0	43.4	.0
Hakuto	47.1	28.3	18.9	28.3	18.9	1,562	.7	.7	18.9	.7	18.9	.7	18.9	.6
Mitsubishi Electric	40.9	31.4	5.5	31.4	5.5	787	.6	.8	5.5	.8	5.5	.3	5.5	.3
STI-Straessle	38.0	8.7	20.9	8.7	20.9	357	.5	.2	20.9	.2	20.9	1.0	20.9	.1
Cisigraph	33.9	11.2	12.9	11.2	12.9	400	.5	.3	12.9	.3	12.9	.6	12.9	.2
Unisys	33.4	17.0	11.7	17.0	11.7	502	.5	.4	11.7	.4	11.7	.6	11.7	.2
PDA Engineering	31.6	.0	30.4	.0	30.4	0	.4	.0	30.4	.0	30.4	1.5	30.4	.0
Sumitomo Denko Workstation	31.2	31.2	.0	31.2	.0	1,739	.4	.8	.0	.8	.0	.0	.0	.7
Sharp System Products—NO OEM	31.2	16.2	15.0	16.2	15.0	205	.4	.4	15.0	.4	15.0	.7	15.0	.1
Alias Research	29.7	.0	27.0	.0	27.0	0	.4	.0	27.0	.0	27.0	1.3	27.0	.0
Gerber Systems	28.9	14.1	9.5	14.1	9.5	400	.4	.4	9.5	.4	9.5	.5	9.5	.2
Swanson Analysis	28.5	.0	28.5	.0	28.5	0	.4	.0	28.5	.0	28.5	1.4	28.5	.0
Investronica SA	28.1	22.5	2.8	22.5	2.8	1,125	.4	.6	2.8	.6	2.8	.1	2.8	.4
Wiechers Datentechnik	27.0	15.4	8.1	15.4	8.1	667	.4	.4	8.1	.4	8.1	.4	8.1	.3
Tokyo Electron—NO OEM	26.8	8.8	12.9	8.8	12.9	99	.4	.2	12.9	.2	12.9	.6	12.9	.0
Auto-Trol	26.3	9.7	10.0	9.7	10.0	329	.4	.2	10.0	.2	10.0	.5	10.0	.1
Cimlinc	25.7	2.6	18.0	2.6	18.0	540	.4	.1	18.0	.1	18.0	.9	18.0	.2
Cimatron	24.4	11.0	11.0	11.0	11.0	781	.3	.3	11.0	.3	11.0	.5	11.0	.3
Mitsui Engineering	21.8	15.2	4.4	15.2	4.4	145	.3	.4	4.4	.4	4.4	.2	4.4	.1
Norsk Data	21.7	11.0	3.8	11.0	3.8	226	.3	.3	3.8	.3	3.8	.2	3.8	.1
ISICAD	20.7	9.1	8.2	9.1	8.2	148	.3	.2	8.2	.2	8.2	.4	8.2	.1

(Continued)

Table A-1 Worldwide—All Platforms (Continued)

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Delcam International	20.4	7.1	10.2	343	.3%	.2%	.5%	.1%
Toyo Information Systems-NO OEM	19.8	12.1	5.8	211	.3%	.3%	.3%	.1%
MCS	19.5	.0	17.2	0	.3%	.0%	.8%	.0%
Fides Industrielle Automation	18.5	2.8	13.0	159	.3%	.1%	.6%	.1%
ADRA Systems	16.2	4.0	10.2	200	.2%	.1%	.5%	.1%
ISKON Software	16.0	7.2	5.6	274	.2%	.2%	.3%	.1%
CAD Lab	15.7	.0	12.6	0	.2%	.0%	.6%	.0%
Digital Kienzle	15.7	8.0	4.4	230	.2%	.2%	.2%	.1%
Vero International Software	15.5	.0	14.1	0	.2%	.0%	.7%	.0%
Kewill Systems	15.5	4.7	8.5	322	.2%	.1%	.4%	.1%
Graphtec Engineering	14.8	7.4	6.6	319	.2%	.2%	.3%	.1%
Tebis	14.5	2.2	10.1	80	.2%	.1%	.5%	.0%
Framasoft	14.2	.0	8.6	0	.2%	.0%	.4%	.0%
Omnron	13.9	12.6	1.4	402	.2%	.3%	.1%	.2%
CADKEY	13.8	.0	13.8	0	.2%	.0%	.7%	.0%
Hahn & Kolb	13.5	8.1	4.1	195	.2%	.2%	.2%	.1%
ICAD	13.0	.0	10.4	0	.2%	.0%	.5%	.0%
Exapt	12.7	6.2	4.3	220	.2%	.2%	.2%	.1%
Dell Computer	12.4	12.4	.0	3,162	.2%	.3%	.0%	1.2%
PAFEC	12.3	.0	12.3	0	.2%	.0%	.6%	.0%
Aries Technology	12.0	.0	10.8	0	.2%	.0%	.5%	.0%
Nestler Electronics	11.0	5.0	6.1	300	.2%	.1%	.3%	.1%
ItalCad	10.8	5.1	2.6	101	.1%	.1%	.1%	.0%

(Continued)

Table A-1 Worldwide—All Platforms (Continued)

Company	Total			Market Share			
	Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue
Design Automation	102	.0	102	0	.1%	.0%	.5%
ICL	102	6.0	3.5	279	.1%	.1%	.2%
Ferranti	10.0	3.7	4.6	87	.1%	.1%	.2%
MARC	10.0	.0	10.0	0	.1%	.0%	.5%
Marcus Computer Systeme	9.8	5.1	3.3	285	.1%	.1%	.2%
Caditron	9.8	4.9	3.9	151	.1%	.1%	.2%
Wacom	9.7	2.0	6.8	155	.1%	.0%	.3%
Radan Computational	9.4	3.3	4.7	315	.1%	.1%	.2%
CNC Software	9.2	.0	9.2	0	.1%	.0%	.4%
Andor	8.5	2.1	6.1	77	.1%	.1%	.3%
Point Control	8.0	.0	8.0	0	.1%	.0%	.4%
Engineering Mechanics	7.6	.4	6.5	604	.1%	.0%	.3%
Mechanical Dynamics	7.5	.0	6.7	0	.1%	.0%	.3%
Research Machines	7.2	7.2	.0	1,162	.1%	.2%	.0%
DAT Standard info systemes	6.5	.0	6.1	0	.1%	.0%	.3%
Technische Computer Systeme	5.8	1.2	4.7	153	.1%	.0%	.2%
Valisys	5.6	.0	5.6	0	.1%	.0%	.3%
Sony	5.6	4.9	.0	325	.1%	.1%	.0%
Ziegler Informatics	5.6	.0	5.6	0	.1%	.0%	.3%
SPATIAL Technology	5.0	.0	5.0	0	.1%	.0%	.2%
Algor Interactive Systems	4.7	.0	4.1	0	.1%	.0%	.2%
Anilam Electronics	4.7	1.4	2.8	58	.1%	.0%	.1%
Serbi	4.6	.0	4.6	0	.1%	.0%	.2%

(Continued)

Table A-1 Worldwide—All Platforms (Continued)

Company	Total			Market Share		
	Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Factory Revenue	Hardware Revenue
Everex Systems	4.5	4.5	.0	1,838	.1%	.1%
Moda CAD	4.2	1.0	2.9	35	.1%	.0%
Whesoe Computing Systems	4.1	.0	4.1	0	.1%	.2%
Pathtrace	4.0	.9	2.6	60	.1%	.1%
Ontos	3.8	.0	3.8	0	.1%	.2%
Micro Engineering Solutions	3.7	1.0	2.4	47	.1%	.1%
XAO Industrie	3.7	1.3	2.2	133	.1%	.1%
CADSI	3.5	.5	2.6	22	.0%	.1%
CADIX	3.2	1.3	1.6	24	.0%	.1%
Solbourne	3.1	3.1	.0	346	.0%	.1%
Clarix	3.1	.0	3.1	0	.0%	.2%
Supdraft	3.1	1.4	1.5	168	.0%	.1%
Micrografx	3.0	.0	3.0	0	.0%	.1%
Century Research Center	2.9	1.6	1.1	12	.0%	.1%
FEA	2.9	.7	.7	17	.0%	.0%
Olivetti	2.9	2.4	.0	436	.0%	.1%
CAMTEK	2.8	.0	2.3	0	.0%	.1%
debis Systemhaus	2.8	.7	1.7	19	.0%	.1%
Catalpa	2.6	.9	1.3	21	.0%	.1%
American Small Business Comp.	2.4	.0	2.4	0	.0%	.1%
Computational Mechanics	2.3	.0	2.3	0	.0%	.1%
Caroline Informatique	2.2	.4	1.1	17	.0%	.1%
ISKA	2.1	1.0	.9	39	.0%	.0%

(Continued)

Table A-1 Worldwide—All Platforms (Continued)

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Kubota Computer	2.0	1.3	.7	113	.0%	.0%	.0%	.0%
Ricoh—NO OEM	1.9	.0	1.6	0	.0%	.0%	.1%	.0%
Rasna Corporation	1.8	.0	1.8	0	.0%	.0%	.1%	.0%
FECS	1.7	.0	1.4	0	.0%	.0%	.1%	.0%
Robocom	1.7	.0	1.7	0	.0%	.0%	.1%	.0%
Softdesk	1.4	.0	1.4	0	.0%	.0%	.1%	.0%
CAD Centre	1.4	.0	1.1	0	.0%	.0%	.1%	.0%
Wisdom Systems	1.4	.0	1.0	0	.0%	.0%	.0%	.0%
Evolution Computing	1.2	.0	1.2	0	.0%	.0%	.1%	.0%
Accugraph	1.1	.5	.5	37	.0%	.0%	.0%	.0%
Object Design	1.0	.0	1.0	0	.0%	.0%	.0%	.0%
S.T.L.D. s.r.l.	1.0	.0	1.0	0	.0%	.0%	.0%	.0%
Objectivity	.9	.0	.9	0	.0%	.0%	.0%	.0%
Vision 3D	.9	.5	.2	6	.0%	.0%	.0%	.0%
Zuken	.8	.3	.5	5	.0%	.0%	.0%	.0%
Innovative Data Design	.8	.0	.8	0	.0%	.0%	.0%	.0%
Foresight Resources	.8	.0	.7	0	.0%	.0%	.0%	.0%
Aura CAD/CAM Systems	.7	.0	.6	0	.0%	.0%	.0%	.0%
Ithaca Software	.7	.0	.7	0	.0%	.0%	.0%	.0%
ESDU International	.7	.0	.7	0	.0%	.0%	.0%	.0%
A.I. Systems	.7	.0	.7	0	.0%	.0%	.0%	.0%
GRAPHISOFT	.6	.0	.6	0	.0%	.0%	.0%	.0%
Machinery Sales	.6	.0	.6	0	.0%	.0%	.0%	.0%

(Continued)

Table A-1 Worldwide—All Platforms (Continued)

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
CADWorks	.6	.0	.5	0	.0%	.0%	.0%	.0%
Graphisoft Software Dev	.6	.0	.6	0	.0%	.0%	.0%	.0%
Uniras	.4	.0	.4	0	.0%	.0%	.0%	.0%
Cascade Graphics	.4	.0	.4	0	.0%	.0%	.0%	.0%
Engineering Systems Corp.	.4	.0	.3	0	.0%	.0%	.0%	.0%
Ashlar	.3	.0	.3	0	.0%	.0%	.0%	.0%
Spectrum Graphics	.3	.1	.2	3	.0%	.0%	.0%	.0%
Georgia Tech Research Corp.	.3	.0	.3	0	.0%	.0%	.0%	.0%
Mc2 Engineering Software	.3	.0	.3	0	.0%	.0%	.0%	.0%
Synthesis	.3	.0	.3	0	.0%	.0%	.0%	.0%
A/E Microsystems	.3	.2	.0	25	.0%	.0%	.0%	.0%
Mega CADD	.2	.0	.2	0	.0%	.0%	.0%	.0%
CAD-Capture	.2	.0	.0	0	.0%	.0%	.0%	.0%
DAPCO	.2	.0	.1	0	.0%	.0%	.0%	.0%
Engineered Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Lamp Software	.1	.0	.1	6	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.1	0	.0%	.0%	.0%	.0%
IGC Technology	.1	.0	.1	0	.0%	.0%	.0%	.0%
Number One Systems	.0	.0	.0	1	.0%	.0%	.0%	.0%
Other Companies	454.2	441.3	.0	62,133	6.3%	11.0%	.0%	23.4%
All Companies	7,238.5	3,995.0	2,040.1	266,062	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	5,410.1	3,030.2	1,408.4	225,025	74.7%	75.8%	69.0%	84.6%

(Continued)

Table A-1 Worldwide—All Platforms (Continued)

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
All Asian-Based Companies	1,171.1	722.5	323.7	30,040	16.2%	18.1%	15.9%	11.3%
All European-Based Companies	657.3	242.3	308.0	10,997	9.1%	6.1%	15.1%	4.1%
All Hardware Companies	1,813.5	1,578.1	5.7	186,666	25.1%	39.5%	.3%	70.2%
All Turnkey & SW Companies	5,425.0	2,417.0	2,034.3	79,395	74.9%	60.5%	99.7%	29.8%

Source: Dataquest (October 1992)

Table A-2 Worldwide—Technical Workstation

Company	Total			Market Share					
	Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	
Computervision	631.2	252.1	170.6	5,365	17.6%	14.1%	14.9%	7.8%	
Hewlett-Packard	447.5	311.5	61.0	17,799	12.5%	17.4%	5.3%	25.9%	
IBM	213.6	118.4	53.5	5,619	5.9%	6.6%	4.7%	8.2%	
EDS	166.0	85.3	57.2	2,525	4.6%	4.8%	5.0%	3.7%	
Silicon Graphics	164.7	149.6	.0	3,896	4.6%	8.4%	.0%	5.7%	
Intergraph	133.0	71.4	25.1	2,077	3.7%	4.0%	2.2%	3.0%	
NEC	99.3	54.6	36.7	3,112	2.8%	3.1%	3.2%	4.5%	
Sun Microsystems	97.1	84.1	.0	5,929	2.7%	4.7%	.0%	8.6%	
Schlumberger	91.9	31.5	34.7	979	2.6%	1.8%	3.0%	1.4%	
SDRC	88.0	.0	88.0	0	2.5%	.0%	7.7%	.0%	
Matra Datavision	79.3	27.9	35.8	757	2.2%	1.6%	3.1%	1.1%	
Fujitsu	74.4	46.9	20.1	1,804	2.1%	2.6%	1.8%	2.6%	
Siemens Nixdorf Info Systeme	71.1	35.6	24.9	1,044	2.0%	2.0%	2.2%	1.5%	
Hitachi	67.5	32.4	28.4	1,334	1.9%	1.8%	2.5%	1.9%	
Digital	63.7	44.0	.0	2,727	1.8%	2.5%	.0%	4.0%	
Nihon Unisys	58.7	39.3	7.6	728	1.6%	2.2%	.7%	1.1%	
Control Data	58.2	35.5	12.2	791	1.6%	2.0%	1.1%	1.2%	
Hitachi Zosen Info Systems	55.6	45.6	1.7	606	1.5%	2.5%	.1%	.9%	
Parametric Technology	47.2	.0	43.4	0	1.3%	.0%	3.8%	.0%	
Toshiba—NO OEM	42.0	21.0	16.8	477	1.2%	1.2%	1.5%	.7%	
STI—Straessle	38.0	8.7	20.9	357	1.1%	.5%	1.8%	.5%	
Cisgraph	30.5	10.1	11.6	360	.8%	.6%	1.0%	.5%	
Mitsubishi Electric	29.8	25.4	2.1	330	.8%	1.4%	.2%	.5%	

(Continued)

Table A-2 Worldwide—Technical Workstation (Continued)

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Alias Research	29.7	.0	27.0	0	.8%	.0%	2.4%	.0%
Sumitomo Denko Workstation	29.1	29.1	.0	1,577	.8%	1.6%	.0%	2.3%
Gerber Systems	28.9	14.1	9.5	400	.8%	.8%	.8%	.6%
Sharp System Products—NO OEM	27.1	14.1	13.0	168	.8%	.8%	1.1%	.2%
Tokyo Electron—NO OEM	26.8	8.8	12.9	99	.7%	.5%	1.1%	.1%
Auto-Trol	26.3	9.7	10.0	329	.7%	.5%	.9%	.5%
Unisys	25.7	13.1	9.0	398	.7%	.7%	.8%	.6%
Cimlinc	25.7	2.6	18.0	540	.7%	.1%	1.6%	.8%
PDA Engineering	23.7	.0	22.8	0	.7%	.0%	2.0%	.0%
Delcam International	20.4	7.1	10.2	343	.6%	.4%	.9%	.5%
Mitsui Engineering	19.8	13.9	4.0	112	.6%	.8%	.3%	.2%
ISICAD	18.8	9.1	6.3	148	.5%	.5%	.6%	.2%
Mutoh Industries—NO OEM	17.0	8.2	5.8	223	.5%	.5%	.5%	.3%
Cimatron	16.3	7.3	7.3	365	.5%	.4%	.6%	.5%
ISYKON Software	16.0	7.2	5.6	274	.4%	.4%	.5%	.4%
Toyo Information Systems—NO OEM	15.8	9.9	4.5	187	.4%	.6%	.4%	.3%
Fides Industrielle Automation	15.7	2.4	11.0	149	.4%	.1%	1.0%	.2%
Digital Kienzle	15.7	8.0	4.4	230	.4%	.4%	.4%	.3%
CAD Lab	14.9	.0	12.0	0	.4%	.0%	1.0%	.0%
Graphtec Engineering	14.8	7.4	6.6	319	.4%	.4%	.6%	.5%
Swanson Analysis	14.3	.0	14.3	0	.4%	.0%	1.2%	.0%
Kewill Systems	14.0	4.2	7.7	309	.4%	.2%	.7%	.4%
Omron	13.9	12.6	1.4	402	.4%	.7%	.1%	.6%

(Continued)

Table A-2 Worldwide—Technical Workstation (Continued)

Company	Market Share				Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
ICAD	13.0	.0	10.4	0	.4%	.0%	.9%	.0%
Framasoft	12.8	.0	7.7	0	.4%	.0%	.7%	.0%
Hahn & Kolb	12.8	7.7	3.9	181	.4%	.4%	.3%	.3%
Autodesk	12.7	.0	12.7	0	.4%	.0%	1.1%	.0%
ADRA Systems	12.5	4.0	7.2	200	.3%	.2%	.6%	.3%
Nestler Electronics	11.0	5.0	6.1	300	.3%	.3%	.5%	.4%
ItalCad	10.8	5.1	2.6	101	.3%	.3%	.2%	.1%
PAFEC	10.5	.0	10.5	0	.3%	.0%	.9%	.0%
ICL	10.2	6.0	3.5	279	.3%	.3%	.3%	.4%
Ferranti	10.0	3.7	4.6	87	.3%	.2%	.4%	.1%
Norsk Data	10.0	5.8	2.0	130	.3%	.3%	.2%	.2%
Marcus Computer Systems	9.8	5.1	3.3	285	.3%	.3%	.3%	.4%
Artes Technology	9.6	.0	8.7	0	.3%	.0%	.8%	.0%
Radan Computational	9.3	3.3	4.7	310	.3%	.2%	.4%	.5%
MCS	9.0	.0	8.0	0	.2%	.0%	.7%	.0%
Wiechers Datentechnik	7.0	4.0	2.1	90	.2%	.2%	.2%	.1%
MARC	7.0	.0	7.0	0	.2%	.0%	.6%	.0%
Mechanical Dynamics	6.4	.0	5.7	0	.2%	.0%	.5%	.0%
MacNeal-Schwendler	6.1	.0	5.9	0	.2%	.0%	.5%	.0%
Technische Computer Systeme	5.8	1.2	4.7	153	.2%	.1%	.4%	.2%
Sony	5.6	4.9	.0	325	.2%	.3%	.0%	.5%
Valisys	5.6	.0	5.6	0	.2%	.0%	.5%	.0%
SPATIAL Technology	5.0	.0	5.0	0	.1%	.0%	.4%	.0%

(Continued)

Table A-2 Worldwide—Technical Workstation (Continued)

Company	Total			Market Share		
	Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Factory Revenue	Hardware Units Shipped
Engineering Mechanics	4.4	2	3.7	212	.1%	.3%
Ontos	3.8	.0	3.8	0	.1%	.0%
XAO Industrie	3.7	1.3	2.2	133	.1%	.2%
Exapt	3.4	1.7	1.2	110	.1%	.2%
Hakuto	3.3	2.0	1.3	63	.1%	.1%
CADIX	3.2	1.3	1.6	24	.1%	.0%
CADKEY	2.8	.0	2.8	0	.1%	.0%
CADSI	2.8	.4	2.1	12	.1%	.0%
Catalpa	2.6	.9	1.3	21	.1%	.0%
ISKA	2.1	1.0	.9	39	.1%	.1%
debris Systemhaus	2.1	.5	1.3	11	.1%	.0%
CAMTEK	2.0	.0	1.6	0	.1%	.0%
Ricoh—NO OEM	1.9	.0	1.6	0	.1%	.0%
Caroline Informatique	1.6	.3	.8	8	.0%	.0%
Century Research Center	1.5	.8	.6	9	.0%	.0%
Kubota Computer	1.5	1.0	.5	97	.0%	.1%
Micro Engineering Solutions	1.4	.4	.9	13	.0%	.0%
CAD Centre	1.4	.0	1.1	0	.0%	.0%
Wisdom Systems	1.4	.0	1.0	0	.0%	.0%
Wacom	1.3	.3	1.0	13	.0%	.0%
Solbourne	1.3	1.3	.0	254	.0%	.4%
FEA	1.2	.3	.3	3	.0%	.0%
Object Design	1.0	.0	1.0	0	.0%	.0%

(Continued)

Table A-2 Worldwide—Technical Workstation (Continued)

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
FEGS	1.0	.0	.8	0	.0%	.0%	.1%	.0%
Accugraph	1.0	.5	.4	36	.0%	.0%	.0%	.1%
Objectivity	.9	.0	.9	0	.0%	.0%	.1%	.0%
Zuken	.8	.3	.5	5	.0%	.0%	.0%	.0%
Computational Mechanics	.6	.0	.6	0	.0%	.0%	.1%	.0%
Point Control	.6	.0	.6	0	.0%	.0%	.0%	.0%
Everex Systems	.5	.5	.0	83	.0%	.0%	.0%	.1%
Whessoe Computing Systems	.4	.0	.4	0	.0%	.0%	.0%	.0%
Spectrum Graphics	.3	.1	.2	3	.0%	.0%	.0%	.0%
Softdesk	.3	.0	.3	0	.0%	.0%	.0%	.0%
Ithaca Software	.3	.0	.3	0	.0%	.0%	.0%	.0%
A/E Microsystems	.2	.2	.0	21	.0%	.0%	.0%	.0%
Serbi	.2	.0	.2	0	.0%	.0%	.0%	.0%
DAPCO	.2	.0	.1	0	.0%	.0%	.0%	.0%
Georgia Tech Research Corp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
Algor Interactive Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
CADWorks	.1	.0	.0	0	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.1	0	.0%	.0%	.0%	.0%
Lamp Software	.0	.0	.0	3	.0%	.0%	.0%	.0%
ESDU International	.0	.0	.0	0	.0%	.0%	.0%	.0%
Synthesis	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	3,590.7	1,790.2	1,145.4	68,799	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	2,505.1	1,239.5	756.9	50,352	69.8%	69.2%	66.1%	73.2%
All Asian-Based Companies	610.8	379.5	168.6	12,014	17.0%	21.2%	14.7%	17.5%

(Continued)

Table A-2 Worldwide—Technical Workstation (Continued)

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
All European-Based Companies	474.9	171.2	220.0	6,434	13.2%	9.6%	19.2%	9.4%
All Hardware Companies	531.5	452.4	2.6	25,548	14.8%	25.3%	.2%	37.1%
All Turnkey & SW Companies	3,059.2	1,337.8	1,142.9	43,252	85.2%	74.7%	99.8%	62.9%

Source: Dataquest (October 1992)

Table A-3 Worldwide—Host-Dependent

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	815.1	440.1	216.0	10,709	42.2%	38.8%	51.6%	38.5%
Digital	195.1	134.6	.0	0	10.1%	11.9%	.0%	.0%
Nihon Unisys	124.8	83.6	16.2	1,033	6.5%	7.4%	3.9%	3.7%
Control Data	104.8	43.0	14.7	334	5.4%	3.8%	3.5%	1.2%
Fujitsu	78.1	49.2	21.1	1,316	4.0%	4.3%	5.0%	4.7%
Computervision	71.6	28.9	16.3	1,592	3.7%	2.5%	3.9%	5.7%
NEC	53.6	40.8	8.6	126	2.8%	3.6%	2.0%	.5%
EDS	42.2	21.4	14.7	1,129	2.2%	1.9%	3.5%	4.1%
MacNeal-Schwendler	31.7	.0	30.5	0	1.6%	.0%	7.3%	.0%
Schlumberger	23.6	7.5	9.8	431	1.2%	.7%	2.3%	1.5%
Hitachi	21.6	10.4	9.1	363	1.1%	.9%	2.2%	1.3%
SDRC	13.2	.0	13.2	0	.7%	.0%	3.1%	.0%
Norsk Data	11.5	5.1	1.7	91	.6%	.4%	.4%	.3%
Exapt	9.3	4.5	3.2	110	.5%	.4%	.8%	.4%
Swanson Analysis	8.9	.0	8.9	0	.5%	.0%	2.1%	.0%
PDA Engineering	7.9	.0	7.6	0	.4%	.0%	1.8%	.0%
Unisys	7.7	3.9	2.7	104	.4%	.3%	.6%	.4%
Toshiba—NO OEM	7.3	3.6	2.9	125	.4%	.3%	.7%	.5%
MCS	6.6	.0	5.8	0	.3%	.0%	1.4%	.0%
Mitsubishi Electric	6.5	3.1	1.8	21	.3%	.3%	.4%	.1%
Intergraph	5.0	2.5	.8	68	.3%	.2%	.2%	.2%
Toyo Information Systems—NO OEM	4.1	2.2	1.3	24	.2%	.2%	.3%	.1%
Hitachi Zosen Info Systems	3.6	.0	.0	0	.2%	.0%	.0%	.0%

(Continued)

Table A-3 Worldwide—Host-Dependent (Continued)

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
MARC	3.0	.0	3.0	0	.2%	.0%	.7%	.0%
Fides Industrielle Automation	2.8	.4	1.9	10	.1%	.0%	.5%	.0%
Computational Mechanics	1.7	.0	1.7	0	.1%	.0%	.4%	.0%
Kewill Systems	1.6	.5	.9	14	.1%	.0%	.2%	.0%
Century Research Center	1.4	.8	.5	2	.1%	.1%	.1%	.0%
Framasoft	1.4	.0	.8	0	.1%	.0%	.2%	.0%
Mechanical Dynamics	1.1	.0	1.0	0	.1%	.0%	.2%	.0%
Whessoe Computing Systems	.8	.0	.8	0	.0%	.0%	.2%	.0%
FECS	.7	.0	.6	0	.0%	.0%	.1%	.0%
Kubota Computer	.5	.3	.2	16	.0%	.0%	.0%	.1%
debis Systemhaus	.3	.1	.2	2	.0%	.0%	.0%	.0%
Olivetti	.3	.3	.0	7	.0%	.0%	.0%	.0%
FEA	.3	.1	.1	1	.0%	.0%	.0%	.0%
Georgia Tech Research Corp.	.2	.0	.2	0	.0%	.0%	.0%	.0%
Engineering Systems Corp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
ESDU International	.0	.0	.0	0	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
Other Companies	259.9	246.9	.0	10,209	13.5%	21.8%	.0%	36.7%
All Companies	1,929.7	1,133.5	418.5	27,835	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	1,597.7	928.8	345.0	24,575	82.8%	81.9%	82.4%	88.3%
All Asian-Based Companies	301.4	193.9	61.7	3,027	15.6%	17.1%	14.7%	10.9%
All European-Based Companies	30.6	10.9	11.9	233	1.6%	1.0%	2.8%	.8%
All Hardware Companies	477.4	390.9	3.1	10,292	24.7%	34.5%	.7%	37.0%
All Turnkey & SW Companies	1,452.3	742.6	415.4	17,543	75.3%	65.5%	99.3%	63.0%

Source: Dataquest (October 1992)

Table A-4 Worldwide—Server

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	214.9	121.1	52.2	1,358	47.1%	45.3%	59.0%	26.0%
Digital	94.4	65.2	.0	768	20.7%	24.4%	.0%	14.7%
Sun Microsystems	44.9	36.6	.0	1,653	9.8%	13.7%	.0%	31.6%
Intergraph	25.3	12.3	6.1	364	5.5%	4.6%	6.9%	7.0%
MacNeal-Schwendler	16.7	.0	16.0	0	3.7%	.0%	18.1%	.0%
Computervision	15.8	6.1	4.8	129	3.5%	2.3%	5.4%	2.5%
Schlumberger	14.5	4.7	5.9	151	3.2%	1.8%	6.6%	2.9%
Silicon Graphics	6.3	5.2	.0	106	1.4%	1.9%	.0%	2.0%
Toshiba—NO OEM	5.1	4.6	.0	83	1.1%	1.7%	.0%	1.6%
Cisigraph	3.4	1.1	1.3	40	.7%	.4%	1.4%	.8%
Control Data	3.3	1.6	.4	6	.7%	.6%	.4%	.1%
Hewlett-Packard	3.0	2.4	.0	228	.7%	.9%	.0%	4.4%
Mutoh Industries—NO OEM	2.4	1.8	.6	75	.5%	.7%	.7%	1.4%
Sumitomo Denko Workstation	2.2	2.2	.0	162	.5%	.8%	.0%	3.1%
Solbourne	1.9	1.8	.0	92	.4%	.7%	.0%	1.8%
Sharp System Products—NO OEM	1.6	.8	.8	7	.3%	.3%	.8%	.1%
Rasna Corporation	.5	.0	.5	0	.1%	.0%	.6%	.0%
A/E Microsystems	.0	.0	.0	2	.0%	.0%	.0%	.0%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	456.0	267.5	88.5	5,223	100.0%	100.0%	100.0%	100.0%

(Continued)

Table A-4 Worldwide—Server (Continued)

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
All N.A.-Based Companies	441.3	257.0	85.8	4,856	96.8%	96.1%	97.0%	93.0%
All Asian-Based Companies	11.3	9.4	1.4	327	2.5%	3.5%	1.5%	6.3%
All European-Based Companies	3.4	1.1	1.3	40	.7%	.4%	1.4%	.8%
All Hardware Companies	155.2	115.6	.1	3,476	34.0%	43.2%	.1%	66.5%
All Turnkey & SW Companies	300.7	151.9	88.4	1,748	66.0%	56.8%	99.9%	33.5%

Source: Dataquest (October 1992)

Table A-5 Worldwide—Personal Computer

Company	Total Factory Revenue	Market Share									
		Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped			
Compaq	141.2	141.2	.0	27,529	11.2%	17.6%	.0%	16.8%			
IBM	96.1	91.3	.0	22,829	7.6%	11.4%	.0%	13.9%			
Apple Computer	94.9	83.5	.0	19,887	7.5%	10.4%	.0%	12.1%			
Autodesk	93.5	.0	93.5	0	7.4%	.0%	24.1%	.0%			
Hewlett-Packard	67.0	53.5	.0	13,013	5.3%	6.7%	.0%	7.9%			
CADAM	64.5	22.5	35.7	4,500	5.1%	2.8%	9.2%	2.7%			
Hitachi	45.9	22.0	19.3	2,269	3.6%	2.7%	5.0%	1.4%			
NEC	45.7	38.4	3.7	6,441	3.6%	4.8%	.9%	3.9%			
Hakuto	43.8	26.3	17.5	1,499	3.5%	3.3%	4.5%	.9%			
Mutoh Industries—NO OEM	29.1	16.3	11.4	1,034	2.3%	2.0%	2.9%	.6%			
Fujitsu	29.1	18.3	7.8	965	2.3%	2.3%	2.0%	.6%			
Investronica SA	28.1	22.5	2.8	1,125	2.2%	2.8%	.7%	.7%			
Wiechers Datentechnik	20.0	11.4	6.0	577	1.6%	1.4%	1.5%	.4%			
Toshiba—NO OEM	18.1	9.1	7.2	1,747	1.4%	1.1%	1.9%	1.1%			
Vero International Software	15.5	.0	14.1	0	1.2%	.0%	3.6%	.0%			
Tebis	14.5	2.2	10.1	80	1.1%	.3%	2.6%	.0%			
Dell Computer	12.4	12.4	.0	3,162	1.0%	1.5%	.0%	1.9%			
Computervision	11.2	.0	10.7	130	.9%	.0%	2.7%	.1%			
CADKEY	11.0	.0	11.0	0	.9%	.0%	2.8%	.0%			
Design Automation	10.2	.0	10.2	0	.8%	.0%	2.6%	.0%			
Caditron	9.8	4.9	3.9	151	.8%	.6%	1.0%	.1%			
CNC Software	9.2	.0	9.2	0	.7%	.0%	2.4%	.0%			
Andor	8.5	2.1	6.1	77	.7%	.3%	1.6%	.0%			

(Continued)

Table A-5 Worldwide—Personal Computer (Continued)

Company	Total			Market Share				
	Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Wacom	8.4	1.6	5.8	141	.7%	.2%	1.5%	.1%
Cimatron	8.0	3.6	3.6	417	.6%	.4%	.9%	.3%
Point Control	7.4	.0	7.4	0	.6%	.0%	1.9%	.0%
Research Machines	7.2	7.2	.0	1,162	.6%	.9%	.0%	.7%
DAT Standard info ssystems	6.5	.0	6.1	0	.5%	.0%	1.6%	.0%
Ziegler Informatics	5.6	.0	5.6	0	.4%	.0%	1.4%	.0%
Swanson Analysis	5.3	.0	5.3	0	.4%	.0%	1.4%	.0%
Intergraph	5.0	.0	4.8	0	.4%	.0%	1.2%	.0%
Anilam Electronics	4.7	1.4	2.8	58	.4%	.2%	.7%	.0%
Algor Interactive Systems	4.6	.0	4.0	0	.4%	.0%	1.0%	.0%
Mitsubishi Electric	4.5	3.0	1.5	435	.4%	.4%	.4%	.3%
Serbi	4.4	.0	4.4	0	.3%	.0%	1.1%	.0%
Moda CAD	4.2	1.0	2.9	35	.3%	.1%	.8%	.0%
Pathtrace	4.0	.9	2.6	60	.3%	.1%	.7%	.0%
Everex Systems	4.0	4.0	.0	1,754	.3%	.5%	.0%	1.1%
MCS	3.9	.0	3.5	0	.3%	.0%	.9%	.0%
ADRA Systems	3.7	.0	3.0	0	.3%	.0%	.8%	.0%
Engineering Mechanics	3.2	.2	2.7	392	.3%	.0%	.7%	.2%
Clarix	3.1	.0	3.1	0	.2%	.0%	.8%	.0%
Superdraft	3.1	1.4	1.5	168	.2%	.2%	.4%	.1%
Micrografx	3.0	.0	3.0	0	.2%	.0%	.8%	.0%
Whesoe Computing Systems	2.9	.0	2.9	0	.2%	.0%	.7%	.0%
Olivetti	2.5	2.2	.0	429	.2%	.3%	.0%	.3%

(Continued)

Table A-5 Worldwide—Personal Computer (Continued)

Company	Total		Market Share				Hardware Units Shipped	Total		Market Share				Hardware Units Shipped
	Factory Revenue	Hardware Revenue	Software Revenue	Hardware Revenue	Software Revenue	Hardware Revenue		Factory Revenue	Hardware Revenue	Software Revenue	Hardware Revenue	Software Revenue	Hardware Revenue	
Sharp System Products—NO OEM	2.5	1.3	1.2				31	2%	2%		2%	.3%		.0%
Aries Technology	2.4	.0	2.2				0	2%	.0%		.0%	.6%		.0%
American Small Business Comp.	2.4	.0	2.4				0	2%	.0%		.0%	.6%		.0%
Micro Engineering Solutions	2.3	.7	1.5				35	2%	.1%		.1%	.4%		.0%
Mitsui Engineering	2.0	1.4	.4				33	2%	2%		2%	.1%		.0%
PAFEC	1.9	.0	1.9				0	1%	.0%		.0%	.5%		.0%
ISICAD	1.9	.0	1.9				0	1%	.0%		.0%	.5%		.0%
Robocom	1.7	.0	1.7				0	1%	.0%		.0%	.4%		.0%
FEA	1.4	.3	.4				13	1%	.0%		.0%	.1%		.0%
Schlumberger	1.3	.3	.6				39	1%	.0%		.0%	.2%		.0%
Rasna Corporation	1.3	.0	1.3				0	1%	.0%		.0%	.3%		.0%
Evolution Computing	1.2	.0	1.2				0	1%	.0%		.0%	.3%		.0%
MacNeal-Schwendler	1.1	.0	1.1				0	1%	.0%		.0%	.3%		.0%
Softdesk	1.1	.0	1.1				0	1%	.0%		.0%	.3%		.0%
S.T.L.D. s.r.l.	1.0	.0	1.0				0	1%	.0%		.0%	.2%		.0%
Vision 3D	.9	.5	.2				6	1%	.1%		.1%	.1%		.0%
CAMTEK	.9	.0	.7				0	1%	.0%		.0%	.2%		.0%
Foresight Resources	.8	.0	.7				0	1%	.0%		.0%	.2%		.0%
Innovative Data Design	.8	.0	.8				0	1%	.0%		.0%	.2%		.0%
CAD Lab	.8	.0	.6				0	1%	.0%		.0%	.2%		.0%
CADSI	.7	.1	.5				10	1%	.0%		.0%	.1%		.0%
Aura CAD/CAM Systems	.7	.0	.6				0	1%	.0%		.0%	.2%		.0%
Hahn & Kolb	.7	.4	.2				14	1%	.0%		.0%	.1%		.0%

(Continued)

Table A-5 Worldwide—Personal Computer (Continued)

Company	Total			Market Share		
	Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Units Shipped
A.I. Systems	.7	.0	.7	0	1%	2%
Caroline Informatique	.6	.1	.3	9	1%	1%
GRAPHISOFT	.6	.0	.6	0	1%	2%
ESDU International	.6	.0	.6	0	0%	2%
Machinery Sales	.6	.0	.6	0	0%	2%
Graphisoft Software Dev.	.6	.0	.6	0	0%	1%
CADWorks	.5	.0	.4	0	0%	1%
Unitas	.4	.0	.4	0	0%	1%
Cascade Graphics	.4	.0	.4	0	0%	1%
Ithaca Software	.4	.0	.4	0	0%	1%
debi Systemhaus	.3	.1	.2	6	0%	1%
Ashlar	.3	.0	.3	0	0%	1%
Mc2 Engineering Software	.3	.0	.3	0	0%	1%
Synthesis	.3	.0	.3	0	0%	1%
Engineering Systems Corp.	.3	.0	.2	0	0%	1%
Mega CADD	.2	.0	.2	0	0%	1%
Norsk Data	.2	.1	.0	6	0%	0%
CAD-Capture	.2	.0	.0	0	0%	0%
Engineered Software	.1	.0	.1	0	0%	0%
IGC Technology	.1	.0	.1	0	0%	0%
Accugraph	.1	.0	.1	0	0%	0%
Lamp Software	.1	.0	.1	4	0%	0%
Radan Computational	.1	.0	.1	5	0%	0%

(Continued)

Table A-5 Worldwide—Personal Computer (Continued)

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Masta Corporation	.1	.0	.0	0	.0%	.0%	.0%	.0%
A/E Microsystems	.0	.0	.0	2	.0%	.0%	.0%	.0%
Number One Systems	.0	.0	.0	1	.0%	.0%	.0%	.0%
Other Companies	194.3	194.3	.0	51,925	15.4%	24.2%	.0%	31.6%
All Companies	1,262.1	803.9	387.6	164,204	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	866.0	605.0	220.7	145,242	68.6%	75.3%	56.9%	88.5%
All Asian-Based Companies	247.7	139.8	92.1	14,672	19.6%	17.4%	23.7%	8.9%
All European-Based Companies	148.5	59.1	74.9	4,291	11.8%	7.4%	19.3%	2.6%
All Hardware Companies	649.3	619.3	.0	147,351	51.4%	77.0%	.0%	89.7%
All Turnkey & SW Companies	612.8	184.6	387.6	16,853	48.6%	23.0%	100.0%	10.3%

Source: Dataquest (October 1992)

Table A-6 North America—All Platforms

Company	Total Factory Revenue	Market Share						
		Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	311.0	180.4	73.7	10,401	15.2%	15.7%	12.8%	10.4%
Digital	175.7	121.2	.0	1,691	8.6%	10.6%	.0%	1.7%
Computervision	153.5	52.2	54.0	1,694	7.5%	4.6%	9.4%	1.7%
EDS	137.0	70.3	44.8	2,111	6.7%	6.1%	7.8%	2.1%
Hewlett-Packard	124.0	91.6	11.0	9,900	6.0%	8.0%	1.9%	9.9%
Intergraph	90.6	46.3	19.7	1,374	4.4%	4.0%	3.4%	1.4%
Silicon Graphics	69.1	60.6	.0	1,651	3.4%	5.3%	.0%	1.7%
Control Data	66.6	32.1	10.9	453	3.2%	2.8%	1.9%	.5%
Compaq	64.9	64.9	.0	12,663	3.2%	5.7%	.0%	12.7%
Sun Microsystems	62.7	53.3	.0	3,890	3.1%	4.6%	.0%	3.8%
Apple Computer	58.9	51.8	.0	12,330	2.9%	4.5%	.0%	12.4%
Autodesk	58.5	.0	58.5	0	2.9%	.0%	10.1%	.0%
Schlumberger	49.5	16.6	19.2	603	2.4%	1.4%	3.3%	.6%
SDRC	38.4	.0	38.4	0	1.9%	.0%	6.7%	.0%
Parametric Technology	29.2	.0	26.9	0	1.4%	.0%	4.7%	.0%
MacNeal-Schwendler	24.9	.0	23.9	0	1.2%	.0%	4.1%	.0%
PDA Engineering	20.6	.0	19.8	0	1.0%	.0%	3.4%	.0%
Unisys	20.4	10.4	7.2	306	1.0%	.9%	1.2%	.3%
Alias Research	19.3	.0	17.6	0	.9%	.0%	3.1%	.0%
CADAM	18.9	6.8	10.4	1,350	.9%	.6%	1.8%	1.4%
Auto-Trol	17.9	6.6	6.8	224	.9%	.6%	1.2%	.2%
Gerber Systems	15.9	7.8	5.3	220	.8%	.7%	.9%	.2%
Cimlinc	15.4	1.5	10.8	324	.8%	.1%	1.9%	.3%

(Continued)

Table A-6 North America—All Platforms (Continued)

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Swanson Analysis	15.1	.0	15.1	0	.7%	.0%	2.6%	.0%
MCS	15.0	.0	13.3	0	.7%	.0%	2.3%	.0%
CADKEY	11.0	.0	11.0	0	.5%	.0%	1.9%	.0%
Dell Computer	9.3	9.3	.0	2,372	.5%	.8%	.0%	2.4%
Aries Technology	8.4	.0	7.6	0	.4%	.0%	1.3%	.0%
ICAD	7.8	.0	6.2	0	.4%	.0%	1.1%	.0%
ADRA Systems	7.3	1.8	4.6	90	.4%	.2%	.8%	.1%
CNC Software	5.5	.0	5.5	0	.3%	.0%	1.0%	.0%
Cimatron	4.4	2.0	2.0	143	.2%	.2%	.3%	.1%
Valisys	4.2	.0	4.2	0	.2%	.0%	.7%	.0%
Algor Interactive Systems	3.9	.0	3.4	0	.2%	.0%	.6%	.0%
Everex Systems	3.9	3.9	.0	1,599	.2%	.3%	.0%	1.6%
Cisigraph	3.7	1.2	1.4	44	.2%	.1%	.2%	.0%
Ontos	3.6	.0	3.6	0	.2%	.0%	.6%	.0%
Point Control	3.5	.0	3.5	0	.2%	.0%	.6%	.0%
Mechanical Dynamics	3.4	.0	3.0	0	.2%	.0%	.5%	.0%
Matra Datavision	3.2	1.2	1.5	33	.2%	.1%	.3%	.0%
Micro Engineering Solutions	3.0	.8	1.9	38	.1%	.1%	.3%	.0%
Moda CAD	2.7	.7	1.9	22	.1%	.1%	.3%	.0%
Engineering Mechanics	2.7	.1	2.3	211	.1%	.0%	.4%	.2%
Solbourne	2.2	2.2	.0	238	.1%	.2%	.0%	.2%
CADSI	2.2	.3	1.7	14	.1%	.0%	.3%	.0%
American Small Business Comp.	2.1	.0	2.1	0	.1%	.0%	.4%	.0%

(Continued)

October 2, 1992

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Table A-6 North America—All Platforms (Continued)

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
MARC	2.0	.0	2.0	0	.1%	.0%	.3%	.0%
SPATIAL Technology	2.0	.0	2.0	0	.1%	.0%	.3%	.0%
Micrografx	1.7	.0	1.7	0	.1%	.0%	.3%	.0%
Claris	1.6	.0	1.6	0	.1%	.0%	.3%	.0%
Delcam International	1.4	.5	.7	24	.1%	.0%	.1%	.0%
Softdesk	1.2	.0	1.2	0	.1%	.0%	.2%	.0%
Investronica SA	1.2	.9	.1	46	.1%	.1%	.0%	.0%
Wisdom Systems	1.1	.0	.8	0	.1%	.0%	.1%	.0%
Accugraph	1.0	.4	.4	34	.0%	.0%	.1%	.0%
Pathtrace	.9	.2	.6	14	.0%	.0%	.1%	.0%
Evolution Computing	.9	.0	.9	0	.0%	.0%	.2%	.0%
Computational Mechanics	.9	.0	.9	0	.0%	.0%	.2%	.0%
Object Design	.8	.0	.8	0	.0%	.0%	.1%	.0%
Innovative Data Design	.8	.0	.8	0	.0%	.0%	.1%	.0%
Objectivity	.7	.0	.7	0	.0%	.0%	.1%	.0%
GRAPHISOFT	.6	.0	.6	0	.0%	.0%	.1%	.0%
Rasna Corporation	.6	.0	.6	0	.0%	.0%	.1%	.0%
Aura CAD/CAM Systems	.6	.0	.5	0	.0%	.0%	.1%	.0%
Machinery Sales	.6	.0	.6	0	.0%	.0%	.1%	.0%
A.I. Systems	.6	.0	.6	0	.0%	.0%	.1%	.0%
Uniras	.4	.0	.4	0	.0%	.0%	.1%	.0%
Foresight Resources	.4	.0	.4	0	.0%	.0%	.1%	.0%
Ashlar	.3	.0	.3	0	.0%	.0%	.1%	.0%

(Continued)

Table A-6 North America—All Platforms (Continued)

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Ithaca Software	.3	.0	.3	0	.0%	.0%	.1%	.0%
Cascade Graphics	.3	.0	.3	0	.0%	.0%	.1%	.0%
FEGS	.3	.0	.3	0	.0%	.0%	.0%	.0%
A/E Microsystems	.3	.2	.0	25	.0%	.0%	.0%	.0%
Engineering Systems Corp.	.3	.0	.2	0	.0%	.0%	.0%	.0%
Georgia Tech Research Corp.	.3	.0	.3	0	.0%	.0%	.0%	.0%
Mc2 Engineering Software	.2	.0	.2	0	.0%	.0%	.0%	.0%
CAD Centre	.2	.0	.2	0	.0%	.0%	.0%	.0%
Mega CADD	.2	.0	.2	0	.0%	.0%	.0%	.0%
Synthesis	.1	.0	.1	0	.0%	.0%	.0%	.0%
Technische Computer Systeme	.1	.0	.1	3	.0%	.0%	.0%	.0%
Vision 3D	.1	.0	.0	0	.0%	.0%	.0%	.0%
IGC Technology	.1	.0	.1	0	.0%	.0%	.0%	.0%
Engineered Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Zuken	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	254.5	247.0	.0	33,484	12.4%	21.5%	.0%	33.6%
All Companies	2,050.6	1,147.3	576.0	99,561	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	2,034.1	1,141.2	568.3	99,253	99.2%	99.5%	98.6%	99.7%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	16.4	6.1	7.8	307	.8%	.5%	1.3%	.3%
All Hardware Companies	819.2	711.2	2.3	85,963	39.9%	62.0%	.4%	86.3%
All Turnkey & SW Companies	1,231.4	436.2	573.7	13,597	60.1%	38.0%	99.6%	13.7%

Source: Dataquest (October 1992)

Table A-7 Europe—All Platforms

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	606.3	348.1	146.3	17,554	20.7%	23.1%	17.6%	18.4%
Computervision	496.7	201.8	116.1	4,726	17.0%	13.4%	14.0%	5.0%
Hewlett-Packard	282.4	197.9	36.0	15,125	9.7%	13.1%	4.3%	15.9%
Digital	135.1	93.2	.0	1,386	4.6%	6.2%	.0%	1.5%
Control Data	84.8	40.7	13.9	577	2.9%	2.7%	1.7%	.6%
Schlumberger	75.1	25.2	29.1	915	2.6%	1.7%	3.5%	1.0%
Matra Datavision	72.2	25.3	32.4	682	2.5%	1.7%	3.9%	.7%
Siemens Nixdorf Info systeme	68.8	34.4	24.1	1,011	2.4%	2.3%	2.9%	1.1%
Compaq	65.0	65.0	.0	12,663	2.2%	4.3%	.0%	13.3%
EDS	60.8	31.0	23.7	1,420	2.1%	2.1%	2.9%	1.5%
Intergraph	57.2	29.3	12.5	830	2.0%	1.9%	1.5%	.9%
Sun Microsystems	42.4	36.1	.0	1,908	1.5%	2.4%	.0%	2.0%
STI-Straessle	38.0	8.7	20.9	357	1.3%	.6%	2.5%	.4%
Silicon Graphics	35.3	31.0	.0	849	1.2%	2.1%	.0%	.9%
Autodesk	35.0	.0	35.0	0	1.2%	.0%	4.2%	.0%
SDRC	31.4	.0	31.4	0	1.1%	.0%	3.8%	.0%
Cisigraph	28.5	9.4	10.8	336	1.0%	.6%	1.3%	.4%
Wiechers Datentechnik	27.0	15.4	8.1	667	.9%	1.0%	1.0%	.7%
Investronica SA	26.5	21.2	2.7	1,060	.9%	1.4%	.3%	1.1%
Apple Computer	24.7	21.7	.0	5,171	.8%	1.4%	.0%	5.4%
Norsk Data	21.7	11.0	3.8	226	.7%	.7%	.5%	.2%
ISICAD	19.9	8.8	7.8	142	.7%	.6%	.9%	.1%
MacNeal-Schwendler	16.9	.0	16.3	0	.6%	.0%	2.0%	.0%

(Continued)

Table A-7 Europe—All Platforms (Continued)

Company	Total		Market Share					Hardware Units Shipped	Total		Hardware			Hardware Units Shipped
	Factory Revenue	Revenue	Hardware Revenue	Software Revenue	Hardware Revenue	Software Revenue	Factory Revenue		Factory Revenue	Revenue	Hardware Revenue	Software Revenue	Hardware Revenue	
ISKON Software	16.0	7.2	5.6	274	.5%	.7%	.3%							
CAD Lab	15.7	.0	12.6	0	.5%	1.5%	.0%							
Digital Kienzle	15.7	8.0	4.4	230	.5%	.5%	.2%							
Kewill Systems	15.5	4.7	8.5	322	.5%	1.0%	.3%							
Cinatron	14.6	6.6	6.6	463	.5%	.8%	.5%							
Vero International Software	14.6	.0	13.3	0	.5%	1.6%	.0%							
Tebis	14.5	2.2	10.1	80	.5%	1.2%	.1%							
Delcam International	14.3	5.0	7.1	240	.5%	.9%	.3%							
Fides Industrielle Automation	13.9	2.1	9.7	107	.5%	1.2%	.1%							
Hahn & Kolb	13.5	8.1	4.1	195	.5%	.5%	.2%							
Exapt	12.7	6.2	4.3	220	.4%	.5%	.2%							
CADAM	12.5	4.5	6.8	900	.4%	.8%	.9%							
PAFEC	12.2	.0	12.2	0	.4%	1.5%	.0%							
Gerber Systems	12.1	5.9	4.0	168	.4%	.5%	.2%							
Framasoft	11.6	.0	7.0	0	.4%	.8%	.0%							
Nestler Electronics	11.0	5.0	6.1	300	.4%	.7%	.3%							
ItalCad	10.8	5.1	2.6	101	.4%	.3%	.1%							
ICL	10.2	6.0	3.5	279	.3%	.4%	.3%							
Ferranti	10.0	3.7	4.6	87	.3%	.6%	.1%							
Marcus Computer Systems	9.8	5.1	3.3	285	.3%	.4%	.3%							
Caditron	9.8	4.9	3.9	151	.3%	.5%	.2%							
PDA Engineering	9.5	.0	9.1	0	.3%	1.1%	.0%							
Radan Computational	9.4	3.3	4.7	315	.3%	.6%	.3%							

(Continued)

Table A-7 Europe—All Platforms (Continued)

Company	Market Share							
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Parametric Technology	9.0	.0	8.2	0	.3%	.0%	1.0%	.0%
Unisys	8.7	4.4	3.0	130	.3%	.3%	.4%	.1%
Swanson Analysis	8.1	.0	8.1	0	.3%	.0%	1.0%	.0%
Cimlinec	7.7	.8	5.4	162	.3%	.1%	.6%	.2%
Auto-Trol	7.4	2.7	2.8	92	.3%	.2%	.3%	.1%
Research Machines	7.2	7.2	.0	1,162	.2%	.5%	.0%	1.2%
DAT Standard info systems	6.5	.0	6.1	0	.2%	.0%	.7%	.0%
Ziegler Informatics	5.5	.0	5.5	0	.2%	.0%	.7%	.0%
Technische Computer Systeme	5.4	1.1	4.3	142	.2%	.1%	.5%	.1%
Alias Research	4.8	.0	4.3	0	.2%	.0%	.5%	.0%
Serbi	4.6	.0	4.6	0	.2%	.0%	.6%	.0%
ADRA Systems	4.1	1.0	2.6	50	.1%	.1%	.3%	.1%
XAO Industrie	3.7	1.3	2.2	133	.1%	.1%	.3%	.1%
Anilam Electronics	3.2	1.0	1.9	40	.1%	.1%	.2%	.0%
MCS	3.1	.0	2.8	0	.1%	.0%	.3%	.0%
Dell Computer	3.1	3.1	.0	791	.1%	.2%	.0%	.8%
Whesoe Computing Systems	3.1	.0	3.1	0	.1%	.0%	.4%	.0%
Olivetti	2.9	2.4	.0	436	.1%	.2%	.0%	.5%
FEA	2.8	.7	.7	16	.1%	.0%	.1%	.0%
CAMTEK	2.8	.0	2.3	0	.1%	.0%	.3%	.0%
debis Systemhaus	2.8	.7	1.7	19	.1%	.0%	.2%	.0%
Superdraft	2.6	1.2	1.3	142	.1%	.1%	.2%	.1%
Catalpa	2.6	.9	1.3	21	.1%	.1%	.2%	.0%

(Continued)

(Continued)

Table A-7 Europe—All Platforms (Continued)

Company	Total			Market Share		
	Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Factory Revenue	Hardware Revenue
MARC	2.5	.0	2.5	0	.1%	.0%
CADKEY	2.5	.0	2.5	0	.1%	.0%
Pathtrace	2.4	.5	1.6	36	.1%	.2%
Point Control	2.2	.0	2.2	0	.1%	.3%
Caroline Informatique	2.2	.4	1.1	17	.1%	.1%
ISKA	2.1	1.0	.9	39	.1%	.1%
ICAD	2.0	.0	1.6	0	.1%	.2%
CNC Software	1.8	.0	1.8	0	.1%	.2%
Robocom	1.7	.0	1.7	0	.1%	.2%
SPATIAL Technology	1.5	.0	1.5	0	.1%	.2%
Aries Technology	1.4	.0	1.3	0	.0%	.2%
Computational Mechanics	1.4	.0	1.4	0	.0%	.2%
FEGS	1.4	.0	1.1	0	.0%	.1%
Micrografx	1.4	.0	1.4	0	.0%	.2%
Mechanical Dynamics	1.3	.0	1.2	0	.0%	.1%
Moda CAD	1.1	.3	.7	9	.0%	.1%
CAD Centre	1.0	.0	.8	0	.0%	.1%
STLD srl	1.0	.0	1.0	0	.0%	.1%
Valisys	.8	.0	.8	0	.0%	.1%
CADSI	.8	.1	.6	5	.0%	.1%
Vision 3D	.8	.4	.2	6	.0%	.0%
Solbourne	.7	.7	.0	78	.0%	.0%
ESDU International	.7	.0	.7	0	.0%	.1%

(Continued)

Table A-7 Europe—All Platforms (Continued)

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Algor Interactive Systems	.7	.0	.6	0	.0%	.0%	.1%	.0%
Rasna Corporation	.6	.0	.6	0	.0%	.0%	.1%	.0%
Graphisoft Software Dev	.5	.0	.5	0	.0%	.0%	.1%	.0%
Everex Systems	.5	.4	.0	184	.0%	.0%	.0%	.2%
Foresight Resources	.4	.0	.3	0	.0%	.0%	.0%	.0%
Micro Engineering Solutions	.4	.1	.2	4	.0%	.0%	.0%	.0%
Spectrum Graphics	.3	.1	.2	3	.0%	.0%	.0%	.0%
Evolution Computing	.3	.0	.3	0	.0%	.0%	.0%	.0%
CADWorks	.3	.0	.2	0	.0%	.0%	.0%	.0%
CAD-Capture	.2	.0	.0	0	.0%	.0%	.0%	.0%
Ontos	.2	.0	.2	0	.0%	.0%	.0%	.0%
Wisdom Systems	.2	.0	.1	0	.0%	.0%	.0%	.0%
DAPCO	.2	.0	.1	0	.0%	.0%	.0%	.0%
American Small Business Comp.	.2	.0	.2	0	.0%	.0%	.0%	.0%
Synthesis	.2	.0	.2	0	.0%	.0%	.0%	.0%
Objectivity	.1	.0	.1	0	.0%	.0%	.0%	.0%
Lamp Software	.1	.0	.1	6	.0%	.0%	.0%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.1	0	.0%	.0%	.0%	.0%
A.I. Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
Cascade Graphics	.1	.0	.1	0	.0%	.0%	.0%	.0%
Object Design	.1	.0	.1	0	.0%	.0%	.0%	.0%
Softdesk	.1	.0	.1	0	.0%	.0%	.0%	.0%

(Continued)

Table A-7 Europe—All Platforms (Continued)

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Engineered Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Mega CADD	.1	.0	.1	0	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
Zuken	.0	.0	.0	0	.0%	.0%	.0%	.0%
Number One Systems	.0	.0	.0	1	.0%	.0%	.0%	.0%
Other Companies	132.3	128.7	.0	19,314	4.5%	8.5%	.0%	20.3%
All Companies	2,925.4	1,509.5	830.1	95,360	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	2,315.4	1,282.4	546.8	85,154	79.1%	85.0%	65.9%	89.3%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	610.0	227.1	283.3	10,206	20.9%	15.0%	34.1%	10.7%
All Hardware Companies	633.9	543.3	2.9	67,483	21.7%	36.0%	.4%	70.8%
All Turnkey & SW Companies	2,291.5	966.1	827.2	27,877	78.3%	64.0%	99.6%	29.2%

Source: Dataquest (October 1992)

Table A-8 Asia—All Platforms

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	404.9	230.9	98.4	11,206	18.8%	18.2%	16.3%	17.4%
NEC	198.6	133.7	49.0	9,679	9.2%	10.5%	8.1%	15.0%
Nihon Unisys	183.5	122.9	23.9	1,761	8.5%	9.7%	3.9%	2.7%
Fujitsu	181.6	114.4	49.0	4,086	8.4%	9.0%	8.1%	6.3%
Hitachi	135.0	64.8	56.7	3,966	6.3%	5.1%	9.4%	6.2%
Hewlett-Packard	102.3	72.0	12.8	5,516	4.8%	5.7%	2.1%	8.6%
Toshiba—NO OEM	72.5	38.2	27.0	2,431	3.4%	3.0%	4.5%	3.8%
Computervision	72.0	30.5	29.6	717	3.3%	2.4%	4.9%	1.1%
Silicon Graphics	66.5	63.2	.0	1,502	3.1%	5.0%	.0%	2.3%
Hitachi Zosen Info Systems	59.1	45.6	1.7	606	2.8%	3.6%	.3%	.9%
Mutoh Industries—NO OEM	48.5	26.3	17.7	1,332	2.3%	2.1%	2.9%	2.1%
Hakuto	47.1	28.3	18.9	1,562	2.2%	2.2%	3.1%	2.4%
Mitsubishi Electric	40.9	31.4	5.5	787	1.9%	2.5%	.9%	1.2%
Sun Microsystems	35.2	29.9	.0	1,741	1.6%	2.4%	.0%	2.7%
CADAM	33.1	11.3	18.6	2,250	1.5%	.9%	3.1%	3.5%
Digital	32.2	22.2	.0	313	1.5%	1.7%	.0%	.5%
Sumitomo Denko Workstation	31.2	31.2	.0	1,739	1.5%	2.5%	.0%	2.7%
Sharp System Products—NO OEM	31.2	16.2	15.0	205	1.4%	1.3%	2.5%	.3%
SDRC	29.3	.0	29.3	0	1.4%	.0%	4.8%	.0%
Tokyo Electron—NO OEM	26.8	8.8	12.9	99	1.2%	.7%	2.1%	.2%
Mitsui Engineering	21.8	15.2	4.4	145	1.0%	1.2%	.7%	.2%
Toyo Information Systems—NO OEM	19.8	12.1	5.8	211	.9%	.9%	1.0%	.3%
Graphtec Engineering	14.8	7.4	6.6	319	.7%	.6%	1.1%	.5%

(Continued)

Table A-8 Asia—All Platforms (Continued)

Company	Market Share							
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Omron	13.9	12.6	1.4	402	.6%	1.0%	.2%	.6%
MacNeal-Schwendler	12.7	.0	12.2	0	.6%	.0%	2.0%	.0%
Autodesk	11.7	.0	11.7	0	.5%	.0%	1.9%	.0%
Control Data	11.7	5.6	1.9	79	.5%	.4%	.3%	.1%
Intergraph	10.5	5.3	2.3	151	.5%	.4%	.4%	.2%
Apple Computer	10.4	9.2	.0	2,188	.5%	.7%	.0%	3.4%
Design Automation	10.2	.0	10.2	0	.5%	.0%	1.7%	.0%
Wacom	9.7	2.0	6.8	155	.4%	.2%	1.1%	.2%
Parametric Technology	9.0	.0	8.2	0	.4%	.0%	1.4%	.0%
Andor	8.5	2.1	6.1	77	.4%	.2%	1.0%	.1%
EDS	7.4	3.8	2.4	74	.3%	.3%	.4%	.1%
Schlumberger	6.7	2.3	2.6	82	.3%	.2%	.4%	.1%
Alias Research	5.6	.0	5.1	0	.3%	.0%	.8%	.0%
Sony	5.6	4.9	.0	325	.3%	.4%	.0%	.5%
MARC	5.5	.0	5.5	0	.3%	.0%	.9%	.0%
Swanson Analysis	4.9	.0	4.9	0	.2%	.0%	.8%	.0%
Fides Industrielle Automation	4.6	.7	3.2	53	.2%	.1%	.5%	.1%
Compaq	4.2	4.2	.0	826	.2%	.3%	.0%	1.3%
ADRA Systems	4.1	1.0	2.6	50	.2%	.1%	.4%	.1%
Unisys	4.0	2.0	1.4	60	.2%	.2%	.2%	.1%
Matra Datavision	4.0	1.5	1.9	42	.2%	.1%	.3%	.1%
ICAD	3.3	.0	2.6	0	.2%	.0%	.4%	.0%
CADIX	3.2	1.3	1.6	24	.1%	.1%	.3%	.0%

(Continued)

Table A-8 Asia—All Platforms (Continued)

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Century Research Center	2.9	1.6	1.1	12	.1%	.1%	.2%	.0%
Cimatron	2.9	1.3	1.3	95	.1%	.1%	.2%	.1%
Mechanical Dynamics	2.8	.0	2.5	0	.1%	.0%	.4%	.0%
Delcam International	2.7	.9	1.3	45	.1%	.1%	.2%	.1%
Framasoft	2.6	.0	1.6	0	.1%	.0%	.3%	.0%
Cimlinc	2.6	.3	1.8	54	.1%	.0%	.3%	.1%
Point Control	2.2	.0	2.2	0	.1%	.0%	.4%	.0%
Kubota Computer	2.0	1.3	.7	113	.1%	.1%	.1%	.2%
Ricoh—NO OEM	1.9	.0	1.6	0	.1%	.0%	.3%	.0%
Aries Technology	1.8	.0	1.6	0	.1%	.0%	.3%	.0%
Cisigraph	1.7	.6	.6	20	.1%	.0%	.1%	.0%
PDA Engineering	1.6	.0	1.5	0	.1%	.0%	.3%	.0%
SPATIAL Technology	1.5	.0	1.5	0	.1%	.0%	.2%	.0%
Anilam Electronics	1.4	.4	.8	18	.1%	.0%	.1%	.0%
MCS	1.4	.0	1.2	0	.1%	.0%	.2%	.0%
Auto-Trol	1.1	.4	.4	13	.0%	.0%	.1%	.0%
Gerber Systems	.9	.4	.3	12	.0%	.0%	.0%	.0%
ISICAD	.8	.4	.3	6	.0%	.0%	.1%	.0%
Zuken	.8	.3	.5	5	.0%	.0%	.1%	.0%
CNC Software	.7	.0	.7	0	.0%	.0%	.1%	.0%
Whesoe Computing Systems	.7	.0	.7	0	.0%	.0%	.1%	.0%
Rasna Corporation	.6	.0	.6	0	.0%	.0%	.1%	.0%
Valisys	.6	.0	.6	0	.0%	.0%	.1%	.0%

(Continued)

Table A-8 Asia—All Platforms (Continued)

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
CADSI	.5	.1	.4	3	.0%	.0%	.1%	.0%
Moda CAD	.4	.1	.3	4	.0%	.0%	.0%	.0%
Micro Engineering Solutions	.4	.1	.2	4	.0%	.0%	.0%	.0%
Investronica SA	.3	.2	.0	11	.0%	.0%	.0%	.0%
Technische Computer Systeme	.3	.1	.2	8	.0%	.0%	.0%	.0%
CADKEY	.3	.0	.3	0	.0%	.0%	.0%	.0%
CADWorks	.3	.0	.2	0	.0%	.0%	.0%	.0%
Solbourne	.3	.3	.0	27	.0%	.0%	.0%	.0%
Superdraft	.2	.1	.1	13	.0%	.0%	.0%	.0%
Object Design	.2	.0	.2	0	.0%	.0%	.0%	.0%
CAD Centre	.1	.0	.1	0	.0%	.0%	.0%	.0%
Wisdom Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
Everex Systems	.1	.1	.0	55	.0%	.0%	.0%	.1%
Pathtrace	.1	.0	.1	2	.0%	.0%	.0%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
PAFEC	.1	.0	.1	0	.0%	.0%	.0%	.0%
Softdesk	.1	.0	.1	0	.0%	.0%	.0%	.0%
Algor Interactive Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
Objectivity	.1	.0	.1	0	.0%	.0%	.0%	.0%
American Small Business Comp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
Foresight Resources	.0	.0	.0	0	.0%	.0%	.0%	.0%
Mega CADD	.0	.0	.0	0	.0%	.0%	.0%	.0%

(Continued)

Table A-8 Asia—All Platforms (Continued)

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Other Companies	48.5	47.3	.0	7,191	2.3%	3.7%	.0%	11.2%
All Companies	2,149.8	1,271.1	605.4	64,472	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	957.0	542.7	269.5	34,126	44.5%	42.7%	44.5%	52.9%
All Asian-Based Companies	1,171.1	722.5	323.7	30,040	54.5%	56.8%	53.5%	46.6%
All European-Based Companies	21.8	5.8	12.2	306	1.0%	.5%	2.0%	.5%
All Hardware Companies	312.9	281.4	.4	27,768	14.6%	22.1%	.1%	43.1%
All Turnkey & SW Companies	1,836.9	989.7	605.0	36,704	85.4%	77.9%	99.9%	56.9%

Source: Dataquest (October 1992)

Table A-9 Rest of World—All Platforms

Company	Total			Market Share				
	Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	17.3	11.5	3.2	1,354	15.4%	17.0%	11.2%	20.3%
Digital	10.5	7.2	.0	105	9.3%	10.7%	.0%	1.6%
Intergraph	10.1	5.2	2.2	153	9.0%	7.7%	7.7%	2.3%
Hewlett-Packard	8.7	6.0	1.2	498	7.7%	8.9%	4.3%	7.5%
Computervision	7.6	2.6	2.7	79	6.7%	3.8%	9.4%	1.2%
Compaq	7.1	7.1	.0	1,376	6.3%	10.5%	.0%	20.6%
Engineering Mechanics Control Data	4.9	.2	4.2	393	4.4%	.4%	14.7%	5.9%
EDS	3.3	1.6	.5	23	3.0%	2.4%	1.9%	.3%
Cinatron	3.1	1.6	1.0	48	2.8%	2.4%	3.6%	.7%
Siemens Nixdorf Info systems	2.4	1.1	1.1	79	2.2%	1.6%	3.9%	1.2%
Delcam International	2.3	1.2	.8	34	2.0%	1.7%	2.8%	.5%
SDRC	2.0	.7	1.0	34	1.8%	1.1%	3.6%	.5%
Sun Microsystems	2.0	.0	2.0	0	1.8%	.0%	7.1%	.0%
Claris	1.7	1.4	.0	102	1.5%	2.1%	.0%	1.5%
CNC Software	1.6	.0	1.6	0	1.4%	.0%	5.5%	.0%
MacNeal-Schwendler	1.1	.0	1.1	0	1.0%	.0%	3.9%	.0%
Autodesk	1.1	.0	1.1	0	1.0%	.0%	3.7%	.0%
Apple Computer	1.1	.0	1.1	0	.9%	.0%	3.7%	.0%
Vero International Software	1.0	.8	.0	199	.8%	1.3%	.0%	3.0%
ADRA Systems	.9	.0	.9	0	.8%	.0%	3.0%	.0%
Pathtrace	.8	.2	.5	10	.7%	.3%	1.8%	.1%
Swanson Analysis	.6	.1	.4	8	.5%	.2%	1.3%	.1%
	.4	.0	.4	0	.3%	.0%	1.3%	.0%

(Continued)

Table A-9 Rest of World—All Platforms (Continued)

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Aries Technology	.4	.0	.3	0	.3%	.0%	1.1%	.0%
Unisys	.3	.2	.1	5	.3%	.3%	.4%	.1%
Whessoe Computing Systems	.3	.0	.3	0	.3%	.0%	1.2%	.0%
Superdraft	.2	.1	.1	13	.2%	.1%	.4%	.2%
Investronica SA	.2	.2	.0	8	.2%	.2%	.1%	.1%
Aura CAD/CAM Systems	.1	.0	.1	0	.1%	.0%	.3%	.0%
Engineering Systems Corp.	.1	.0	.1	0	.1%	.0%	.2%	.0%
Mc2 Engineering Software	.1	.0	.1	0	.1%	.0%	.3%	.0%
Ithaca Software	.1	.0	.1	0	.1%	.0%	.3%	.0%
Georgia Tech Research Corp.	.1	.0	.1	0	.1%	.0%	.2%	.0%
American Small Business Comp.	.1	.0	.1	0	.1%	.0%	.2%	.0%
Softdesk	.1	.0	.1	0	.1%	.0%	.2%	.0%
Algor Interactive Systems	.0	.0	.0	0	.0%	.0%	.1%	.0%
Moda CAD	.0	.0	.0	0	.0%	.0%	.1%	.0%
Ziegler Informatics	.0	.0	.0	0	.0%	.0%	.1%	.0%
Innovative Data Design	.0	.0	.0	0	.0%	.0%	.1%	.0%
CAD Centre	.0	.0	.0	0	.0%	.0%	.1%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
FEA	.0	.0	.0	0	.0%	.0%	.0%	.0%
Vision 3D	.0	.0	.0	0	.0%	.0%	.0%	.0%
Fides Industrielle Automation	.0	.0	.0	0	.0%	.0%	.0%	.0%
Foresight Resources	.0	.0	.0	0	.0%	.0%	.0%	.0%
ESDU International	.0	.0	.0	0	.0%	.0%	.0%	.0%

(Continued)

Table A-9 Rest of World—All Platforms (Continued)

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Graphisoft Software Dev	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	18.9	18.3	.0	2,147	16.8%	27.2%	.0%	32.2%
All Companies	112.7	67.2	28.5	6,669	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	103.6	63.8	23.8	6,492	91.8%	95.0%	83.5%	97.3%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	9.2	3.3	4.7	178	8.2%	5.0%	16.5%	2.7%
All Hardware Companies	47.6	42.2	.1	5,452	42.2%	62.8%	.4%	81.8%
All Turnkey & SW Companies	65.2	25.0	28.4	1,217	57.8%	37.2%	99.6%	18.2%

Source: Dataquest (October 1992)

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**Mechanical Applications
Final Market Share**

September 14, 1992

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Market Statistics

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File behind the *Market Statistics* tab inside the
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Mechanical Applications Final Market Share

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Note: All tables show estimated data.

Mechanical Applications Final Market Share

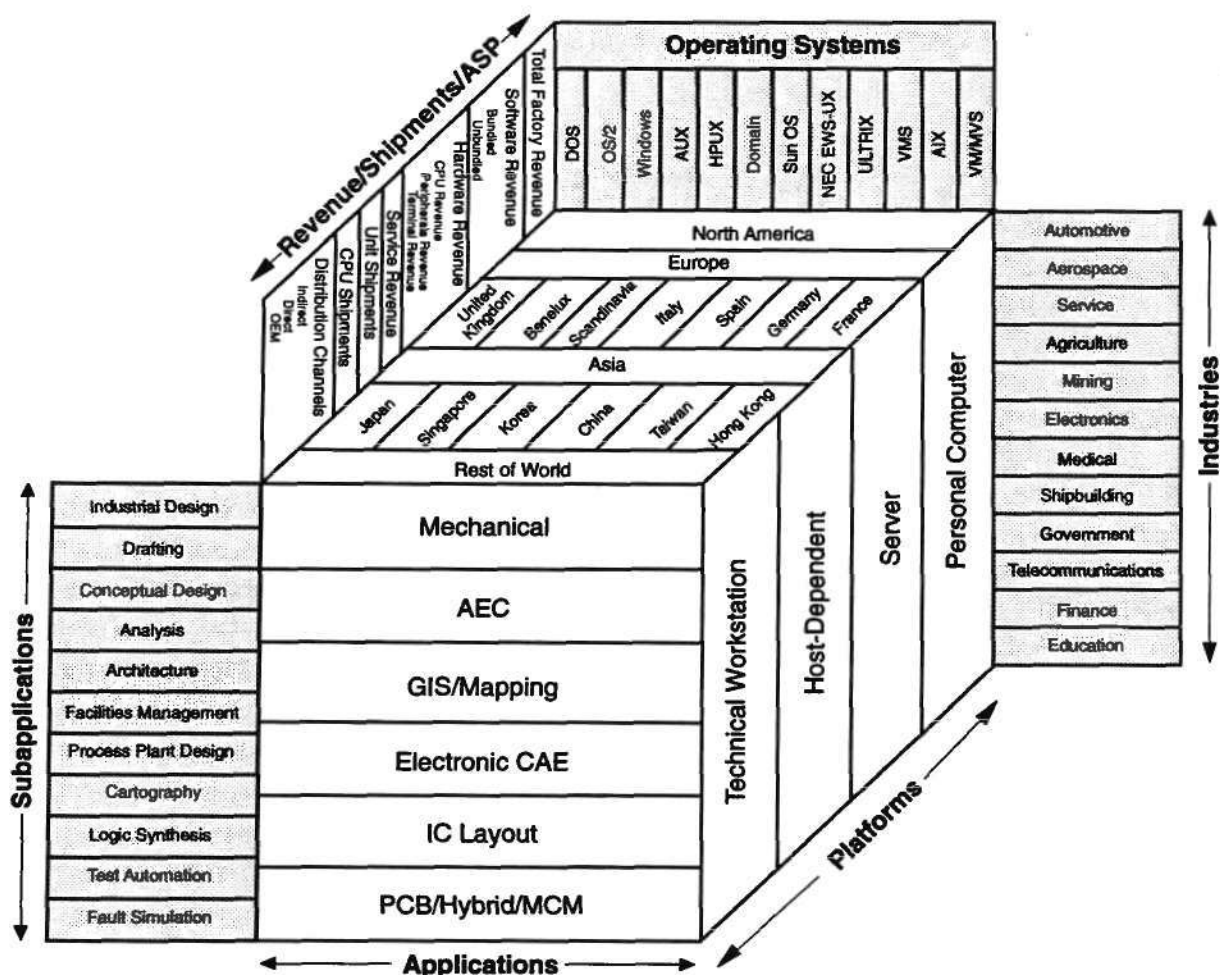
Introduction

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.

Figure 1
CAD/CAM/CAE/GIS Market Database



Source: Dataquest (September 1992)

G2000995

Market Analysis

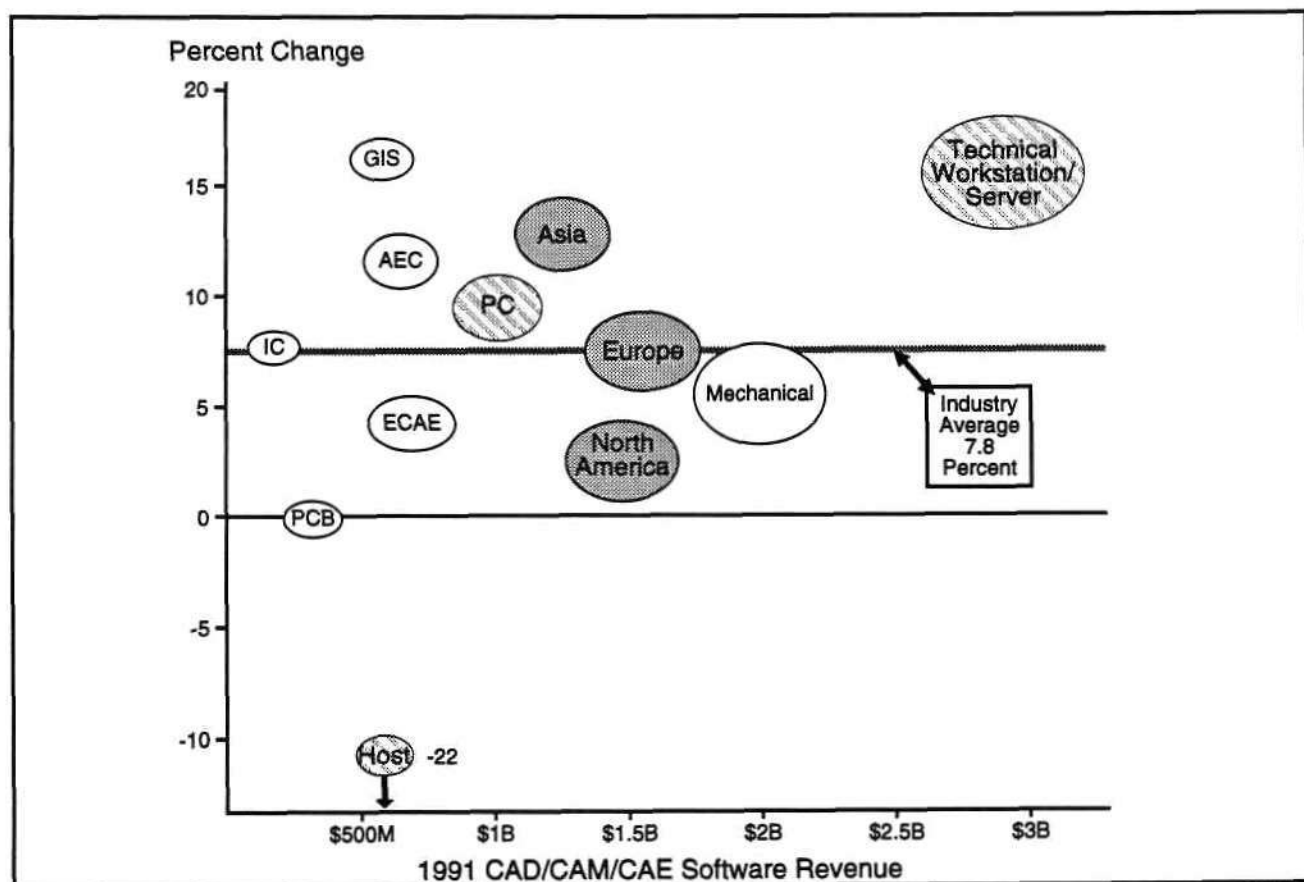
Analysis of Dataquest's final 1991 market share information shows that the entire worldwide CAD/CAM/CAE/GIS market grew at a 3.0 percent rate in 1991, to \$14.8 billion. The software market portion grew by more than 7 percent, to \$4.5 billion. Causes of the downward revision are examined in the following section.

Figure 2 depicts the market size and market growth rate of segments in the CAD/CAM/CAE/GIS software industry. In Figure 2, the size of the bubble reflects the size of the market, and the bubbles are centered over both their market size, and their market growth rate last year. For example, mechanical applications, valued at slightly more than \$2.0 billion, grew close to the industry average, at 7 percent; while the considerably smaller GIS market grew at a brisk 16.8 percent rate. Each shade

in the figure represents a different market segmentation: segments by application are clear; segments by region have light shading, and segments by platform have diagonal lines. The sum of any one type of shading equals the total \$4.5 billion software market. Corresponding to this figure, Table 1 lists market size and 1990-to-1991 growth rates by segment, for both software revenue and total revenue.

In 1991, the platform category of servers was created. Most of the revenue for servers came from what had formerly been classified as technical workstations, which depressed the apparent growth rate of technical workstations. In reality, workstations are the largest market platform, and had a better-than-average growth rate. In the illustration, workstations and servers are combined. In total, computer hardware sold into CAD/CAM/CAE/GIS remained flat with 1990 revenue.

Figure 2
CAD/CAM/CAE/GIS Market Portfolio



Source: Dataquest (September 1992)

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Table 1
CAD/CAM/CAE/GIS 1991 Market Summary

	Software Revenue 1990 (\$M)	Software Revenue 1991 (\$M)	Growth Rate (%)	Total Revenue 1990 (\$M)	Total Revenue 1991 (\$M)	Growth Rate (%)
Application						
Mechanical	1,910.5	2,040.1	6.8	7,176.5	7,238.5	0.9
AEC	589.4	659.5	11.9	2,173.6	2,330.0	7.2
GIS/Mapping	476.2	556.3	16.8	1,652.7	1,843.6	11.6
Electronic CAE	653.7	686.3	5.0	1,778.5	1,763.9	-0.8
IC Layout	184.5	195.8	6.1	527.1	574.7	9.0
PCB/Hybrid/MCM	328.0	328.3	0.1	1,089.8	1,086.1	-0.3
Total	4,142.2	4,466.3	7.8	14,398.2	14,836.8	3.0
Region						
North America	1,480.7	1,520.3	2.7	5,012.2	5,026.7	0.3
Europe	1,492.7	1,617.7	8.4	5,251.4	5,472.4	4.2
Asia	1,105.3	1,247.7	12.9	3,867.4	4,039.0	4.4
Rest of World	63.6	80.6	26.8	267.3	298.6	11.7
Total	4,142.2	4,466.3	7.8	14,398.2	14,836.8	3.0
Platform						
Technical Workstation	2,478.3	2,684.9	8.3	7,634.8	7,923.0	3.8
Host Dependent	761.8	593.1	-22.1	3,856.1	2,875.5	-25.4
Server	0	188.7	NA	0	991.1	NA
Personal Computer	902.1	999.6	10.8	2,907.3	3,047.1	4.8
Total	4,142.2	4,466.3	7.8	14,398.2	14,836.8	3.0

NA = Not applicable

Source: Dataquest (September 1992)

In contrast, Dataquest's research in our computer systems group shows that worldwide computer revenue declined 7 percent throughout the same period. So things could be worse—software was one of the few growth areas in some very tough economic times, and CAD software clearly boosted revenue for a few hardware suppliers.

About This Update

Since the preliminary market share numbers were published, eight more new companies have been added to the database, bringing the total new companies added this year to 15. The market share numbers also have been rechecked and verified for all vendors worldwide. Year-end 1991 financial results released this past spring have also been checked and incorporated into the final numbers.

The most important change affecting the market share numbers for this update was the

significant downward revision of revenue for most of the major vendors. Of the top 20 vendors listed in Table 2, 18 companies' revenue was revised downward, 10 of them significantly, based on final fourth-quarter financial results. Looking at software alone, Table 3 also portrays a primarily downward revision trend. In all cases, however, these changes have produced very small changes in any company's market position.

Two companies, Electronic Data Systems Corp. (EDS) and Computervision Corp., revealed previously unavailable information in 1992. EDS' market position was significantly lowered due to new reporting structure put in place after its purchase from McDonnell Douglas, which eliminated considerable revenue from service and consulting that has been reclassified as a separate, non-CAD activity. Computervision's revenue was also revised downward almost \$90 million based on the company's final published results in conjunction

Table 2
1991 Top Twenty CAD/CAM/CAE/GIS Vendors Total Revenue

	Preliminary Total Revenue (\$M)	Final Total Revenue (\$M)	Revenue Change (\$M)	Final Market Share (%)	Share Change (%)
IBM	1,762.0	1,712.1	-49.9	11.5	0.4
Intergraph	1,156.8	1,148.0	-8.8	7.7	0.4
Computervision	982.9	890.5	-92.4	6.0	-0.2
Hewlett-Packard	850.0	830.2	-19.8	5.6	0.2
Digital	926.7	816.1	-110.6	5.5	-0.4
Sun	679.7	674.3	-5.4	4.5	0.2
Fujitsu	491.8	442.9	-48.9	3.0	-0.1
Mentor	406.5	396.1	-10.4	2.7	0.1
Compaq	433.1	394.3	-38.8	2.7	-0.1
NEC	462.0	342.4	-119.6	2.3	-0.6
EDS	419.8	287.2	-132.6	1.9	-0.7
Autodesk	278.4	279.5	1.1	1.9	0.1
Siemens Nixdorf	309.0	267.5	-41.5	1.8	-0.2
Cadence	233.6	233.9	0.3	1.6	0.1
Apple	231.5	231.5	0.0	1.6	0.1
Nihon Unisys	245.4	210.9	-34.5	1.4	-0.1
Silicon Graphics	172.5	189.8	17.3	1.3	0.2
Hitachi	210.0	180.0	-30.0	1.2	-0.1
Control Data	160.2	176.3	16.1	1.2	0.2
Valid Logic	152.1	152.1	0.0	1.0	0.1
380 Other Companies	5,227.5	4,981.2	-246.3	33.6	0.5
All Companies	15,791.5	14,836.8	-954.7	100.0	0.0

Source: Dataquest (September 1992)

Table 3
1991 CAD/CAM/CAE/GIS Software Market

Company	Preliminary Software Revenue (\$M)	Final Software Revenue (\$M)	Revenue Change (\$M)	Final Software Share (%)	Share Change (%)
IBM	369.0	378.8	9.8	8.5	0.7
Intergraph	282.4	280.3	-2.1	6.3	0.3
Autodesk	278.4	279.5	1.1	6.3	0.4
Computervision	272.9	247.3	-25.6	5.5	-0.3
Cadence	195.2	184.3	-10.9	4.1	0.0
Mentor Graphics	170.7	146.4	-24.3	3.3	-0.3
Fujitsu	134.4	119.6	-14.8	2.7	-0.1
Valid	109.6	108.5	-1.1	2.4	0.1
SDRC	93.5	101.1	7.6	2.3	0.3
EDS	146.6	100.1	-46.5	2.2	-0.9
Siemens Nixdorf Infosysteme	109.1	94.3	-14.8	2.1	-0.2
NEC	103.5	83.4	-20.1	1.9	-0.3

(Continued)

Table 3 (Continued)
1991 CAD/CAM/CAE/GIS Software Market

Company	Preliminary Software Revenue (\$M)	Final Software Revenue (\$M)	Revenue Change (\$M)	Final Software Share (%)	Share Change (%)
ESRI	82.5	77.5	-5	1.7	0.0
Hitachi	88.2	75.6	-12.6	1.7	-0.2
Racal-Redac	67.6	70.6	3	1.6	0.2
Zuken	62.8	62.8	0	1.4	0.1
Hewlett-Packard	72.7	61.0	-11.8	1.4	-0.1
MacNeal-Schwendler	52.8	53.6	0.8	1.2	0.1
CADAM	48.3	51.3	3	1.2	0.2
Schlumberger	60.9	50.9	-10	1.1	-0.2
Parametric Technology	43.4	43.4	0	1.0	0.1
Toshiba—No OEM	51.5	40.0	-11.5	0.9	-0.2
Matra Datavision	37.6	35.8	-1.8	0.8	0.0
Wacom	32.3	32.3	0	0.7	0.0
Viewlogic Systems	30.7	32.0	1.3	0.7	0.0
PDA Engineering	24.9	30.4	5.5	0.7	0.2
Synopsys	31.4	30.1	-1.3	0.7	0.0
Sharp System Products—No OEM	29.9	29.9	0	0.7	0.1
Control Data	28.2	29.3	1.1	0.7	0.1
Swanson Analysis	28.8	28.5	-0.3	0.6	0.0
ISICAD	27.6	27.6	0.9	0.6	0.0
Nihon Unisys	31.9	27.4	-4.5	0.6	-0.1
Alias Research	27.0	27.0	0	0.6	0.0
Mutoh Industries—No OEM	31.0	26.7	-4.3	0.6	-0.1
STI-Straessle	26.1	26.1	0	0.6	0.0
Nemetschek	24.0	24.7	0.6	0.6	0.1
COMPASS Design Automation-VLSI	28.1	23.9	-4.2	0.5	-0.1
Landmark Graphics	20.7	23.2	2.5	0.5	0.1
Auto-Trol	19.6	21.3	1.7	0.5	0.1
Harris EDA	19.1	20.1	0.8	0.4	0.0
IEZ	33.7	19.8	-13.9	0.4	-0.3
Hakuto	22.0	18.9	-3.2	0.4	-0.1
EEsof	18.1	18.1	0	0.4	0.0
Cimline	17.7	18.0	0.3	0.4	0.0
PAFEC	19.4	17.9	-1.5	0.4	0.0
MCS	17.2	17.2	0	0.4	0.0
Kewill Systems	17.1	17.1	0	0.4	0.0
CADKEY	14.8	16.4	1.6	0.4	0.1
Xilinx	16.2	16.2	0	0.4	0.1
CADIX	16.1	16.1	0	0.4	0.1
Tokyo Electron—No OEM	15.1	15.1	0	0.3	0.0
170 Other Companies	1,120.6	1,072.4	-58.5	23.8	0.1
Total	4,722.9	4,466.3	-256.6	100.0	0.0

Source: Dataquest (September 1992)

with the company's recapitalization. Both Digital Equipment Corporation and NEC Electronics Inc. are significant computer suppliers in the CAD/CAM market, so our reduced revenue estimates here produced a significant dollar drop. Changes to these four companies (EDS, Computervision, Digital, and NEC) account for approximately 50 percent of our market size reduction.

Final financial results for most Asian-based and European-based companies, which are not usually available until midspring, were also overoptimistically estimated (by the companies themselves and Dataquest) in January. The worldwide economic slowdown, much of which occurred in the fourth quarter of 1991, was significantly underestimated.

On the software side, most of the changes to vendor revenue were again downward, with fewer balancing upward adjustments (see Table 3). Beyond the companies already mentioned, Mentor Graphics Corp. revenue was adjusted to reflect a lower proportion of software in 1991, based on delayed shipment of a new software release—with a resulting reductions in software revenue. Here, too, changes to our software revenue produced almost insignificant changes to any company's market share.

In addition to these changes, the CAD/CAM/CAE/GIS group significantly refined its database model for tracking sales through the OEM distribution channel. This model change affected many of the major hardware vendors' market position by application as we tried to match their hardware OEM sales going through to turnkey vendors. This model change has been adjusted for historical information also and will continue to be refined each update.

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.

Dataquest Perspective

The market dynamics in the total CAD/CAM/CAE/GIS market comprises many factors based on application-specific market needs, diverse geographical issues, and the amazing growth

of computing and graphics resources. A more detailed analysis of each application area must be made to thoroughly understand the forces driving the entire market. Dataquest will discuss these forces and will provide an in-depth analysis of CAD/CAM/CAE/GIS regional issues, technology trends, and company analyses in future publications.

About This Document

This document contains Dataquest's detailed market share information on the CAD/CAM/CAE/GIS industry. Following is a description of the information reported in the *Market Share* book for each segment:

- Source—All companies in database; overview of industry
- Mechanical Applications—All companies in database with mechanical revenue
- AEC and GIS Applications—All companies in database with AEC or GIS revenue
- Electronic Design Automation Applications—All companies in database with EDA (electronic CAE, IC layout, PCB/hybrid/MCM) revenue
- Europe—All Europe-based companies and all other companies with more than \$1 million in European revenue
- Asia—All Asia-based companies and all other companies with more than \$1 million in Asian revenue
- Personal CAD and Distribution Channels—All companies in database with personal computer revenue

More detailed data on this market may be requested through our client inquiry service.

Segmentation

Dataquest defines CAD/CAM/CAE/GIS as systems used in the mechanical; architecture, engineering, and construction (AEC); GIS/mapping; and electronic design automation (EDA) application areas. The CAD/CAM/CAE/GIS market is defined

according to the following segmentation scheme:

- CAD/CAM/CAE/GIS
 - Mechanical
 - AEC (Architecture, Engineering, and Construction)
 - GIS/Mapping (Geographic Information Systems)
 - EDA (Electronic Design Automation)
 - Electronic CAE
 - IC Layout
 - PCB/Hybrid/MCM

In addition, more detailed information by subapplication is available and usually published in *Dataquest Perspectives*.

Definitions

This section lists the definitions that are specific to this document.

Application definitions are as follows:

- Mechanical—Mechanical CAD/CAM refers to computer-aided tools used to design, analyze, document, and manufacture discrete parts, components, and assemblies.
- 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.
- 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 ECAE, 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 application 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.

Regional definitions are as follows:

- North America—Includes United States and Canada
- Europe—Includes the United Kingdom, Scandinavia, Benelux, France, Germany, Italy, Spain, and Rest of Europe
- Asia—Includes Japan, Singapore, Taiwan, Korea, China, and Hong Kong
- Rest of World—All other countries including Australia, New Zealand, Oceania, Africa, Central America, South America, and the Middle East

Platform definitions are as follows:

- Technical Workstation—This is a single-user computer that is distinguished from a personal computer by its features and by the user's potential range of expansion on the platform. Features include a virtual, multi-tasking operating system (UNIX, VMS, DOMAIN); the computer is designed by manufacturer to run high-performance graphic applications in a multiuser/multi-tasking environment.

- **Host-Dependent**—This is a shared logic system in which the external workstations' functions are dependent on a host computer.
- **Server**—A server is a computer that transparently provides its resources for use by other computer systems. It is a system on a network that provides specific functionality to other computer systems: the clients. Functions include file storage, database access, compute capability, and others. Dataquest tracks the following major categories of servers used for CAD/CAM/CAE/GIS applications:
 - **Compute Servers**—These systems provide capabilities for solving numerical problems (for example, simulations, statistical calculations, and simultaneous partial differential equations). System features usually include high-speed computational capabilities (for example, vector and parallel processing) and large memories.
 - **Print Servers**—These systems provide access to printers, specialized printing applications software, and print spooling resources to a network.
 - **File Servers**—These systems provide mass storage capability to clients on a network. Services can range from temporary storage of working files to long-term backup and archive systems.
 - **Database Servers**—These systems manage databases as a shared resource to a network. These servers handle such functions as physical data storage, data security, and high-level queries and can access stored information at the record level.
- **Personal Computer**—This is defined as a single-user computer that is distinguished from a technical workstation by its features and by the user's potential range of expansion on the platform. Features found in technical workstations (such as a virtual operating system, networking, high-performance graphics, multiuser/multitasking capability) are optional rather than integrated by the manufacturer.

Revenue/shipments/ASP definitions are as follows:

- **Total factory revenue** is defined as the amount of money received by a manufacturer for its goods 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).
- **Unit shipment** is defined as the number of products delivered (that is, seats).
- **Software revenue** is revenue derived from the sale of bundled (part of a turnkey system) and unbundled software.
- **Service revenue** is defined as 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.

Market Share Methodology

Dataquest uses both primary and secondary sources to produce our market share data. In the fourth quarter of each year, we survey all major 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

We resurvey select companies during the second quarter of the following year to verify final annual results and then publish final market share information based on this updated information. Our annual delivery schedule is as follows:

- First Quarter (January 31)—Preliminary market data are available. All tables will be published and distributed to clients. Historical database is opened for changes for a six-month period.
- Second Quarter (March 31)—We provide complete preliminary forecast tables, including a new five-year forecast period.
- Third Quarter (July 1)—We send complete, final updated market share tables based on additional data collection and analysis over the previous six months. 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 these final market data.
- Fourth Quarter (October 1)—We provide complete final forecast tables, taking into consideration changes in the market during the previous six months.

The Audit Process

Data supplied by vendors are 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

In addition, Dataquest 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 above tools 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—particularly useful when comparing regions or applications.

Notes on Market Share

For the 1991 market share cycle, Dataquest's CAD/CAM/CAE/GIS group added server as a platform. The platform categories now include technical workstation, host-dependent, server, and personal computer. Revenue formerly classified in technical workstations, host-dependent, or personal computer may now be more accurately classified, where appropriate, in the server category. However, because of this reclassification, data and growth rates for the other platform areas were affected.

Finally, please note that despite the care taken in gathering and analyzing the available data and in attempting to categorize those 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 these data and those provided by others.

Table 4
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	1,339.6	770.9	321.7	40,515	18.5%	19.3%	15.8%	15.2%
Computervision	729.8	287.1	202.3	7,216	10.1%	7.2%	9.9%	2.7%
Hewlett-Packard	517.4	367.4	61.0	31,039	7.1%	9.2%	3.0%	11.7%
Digital	353.3	243.7	.0	3,494	4.9%	6.1%	.0%	1.3%
EDS	208.2	106.7	71.9	3,654	2.9%	2.7%	3.5%	1.4%
NEC	198.6	133.7	49.0	9,679	2.7%	3.3%	2.4%	3.6%
Nihon Unisys	183.5	122.9	23.9	1,761	2.5%	3.1%	1.2%	.7%
Fujitsu	181.6	114.4	49.0	4,086	2.5%	2.9%	2.4%	1.5%
Silicon Graphics	171.0	154.8	.0	4,002	2.4%	3.9%	.0%	1.5%
Intergraph	168.4	86.1	36.7	2,508	2.3%	2.2%	1.8%	.9%
Control Data	166.4	80.1	27.3	1,132	2.3%	2.0%	1.3%	.4%
Sun Microsystems	142.0	120.7	.0	7,582	2.0%	3.0%	.0%	2.8%
Compaq	141.2	141.2	.0	27,529	2.0%	3.5%	.0%	10.3%
Hitachi	135.0	64.8	56.7	3,966	1.9%	1.6%	2.8%	1.5%
Schlumberger	131.3	44.1	50.9	1,600	1.8%	1.1%	2.5%	.6%
Autodesk	106.2	.0	106.2	0	1.5%	.0%	5.2%	.0%
SDRC	101.1	.0	101.1	0	1.4%	.0%	5.0%	.0%
Apple Computer	94.9	83.5	.0	19,887	1.3%	2.1%	.0%	7.5%
Matra Datavision	79.3	27.9	35.8	757	1.1%	.7%	1.8%	.3%
Toshiba—NO OEM	72.5	38.2	27.0	2,431	1.0%	1.0%	1.3%	.9%
Siemens Nixdorf Info systems	71.1	35.6	24.9	1,045	1.0%	.9%	1.2%	.4%
CADAM	64.5	22.5	35.7	4,500	.9%	.6%	1.7%	1.7%
Hitachi Zosen Info Systems	59.1	45.6	1.7	606	.8%	1.1%	.1%	.2%
MacNeal-Schwendler	55.6	.0	53.4	0	.8%	.0%	2.6%	.0%

(Continued)

Table 4 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Mutoh Industries—NO OEM	48.5	26.3	17.7	1,332	.7%	.7%	.9%	.5%
Parametric Technology	47.2	.0	43.4	0	.7%	.0%	2.1%	.0%
Hakuto	47.1	28.3	18.9	1,562	.7%	.7%	.9%	.6%
Mitsubishi Electric	40.9	31.4	5.5	787	.6%	.8%	.3%	.3%
STI-Straessle	38.0	8.7	20.9	357	.5%	.2%	1.0%	.1%
Cisgraph	33.9	11.2	12.9	400	.5%	.3%	.6%	.2%
Unisys	33.4	17.0	11.7	502	.5%	.4%	.6%	.2%
PDA Engineering	31.6	.0	30.4	0	.4%	.0%	1.5%	.0%
Sumitomo Denko Workstation	31.2	31.2	.0	1,739	.4%	.8%	.0%	.7%
Sharp System Products—NO OEM	31.2	16.2	15.0	205	.4%	.4%	.7%	.1%
Alias Research	29.7	.0	27.0	0	.4%	.0%	1.3%	.0%
Gerber Systems	28.9	14.1	9.5	400	.4%	.4%	.5%	.2%
Swanson Analysis	28.5	.0	28.5	0	.4%	.0%	1.4%	.0%
Investronica SA	28.1	22.5	2.8	1,125	.4%	.6%	.1%	.4%
Wlechers Datentechnik	27.0	15.4	8.1	667	.4%	.4%	.4%	.3%
Tokyo Electron—NO OEM	26.8	8.8	12.9	99	.4%	.2%	.6%	.0%
Auto-Trol	26.3	9.7	10.0	329	.4%	.2%	.5%	.1%
Cimline	25.7	2.6	18.0	540	.4%	.1%	.9%	.2%
Cimatron	24.4	11.0	11.0	781	.3%	.3%	.5%	.3%
Mitsui Engineering	21.8	15.2	4.4	145	.3%	.4%	.2%	.1%
Norsk Data	21.7	11.0	3.8	226	.3%	.3%	.2%	.1%
ISICAD	20.7	9.1	8.2	148	.3%	.2%	.4%	.1%
Delcam International	20.4	7.1	10.2	343	.3%	.2%	.5%	.1%
Toyo Information Systems—NO OEM	19.8	12.1	5.8	211	.3%	.3%	.3%	.1%

(Continued)

Table 4 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application:	Mechanical									
Platform:	All Platforms									
Region:	Worldwide									
Units:	Millions of U.S. Dollars/Actual Units									
Company	Market Share									
	Total		Hardware		Software		Total		Hardware	
	Factory Revenue	Hardware Revenue	Hardware Revenue	Units Shipped	Software Revenue	Hardware Revenue	Factory Revenue	Hardware Revenue	Software Revenue	Units Shipped
MCS	19.5	.0	17.2	0		.0%	.3%	.0%	.8%	.0%
Fides Industrielle Automation	18.5	2.8	13.0	159		.1%	.3%	.1%	.6%	.1%
ADRA Systems	16.2	4.0	10.2	200		.1%	.2%	.1%	.5%	.1%
ISKON Software	16.0	7.2	5.6	274		.2%	.2%	.2%	.3%	.1%
CAD Lab	15.7	.0	12.6	0		.0%	.2%	.0%	.6%	.0%
Digital Kienzle	15.7	8.0	4.4	230		.2%	.2%	.2%	.2%	.1%
Vero International Software	15.5	.0	14.1	0		.0%	.2%	.0%	.7%	.0%
Kewill Systems	15.5	4.7	8.5	322		.1%	.2%	.1%	.4%	.1%
Graphtec Engineering	14.8	7.4	6.6	319		.2%	.2%	.2%	.3%	.1%
Tebis	14.5	2.2	10.1	80		.1%	.2%	.1%	.5%	.0%
Framasoft	14.2	.0	8.6	0		.0%	.2%	.0%	.4%	.0%
Omron	13.9	12.6	1.4	402		.3%	.2%	.3%	.1%	.2%
CADKEY	13.8	.0	13.8	0		.0%	.2%	.0%	.7%	.0%
Hahn & Kolb	13.5	8.1	4.1	195		.2%	.2%	.2%	.2%	.1%
ICAD	13.0	.0	10.4	0		.0%	.2%	.0%	.5%	.0%
Exapt	12.7	6.2	4.3	220		.2%	.2%	.2%	.2%	.1%
Dell Computer	12.4	12.4	.0	3,162		.3%	.2%	.3%	.0%	1.2%
PAFEC	12.3	.0	12.3	0		.0%	.2%	.0%	.6%	.0%
Aries Technology	12.0	.0	10.8	0		.0%	.2%	.0%	.5%	.0%
Nestler Electronics	11.0	5.0	6.1	300		.1%	.2%	.1%	.3%	.1%
ItalCad	10.8	5.1	2.6	101		.1%	.1%	.1%	.1%	.0%
Design Automation	10.2	.0	10.2	0		.0%	.1%	.0%	.5%	.0%
ICL	10.2	6.0	3.5	279		.1%	.1%	.1%	.2%	.1%
Ferranti	10.0	3.7	4.6	87		.1%	.1%	.1%	.2%	.0%

(Continued)

(Continued)

Table 4 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Company	Application: Platform: Region: Units:	Total Factory Revenue	Millions of U.S. Dollars/Actual Units				Market Share			
			Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Hardware Units Shipped
MARC	Mechanical	10.0	.0	10.0	0	.1%	.0%	.5%	.0%	.0%
Marcus Computer Systeme	All Platforms	9.8	5.1	3.3	285	.1%	.1%	.2%	.1%	.1%
Caditron	Worldwide	9.8	4.9	3.9	151	.1%	.1%	.2%	.1%	.1%
Wacom		9.7	2.0	6.8	155	.1%	.0%	.3%	.1%	.1%
Radan Computational		9.4	3.3	4.7	315	.1%	.1%	.2%	.1%	.1%
CNC Software		9.2	.0	9.2	0	.1%	.0%	.4%	.0%	.0%
Andor		8.5	2.1	6.1	77	.1%	.1%	.3%	.0%	.0%
Point Control		8.0	.0	8.0	0	.1%	.0%	.4%	.0%	.0%
Engineering Mechanics		7.6	.4	6.5	604	.1%	.0%	.3%	.2%	.2%
Mechanical Dynamics		7.5	.0	6.7	0	.1%	.0%	.3%	.0%	.0%
Research Machines		7.2	7.2	.0	1,162	.1%	.2%	.0%	.4%	.4%
DAI Standard info ssystemes		6.5	.0	6.1	0	.1%	.0%	.3%	.0%	.0%
Technische Computer Systeme		5.8	1.2	4.7	153	.1%	.0%	.2%	.1%	.1%
Valisys		5.6	.0	5.6	0	.1%	.0%	.3%	.0%	.0%
Sony		5.6	4.9	.0	325	.1%	.1%	.0%	.1%	.1%
Ziegler Informatics		5.6	.0	5.6	0	.1%	.0%	.3%	.0%	.0%
SPATIAL Technology		5.0	.0	5.0	0	.1%	.0%	.2%	.0%	.0%
Algor Interactive Systems		4.7	.0	4.1	0	.1%	.0%	.2%	.0%	.0%
Anilam Electronics		4.7	1.4	2.8	58	.1%	.0%	.1%	.0%	.0%
Serbi		4.6	.0	4.6	0	.1%	.0%	.2%	.0%	.0%
Everex Systems		4.5	4.5	.0	1,838	.1%	.1%	.0%	.7%	.7%
Moda CAD		4.2	1.0	2.9	35	.1%	.0%	.1%	.0%	.0%
Whesoe Computing Systems		4.1	.0	4.1	0	.1%	.0%	.2%	.0%	.0%
Pathrace		4.0	.9	2.6	60	.1%	.0%	.1%	.0%	.0%

(Continued)

Table 4 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Platform: Region: Units:	Mechanical All Platforms Worldwide Millions of U.S. Dollars/Actual Units	Market Share												
		Total		Hardware		Software		Total		Hardware		Software		
		Factory Revenue	Hardware Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Ortos		3.8	.0	3.8	0	.1%	.0%	.2%	.0%					.0%
Micro Engineering Solutions		3.7	1.0	2.4	47	.1%	.0%	.1%	.0%					.0%
XAO Industrie		3.7	1.3	2.2	133	.1%	.0%	.1%	.1%					.1%
CADSI		3.5	.5	2.6	22	.0%	.0%	.1%	.0%					.0%
CADIX		3.2	1.3	1.6	24	.0%	.0%	.1%	.0%					.0%
Solbourne		3.1	3.1	.0	346	.0%	.1%	.0%	.1%					.1%
Clarix		3.1	.0	3.1	0	.0%	.0%	.2%	.0%					.0%
Superdraft		3.1	1.4	1.5	168	.0%	.0%	.1%	.1%					.1%
Micrografx		3.0	.0	3.0	0	.0%	.0%	.1%	.0%					.0%
Century Research Center		2.9	1.6	1.1	12	.0%	.0%	.1%	.0%					.0%
FEA		2.9	.7	.7	17	.0%	.0%	.0%	.0%					.0%
Olivetti		2.9	2.4	.0	436	.0%	.1%	.0%	.2%					.0%
CAMTEK		2.8	.0	2.3	0	.0%	.0%	.1%	.0%					.0%
debis Systemhaus		2.8	.7	1.7	19	.0%	.0%	.1%	.0%					.0%
Catalpa		2.6	.9	1.3	21	.0%	.0%	.1%	.0%					.0%
American Small Business Comp.		2.4	.0	2.4	0	.0%	.0%	.1%	.0%					.0%
Computational Mechanics		2.3	.0	2.3	0	.0%	.0%	.1%	.0%					.0%
Caroline Informatique		2.2	.4	1.1	17	.0%	.0%	.1%	.0%					.0%
ISKA		2.1	1.0	.9	39	.0%	.0%	.0%	.0%					.0%
Kubota Computer		2.0	1.3	.7	113	.0%	.0%	.0%	.0%					.0%
Ricoh--NO OEM		1.9	.0	1.6	0	.0%	.0%	.1%	.0%					.0%
Rasna Corporation		1.8	.0	1.8	0	.0%	.0%	.1%	.0%					.0%
FEGS		1.7	.0	1.4	0	.0%	.0%	.1%	.0%					.0%
Robocom		1.7	.0	1.7	0	.0%	.0%	.1%	.0%					.0%

(Continued)

(Continued)

Table 4 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Softdesk	1.4	.0	1.4	0	.0%	.0%	.1%	.0%
CAD Centre	1.4	.0	1.1	0	.0%	.0%	.1%	.0%
Wisdom Systems	1.4	.0	1.0	0	.0%	.0%	.0%	.0%
Evolution Computing	1.2	.0	1.2	0	.0%	.0%	.1%	.0%
Accugraph	1.1	.5	.5	37	.0%	.0%	.0%	.0%
Object Design	1.0	.0	1.0	0	.0%	.0%	.0%	.0%
S.T.L.D. s.r.l.	1.0	.0	1.0	0	.0%	.0%	.0%	.0%
Objectivity	.9	.0	.9	0	.0%	.0%	.0%	.0%
Vision 3D	.9	.5	.2	6	.0%	.0%	.0%	.0%
Zuken	.8	.3	.5	5	.0%	.0%	.0%	.0%
Innovative Data Design	.8	.0	.8	0	.0%	.0%	.0%	.0%
Foresight Resources	.8	.0	.7	0	.0%	.0%	.0%	.0%
Aura CAD/CAM Systems	.7	.0	.6	0	.0%	.0%	.0%	.0%
Ithaca Software	.7	.0	.7	0	.0%	.0%	.0%	.0%
ESDU International	.7	.0	.7	0	.0%	.0%	.0%	.0%
A.I. Systems	.7	.0	.7	0	.0%	.0%	.0%	.0%
GRAPHISOFT	.6	.0	.6	0	.0%	.0%	.0%	.0%
Machinery Sales	.6	.0	.6	0	.0%	.0%	.0%	.0%
CADWorks	.6	.0	.5	0	.0%	.0%	.0%	.0%
Graphisoft Software Dev	.6	.0	.6	0	.0%	.0%	.0%	.0%
Uniras	.4	.0	.4	0	.0%	.0%	.0%	.0%
Cascade Graphics	.4	.0	.4	0	.0%	.0%	.0%	.0%
Engineering Systems Corp.	.4	.0	.3	0	.0%	.0%	.0%	.0%
Ashlar	.3	.0	.3	0	.0%	.0%	.0%	.0%

(Continued)

Table 4 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
Platform: All Platforms
Region: Worldwide
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Spectrum Graphics	.3	.1	.2	3	.0%	.0%	.0%	.0%
Georgia Tech Research Corp.	.3	.0	.3	0	.0%	.0%	.0%	.0%
Mc2 Engineering Software	.3	.0	.3	0	.0%	.0%	.0%	.0%
Synthesis	.3	.0	.3	0	.0%	.0%	.0%	.0%
A/E Microsystems	.3	.2	.0	25	.0%	.0%	.0%	.0%
Mega CADD	.2	.0	.2	0	.0%	.0%	.0%	.0%
CAD-Capture	.2	.0	.0	0	.0%	.0%	.0%	.0%
DAPCO	.2	.0	.1	0	.0%	.0%	.0%	.0%
Engineered Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Lamp Software	.1	.0	.1	6	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.1	0	.0%	.0%	.0%	.0%
IGC Technology	.1	.0	.1	0	.0%	.0%	.0%	.0%
Number One Systems	.0	.0	.0	1	.0%	.0%	.0%	.0%
Other Companies	454.2	441.3	.0	62,133	6.3%	11.0%	.0%	23.4%
All Companies	7,238.5	3,995.0	2,040.1	266,062	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	5,410.1	3,030.2	1,408.4	225,025	74.7%	75.8%	69.0%	84.6%
All Asian-Based Companies	1,171.1	722.5	323.7	30,040	16.2%	18.1%	15.9%	11.3%
All European-Based Companies	657.3	242.3	308.0	10,997	9.1%	6.1%	15.1%	4.1%
All Hardware Companies	1,813.5	1,578.1	5.7	186,666	25.1%	39.5%	.3%	70.2%
All Turnkey & SW Companies	5,425.0	2,417.0	2,034.3	79,395	74.9%	60.5%	99.7%	29.8%

Source: Dataquest (September 1992)

Mechanical Applications Final Market Share

Table 5
1991 CAD/CAM/CAB/GIS Final Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Computervision	631.2	252.1	170.6	5,365	17.6%	14.1%	14.9%	7.8%
Hewlett-Packard	447.5	311.5	61.0	17,799	12.5%	17.4%	5.3%	25.9%
IBM	213.6	118.4	53.5	5,619	5.9%	6.6%	4.7%	8.2%
EDS	166.0	85.3	57.2	2,525	4.6%	4.8%	5.0%	3.7%
Silicon Graphics	164.7	149.6	.0	3,896	4.6%	8.4%	.0%	5.7%
Intergraph	133.0	71.4	25.1	2,077	3.7%	4.0%	2.2%	3.0%
NEC	99.3	54.6	36.7	3,112	2.8%	3.1%	3.2%	4.5%
Sun Microsystems	97.1	84.1	.0	5,929	2.7%	4.7%	.0%	8.6%
Schlumberger	91.9	31.5	34.7	979	2.6%	1.8%	3.0%	1.4%
SDRC	88.0	.0	88.0	0	2.5%	.0%	7.7%	.0%
Matra Datavision	79.3	27.9	35.8	757	2.2%	1.6%	3.1%	1.1%
Fujitsu	74.4	46.9	20.1	1,804	2.1%	2.6%	1.8%	2.6%
Siemens Nixdorf Info systeme	71.1	35.6	24.9	1,044	2.0%	2.0%	2.2%	1.5%
Hitachi	67.5	32.4	28.4	1,334	1.9%	1.8%	2.5%	1.9%
Digital	63.7	44.0	.0	2,727	1.8%	2.5%	.0%	4.0%
Nihon Unisys	58.7	39.3	7.6	728	1.6%	2.2%	.7%	1.1%
Control Data	58.2	35.5	12.2	791	1.6%	2.0%	1.1%	1.2%
Hitachi Zosen Info Systems	55.6	45.6	1.7	606	1.5%	2.5%	.1%	.9%
Parametric Technology	47.2	.0	43.4	0	1.3%	.0%	3.8%	.0%
Toshiba—NO OEM	42.0	21.0	16.8	477	1.2%	1.2%	1.5%	.7%
STI-Straessle	38.0	8.7	20.9	357	1.1%	.5%	1.8%	.5%
Cisigraph	30.5	10.1	11.6	360	.8%	.6%	1.0%	.5%
Mitsubishi Electric	29.8	25.4	2.1	330	.8%	1.4%	.2%	.5%
Alias Research	29.7	.0	27.0	0	.8%	.0%	2.4%	.0%

(Continued)

Table 5 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Sumitomo Denko Workstation	29.1	29.1	.0	1,577	.8%	1.6%	.0%	2.3%
Gerber Systems	28.9	14.1	9.5	400	.8%	.8%	.8%	.6%
Sharp System Products—NO OEM	27.1	14.1	13.0	168	.8%	.8%	1.1%	.2%
Tokyo Electron—NO OEM	26.8	8.8	12.9	99	.7%	.5%	1.1%	.1%
Auto-Trol	26.3	9.7	10.0	329	.7%	.5%	.9%	.5%
Unisys	25.7	13.1	9.0	398	.7%	.7%	.8%	.6%
Cimlinc	25.7	2.6	18.0	540	.7%	.1%	1.6%	.8%
PDA Engineering	23.7	.0	22.8	0	.7%	.0%	2.0%	.0%
Delcam International	20.4	7.1	10.2	343	.6%	.4%	.9%	.5%
Mitsui Engineering	19.8	13.9	4.0	112	.6%	.8%	.3%	.2%
ISICAD	18.8	9.1	6.3	148	.5%	.5%	.6%	.2%
Mutoh Industries—NO OEM	17.0	8.2	5.8	223	.5%	.5%	.5%	.3%
Cimatron	16.3	7.3	7.3	365	.5%	.4%	.6%	.5%
ISYKON Software	16.0	7.2	5.6	274	.4%	.4%	.5%	.4%
Toyo Information Systems—NO OEM	15.8	9.9	4.5	187	.4%	.6%	.4%	.3%
Fides Industrielle Automation	15.7	2.4	11.0	149	.4%	.1%	1.0%	.2%
Digital Kienzle	15.7	8.0	4.4	230	.4%	.4%	.4%	.3%
CAD Lab	14.9	.0	12.0	0	.4%	.0%	1.0%	.0%
Graphtec Engineering	14.8	7.4	6.6	319	.4%	.4%	.6%	.5%
Swanson Analysis	14.3	.0	14.3	0	.4%	.0%	1.2%	.0%
Kewill Systems	14.0	4.2	7.7	309	.4%	.2%	.7%	.4%
Omron	13.9	12.6	1.4	402	.4%	.7%	.1%	.6%
ICAD	13.0	.0	10.4	0	.4%	.0%	.9%	.0%
Framasoft	12.8	.0	7.7	0	.4%	.0%	.7%	.0%

(Continued)

Table 5 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company	Market Share							
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Hahn & Kolb	12.8	7.7	3.9	181	.4%	.4%	.3%	.3%
Autodesk	12.7	.0	12.7	0	.4%	.0%	1.1%	.0%
ADRA Systems	12.5	4.0	7.2	200	.3%	.2%	.6%	.3%
Nestler Electronics	11.0	5.0	6.1	300	.3%	.3%	.5%	.4%
ItalCad	10.8	5.1	2.6	101	.3%	.3%	.2%	.1%
PAFEC	10.5	.0	10.5	0	.3%	.0%	.9%	.0%
ICL	10.2	6.0	3.5	279	.3%	.3%	.3%	.4%
Ferranti	10.0	3.7	4.6	87	.3%	.2%	.4%	.1%
Norsk Data	10.0	5.8	2.0	130	.3%	.3%	.2%	.2%
Marcus Computer Systeme	9.8	5.1	3.3	285	.3%	.3%	.3%	.4%
Aries Technology	9.6	.0	8.7	0	.3%	.0%	.8%	.0%
Radan Computational	9.3	3.3	4.7	310	.3%	.2%	.4%	.5%
MCS	9.0	.0	8.0	0	.2%	.0%	.7%	.0%
Wiechers Datentechnik	7.0	4.0	2.1	90	.2%	.2%	.2%	.1%
MARC	7.0	.0	7.0	0	.2%	.0%	.6%	.0%
Mechanical Dynamics	6.4	.0	5.7	0	.2%	.0%	.5%	.0%
MacNeal-Schwendler	6.1	.0	5.9	0	.2%	.0%	.5%	.0%
Technische Computer Systeme	5.8	1.2	4.7	153	.2%	.1%	.4%	.2%
Sony	5.6	4.9	.0	325	.2%	.3%	.0%	.5%
Valisys	5.6	.0	5.6	0	.2%	.0%	.5%	.0%
SPATIAL Technology	5.0	.0	5.0	0	.1%	.0%	.4%	.0%
Engineering Mechanics	4.4	.2	3.7	212	.1%	.0%	.3%	.3%
Ontos	3.8	.0	3.8	0	.1%	.0%	.3%	.0%
XAO Industrie	3.7	1.3	2.2	133	.1%	.1%	.2%	.2%

(Continued)

Table 5 (Continued)

1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company	Market Share							
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Exapt	3.4	1.7	1.2	110	.1%	.1%	.1%	.2%
Hakuto	3.3	2.0	1.3	63	.1%	.1%	.1%	.1%
CADIX	3.2	1.3	1.6	24	.1%	.1%	.1%	.0%
CADKEY	2.8	.0	2.8	0	.1%	.0%	.2%	.0%
CADSI	2.8	.4	2.1	12	.1%	.0%	.2%	.0%
Catalpa	2.6	.9	1.3	21	.1%	.0%	.1%	.0%
ISKA	2.1	1.0	.9	39	.1%	.1%	.1%	.1%
debis Systemhaus	2.1	.5	1.3	11	.1%	.0%	.1%	.0%
CAMTEK	2.0	.0	1.6	0	.1%	.0%	.1%	.0%
Ricoh—NO OEM	1.9	.0	1.6	0	.1%	.0%	.1%	.0%
Caroline Informatique	1.6	.3	.8	8	.0%	.0%	.1%	.0%
Century Research Center	1.5	.8	.6	9	.0%	.0%	.0%	.0%
Kubota Computer	1.5	1.0	.5	97	.0%	.1%	.0%	.1%
Micro Engineering Solutions	1.4	.4	.9	13	.0%	.0%	.1%	.0%
CAD Centre	1.4	.0	1.1	0	.0%	.0%	.1%	.0%
Wisdom Systems	1.4	.0	1.0	0	.0%	.0%	.1%	.0%
Wacom	1.3	.3	1.0	13	.0%	.0%	.1%	.0%
Solbourne	1.3	1.3	.0	254	.0%	.1%	.0%	.4%
FEA	1.2	.3	.3	3	.0%	.0%	.0%	.0%
Object Design	1.0	.0	1.0	0	.0%	.0%	.1%	.0%
FEGS	1.0	.0	.8	0	.0%	.0%	.1%	.0%
Accugraph	1.0	.5	.4	36	.0%	.0%	.0%	.1%
Objectivity	.9	.0	.9	0	.0%	.0%	.1%	.0%
Zuken	.8	.3	.5	5	.0%	.0%	.0%	.0%

(Continued)

Table 5 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company	Market Share							
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Computational Mechanics	.6	.0	.6	0	.0%	.0%	.1%	.0%
Point Control	.6	.0	.6	0	.0%	.0%	.0%	.0%
Everex Systems	.5	.5	.0	83	.0%	.0%	.0%	.1%
Whesoe Computing Systems	.4	.0	.4	0	.0%	.0%	.0%	.0%
Spectrum Graphics	.3	.1	.2	3	.0%	.0%	.0%	.0%
Softdesk	.3	.0	.3	0	.0%	.0%	.0%	.0%
Ithaca Software	.3	.0	.3	0	.0%	.0%	.0%	.0%
A/E Microsystems	.2	.2	.0	21	.0%	.0%	.0%	.0%
Serbi	.2	.0	.2	0	.0%	.0%	.0%	.0%
DAPCO	.2	.0	.1	0	.0%	.0%	.0%	.0%
Georgia Tech Research Corp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
Algor Interactive Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
CADWorks	.1	.0	.0	0	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.1	0	.0%	.0%	.0%	.0%
Lamp Software	.0	.0	.0	3	.0%	.0%	.0%	.0%
ESDU International	.0	.0	.0	0	.0%	.0%	.0%	.0%
Synthesis	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	3,590.7	1,790.2	1,145.4	68,799	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	2,505.1	1,239.5	756.9	50,352	69.8%	69.2%	66.1%	73.2%
All Asian-Based Companies	610.8	379.5	168.6	12,014	17.0%	21.2%	14.7%	17.5%
All European-Based Companies	474.9	171.2	220.0	6,434	13.2%	9.6%	19.2%	9.4%
All Hardware Companies	531.5	452.4	2.6	25,548	14.8%	25.3%	.2%	37.1%
All Turnkey & SW Companies	3,059.2	1,337.8	1,142.9	43,252	85.2%	74.7%	99.8%	62.9%

Source: Dataquest (September 1992)

Table 6
1991 CAD/CAM/CAE/CIS Final Market Share

Application: Platform: Region: Units:	Mechanical Host-Dependent Worldwide Millions of U.S. Dollars/Actual Units	Market Share												
		Company	Total		Hardware		Software		Hardware		Software		Hardware	
			Factory Revenue	Revenue	Revenue	Units Shipped	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Units Shipped
IBM		815.1	440.1	216.0	10,709	42.2%	38.8%	51.6%	38.5%					
Digital		195.1	134.6	.0	0	10.1%	11.9%	.0%	.0%					
Nihon Unisys		124.8	83.6	16.2	1,033	6.5%	7.4%	3.9%	3.7%					
Control Data		104.8	43.0	14.7	334	5.4%	3.8%	3.5%	1.2%					
Fujitsu		78.1	49.2	21.1	1,316	4.0%	4.3%	5.0%	4.7%					
Computervision		71.6	28.9	16.3	1,592	3.7%	2.5%	3.9%	5.7%					
NEC		53.6	40.8	8.6	126	2.8%	3.6%	2.0%	.5%					
EDS		42.2	21.4	14.7	1,129	2.2%	1.9%	3.5%	4.1%					
MacNeal-Schwendler		31.7	.0	30.5	0	1.6%	.0%	7.3%	.0%					
Schlumberger		23.6	7.5	9.8	431	1.2%	.7%	2.3%	1.5%					
Hitachi		21.6	10.4	9.1	363	1.1%	.9%	2.2%	1.3%					
SDRC		13.2	.0	13.2	0	.7%	.0%	3.1%	.0%					
Norsk Data		11.5	5.1	1.7	91	.6%	.4%	.4%	.3%					
Exapt		9.3	4.5	3.2	110	.5%	.4%	.8%	.4%					
Swanson Analysis		8.9	.0	8.9	0	.5%	.0%	2.1%	.0%					
PDA Engineering		7.9	.0	7.6	0	.4%	.0%	1.8%	.0%					
Unisys		7.7	3.9	2.7	104	.4%	.3%	.6%	.4%					
Toshiba—NO OEM		7.3	3.6	2.9	125	.4%	.3%	.7%	.5%					
MCS		6.6	.0	5.8	0	.3%	.0%	1.4%	.0%					
Mitsubishi Electric		6.5	3.1	1.8	21	.3%	.3%	.4%	.1%					
Intergraph		5.0	2.5	.8	68	.3%	.2%	.2%	.2%					
Toyo Information Systems-NO OEM		4.1	2.2	1.3	24	.2%	.2%	.3%	.1%					
Hitachi Zosen Info Systems		3.6	.0	.0	0	.2%	.0%	.0%	.0%					
MARC		3.0	.0	3.0	0	.2%	.0%	.7%	.0%					

(Continued)

(Continued)

Table 6 (Continued)

1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Host-Dependent
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company	Market Share							
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Fides Industrielle Automation	2.8	.4	1.9	10	.1%	.0%	.5%	.0%
Computational Mechanics	1.7	.0	1.7	0	.1%	.0%	.4%	.0%
Kewill Systems	1.6	.5	.9	14	.1%	.0%	.2%	.0%
Century Research Center	1.4	.8	.5	2	.1%	.1%	.1%	.0%
Pramasoft	1.4	.0	.8	0	.1%	.0%	.2%	.0%
Mechanical Dynamics	1.1	.0	1.0	0	.1%	.0%	.2%	.0%
Whessoe Computing Systems	.8	.0	.8	0	.0%	.0%	.2%	.0%
FEES	.7	.0	.6	0	.0%	.0%	.1%	.0%
Kubota Computer	.5	.3	.2	16	.0%	.0%	.0%	.1%
debis Systemhaus	.3	.1	.2	2	.0%	.0%	.0%	.0%
Olivetti	.3	.3	.0	7	.0%	.0%	.0%	.0%
FEA	.3	.1	.1	1	.0%	.0%	.0%	.0%
Georgia Tech Research Corp.	.2	.0	.2	0	.0%	.0%	.0%	.0%
Engineering Systems Corp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
ESDU International	.0	.0	.0	0	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
Other Companies	259.9	246.9	.0	10,209	13.5%	21.8%	.0%	36.7%
All Companies	1,929.7	1,133.5	418.5	27,835	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	1,597.7	928.8	345.0	24,575	82.8%	81.9%	82.4%	88.3%
All Asian-Based Companies	301.4	193.9	61.7	3,027	15.6%	17.1%	14.7%	10.9%
All European-Based Companies	30.6	10.9	11.9	233	1.6%	1.0%	2.8%	.8%
All Hardware Companies	477.4	390.9	3.1	10,292	24.7%	34.5%	.7%	37.0%
All Turnkey & SW Companies	1,452.3	742.6	415.4	17,543	75.3%	65.5%	99.3%	63.0%

Source: Dataquest (September 1992)

Table 7
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Server
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	214.9	121.1	52.2	1,358	47.1%	45.3%	59.0%	26.0%
Digital	94.4	65.2	.0	768	20.7%	24.4%	.0%	14.7%
Sun Microsystems	44.9	36.6	.0	1,653	9.8%	13.7%	.0%	31.6%
Intergraph	25.3	12.3	6.1	364	5.5%	4.6%	6.9%	7.0%
MacNeal-Schwendler	16.7	.0	16.0	0	3.7%	.0%	18.1%	.0%
Computervision	15.8	6.1	4.8	129	3.5%	2.3%	5.4%	2.5%
Schlumberger	14.5	4.7	5.9	151	3.2%	1.8%	6.6%	2.9%
Silicon Graphics	6.3	5.2	.0	106	1.4%	1.9%	.0%	2.0%
Toshiba—NO OEM	5.1	4.6	.0	83	1.1%	1.7%	.0%	1.6%
Cisgraph	3.4	1.1	1.3	40	.7%	.4%	1.4%	.8%
Control Data	3.3	1.6	.4	6	.7%	.6%	.4%	.1%
Hewlett-Packard	3.0	2.4	.0	228	.7%	.9%	.0%	4.4%
Mutoh Industries—NO OEM	2.4	1.8	.6	75	.5%	.7%	.7%	1.4%
Sumitomo Denko Workstation	2.2	2.2	.0	162	.5%	.8%	.0%	3.1%
Solbourne	1.9	1.8	.0	92	.4%	.7%	.0%	1.8%
Sharp System Products—NO OEM	1.6	.8	.8	7	.3%	.3%	.8%	.1%
Rasna Corporation	.5	.0	.5	0	.1%	.0%	.6%	.0%
A/E Microsystems	.0	.0	.0	2	.0%	.0%	.0%	.0%

(Continued)

Table 7 (Continued)

1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Server
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company	Market Share							
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	456.0	267.5	88.5	5,223	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	441.3	257.0	85.8	4,856	96.8%	96.1%	97.0%	93.0%
All Asian-Based Companies	11.3	9.4	1.4	327	2.5%	3.5%	1.5%	6.3%
All European-Based Companies	3.4	1.1	1.3	40	.7%	.4%	1.4%	.8%
All Hardware Companies	155.2	115.6	.1	3,476	34.0%	43.2%	.1%	66.5%
All Turnkey & SW Companies	300.7	151.9	88.4	1,748	66.0%	56.8%	99.9%	33.5%

Source: Dataquest (September 1992)

Table 8
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Compaq	141.2	141.2	.0	27,529	11.2%	17.6%	.0%	16.8%
IBM	96.1	91.3	.0	22,829	7.6%	11.4%	.0%	13.9%
Apple Computer	94.9	83.5	.0	19,887	7.5%	10.4%	.0%	12.1%
Autodesk	93.5	.0	93.5	0	7.4%	.0%	24.1%	.0%
Hewlett-Packard	67.0	53.5	.0	13,013	5.3%	6.7%	.0%	7.9%
CADAM	64.5	22.5	35.7	4,500	5.1%	2.8%	9.2%	2.7%
Hitachi	45.9	22.0	19.3	2,269	3.6%	2.7%	5.0%	1.4%
NEC	45.7	38.4	3.7	6,441	3.6%	4.8%	.9%	3.9%
Hakuto	43.8	26.3	17.5	1,499	3.5%	3.3%	4.5%	.9%
Mutoh Industries—NO OEM	29.1	16.3	11.4	1,034	2.3%	2.0%	2.9%	.6%
Fujitsu	29.1	18.3	7.8	965	2.3%	2.3%	2.0%	.6%
Investronica SA	28.1	22.5	2.8	1,125	2.2%	2.8%	.7%	.7%
Wiechers Datentechnik	20.0	11.4	6.0	577	1.6%	1.4%	1.5%	.4%
Toshiba—NO OEM	18.1	9.1	7.2	1,747	1.4%	1.1%	1.9%	1.1%
Vero International Software	15.5	.0	14.1	0	1.2%	.0%	3.6%	.0%
Tebis	14.5	2.2	10.1	80	1.1%	.3%	2.6%	.0%
Dell Computer	12.4	12.4	.0	3,162	1.0%	1.5%	.0%	1.9%
Computervision	11.2	.0	10.7	130	.9%	.0%	2.7%	.1%
CADKEY	11.0	.0	11.0	0	.9%	.0%	2.8%	.0%
Design Automation	10.2	.0	10.2	0	.8%	.0%	2.6%	.0%
Caditron	9.8	4.9	3.9	151	.8%	.6%	1.0%	.1%
CNC Software	9.2	.0	9.2	0	.7%	.0%	2.4%	.0%
Andor	8.5	2.1	6.1	77	.7%	.3%	1.6%	.0%
Wacom	8.4	1.6	5.8	141	.7%	.2%	1.5%	.1%

(Continued)

Table 8 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company	Market Share							
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Cimatron	8.0	3.6	3.6	417	.6%	.4%	.9%	.3%
Point Control	7.4	.0	7.4	0	.6%	.0%	1.9%	.0%
Research Machines	7.2	7.2	.0	1,162	.6%	.9%	.0%	.7%
DAT Standard Info ssystems	6.5	.0	6.1	0	.5%	.0%	1.6%	.0%
Ziegler Informatics	5.6	.0	5.6	0	.4%	.0%	1.4%	.0%
Swanson Analysis	5.3	.0	5.3	0	.4%	.0%	1.4%	.0%
Intergraph	5.0	.0	4.8	0	.4%	.0%	1.2%	.0%
Anilam Electronics	4.7	1.4	2.8	58	.4%	.2%	.7%	.0%
Algor Interactive Systems	4.6	.0	4.0	0	.4%	.0%	1.0%	.0%
Mitsubishi Electric	4.5	3.0	1.5	435	.4%	.4%	.4%	.3%
Serbi	4.4	.0	4.4	0	.3%	.0%	1.1%	.0%
Moda CAD	4.2	1.0	2.9	35	.3%	.1%	.8%	.0%
Pathtrace	4.0	.9	2.6	60	.3%	.1%	.7%	.0%
Everex Systems	4.0	4.0	.0	1,754	.3%	.5%	.0%	1.1%
MCS	3.9	.0	3.5	0	.3%	.0%	.9%	.0%
ADRA Systems	3.7	.0	3.0	0	.3%	.0%	.8%	.0%
Engineering Mechanics	3.2	.2	2.7	392	.3%	.0%	.7%	.2%
Claris	3.1	.0	3.1	0	.2%	.0%	.8%	.0%
Superdraft	3.1	1.4	1.5	168	.2%	.2%	.4%	.1%
Micrografx	3.0	.0	3.0	0	.2%	.0%	.8%	.0%
Whessoe Computing Systems	2.9	.0	2.9	0	.2%	.0%	.7%	.0%
Olivetti	2.5	2.2	.0	429	.2%	.3%	.0%	.3%
Sharp System Products—NO OEM	2.5	1.3	1.2	31	.2%	.2%	.3%	.0%
Aries Technology	2.4	.0	2.2	0	.2%	.0%	.6%	.0%

(Continued)

Table 8 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
Platform: Personal Computer
Region: Worldwide
Units: Millions of U.S. Dollars/Actual Units

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
American Small Business Comp.	2.4	.0	2.4	0	.2%	.0%	.6%	.0%
Micro Engineering Solutions	2.3	.7	1.5	35	.2%	.1%	.4%	.0%
Mitsui Engineering	2.0	1.4	.4	33	.2%	.2%	.1%	.0%
PAFEC	1.9	.0	1.9	0	.1%	.0%	.5%	.0%
ISICAD	1.9	.0	1.9	0	.1%	.0%	.5%	.0%
Robocom	1.7	.0	1.7	0	.1%	.0%	.4%	.0%
FEA	1.4	.3	.4	13	.1%	.0%	.1%	.0%
Schlumberger	1.3	.3	.6	39	.1%	.0%	.2%	.0%
Rasna Corporation	1.3	.0	1.3	0	.1%	.0%	.3%	.0%
Evolution Computing	1.2	.0	1.2	0	.1%	.0%	.3%	.0%
MacNeal-Schwendler	1.1	.0	1.1	0	.1%	.0%	.3%	.0%
Softdesk	1.1	.0	1.1	0	.1%	.0%	.3%	.0%
S.T.L.D. s.r.l.	1.0	.0	1.0	0	.1%	.0%	.2%	.0%
Vision 3D	.9	.5	.2	6	.1%	.1%	.1%	.0%
CAMTEK	.9	.0	.7	0	.1%	.0%	.2%	.0%
Foresight Resources	.8	.0	.7	0	.1%	.0%	.2%	.0%
Innovative Data Design	.8	.0	.8	0	.1%	.0%	.2%	.0%
CAD Lab	.8	.0	.6	0	.1%	.0%	.2%	.0%
CADSI	.7	.1	.5	10	.1%	.0%	.1%	.0%
Aura CAD/CAM Systems	.7	.0	.6	0	.1%	.0%	.2%	.0%
Hahn & Kolb	.7	.4	.2	14	.1%	.0%	.1%	.0%
A.I. Systems	.7	.0	.7	0	.1%	.0%	.2%	.0%
Caroline Informatique	.6	.1	.3	9	.1%	.0%	.1%	.0%
GRAPHISOFT	.6	.0	.6	0	.1%	.0%	.2%	.0%

(Continued)

Mechanical Applications Final Market Share

Table 8 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company	Market Share							
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
ESDU International	.6	.0	.6	0	.0%	.0%	.2%	.0%
Machinery Sales	.6	.0	.6	0	.0%	.0%	.2%	.0%
Graphisoft Software Dev	.6	.0	.6	0	.0%	.0%	.1%	.0%
CADWorks	.5	.0	.4	0	.0%	.0%	.1%	.0%
Uniras	.4	.0	.4	0	.0%	.0%	.1%	.0%
Cascade Graphics	.4	.0	.4	0	.0%	.0%	.1%	.0%
Ithaca Software	.4	.0	.4	0	.0%	.0%	.1%	.0%
debis Systemhaus	.3	.1	.2	6	.0%	.0%	.1%	.0%
Ashlar	.3	.0	.3	0	.0%	.0%	.1%	.0%
Mc2 Engineering Software	.3	.0	.3	0	.0%	.0%	.1%	.0%
Synthesis	.3	.0	.3	0	.0%	.0%	.1%	.0%
Engineering Systems Corp.	.3	.0	.2	0	.0%	.0%	.1%	.0%
Mega CADD	.2	.0	.2	0	.0%	.0%	.1%	.0%
Norsk Data	.2	.1	.0	6	.0%	.0%	.0%	.0%
CAD-Capture	.2	.0	.0	0	.0%	.0%	.0%	.0%
Engineered Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
IGC Technology	.1	.0	.1	0	.0%	.0%	.0%	.0%
Accugraph	.1	.0	.1	0	.0%	.0%	.0%	.0%
Lamp Software	.1	.0	.1	4	.0%	.0%	.0%	.0%
Radan Computational	.1	.0	.1	5	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.0	0	.0%	.0%	.0%	.0%
A/E Microsystems	.0	.0	.0	2	.0%	.0%	.0%	.0%
Number One Systems	.0	.0	.0	1	.0%	.0%	.0%	.0%

(Continued)

Table 8 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Other Companies	194.3	194.3	.0	51,925	15.4%	24.2%	.0%	31.6%
All Companies	1,262.1	803.9	387.6	164,204	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	866.0	605.0	220.7	145,242	68.6%	75.3%	56.9%	88.5%
All Asian-Based Companies	247.7	139.8	92.1	14,672	19.6%	17.4%	23.7%	8.9%
All European-Based Companies	148.5	59.1	74.9	4,291	11.8%	7.4%	19.3%	2.6%
All Hardware Companies	649.3	619.3	.0	147,351	51.4%	77.0%	.0%	89.7%
All Turnkey & SW Companies	612.8	184.6	387.6	16,853	48.6%	23.0%	100.0%	10.3%

Source: Dataquest (September 1992)

Table 9
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Platform: Region: Units:	Mechanical All Platforms North America Millions of U.S. Dollars/Actual Units	Market Share																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
		Company	Total		Hardware		Total	Hardware		Software	Hardware	Software	Hardware	Units	Shipped																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
			Factory	Revenue	Revenue	Revenue		Revenue	Revenue							Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue

(Continued)

Table 9 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: All Platforms
 Region: North America
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
MCS	15.0	.0	13.3	0	.7%	.0%	2.3%	.0%
CADKEY	11.0	.0	11.0	0	.5%	.0%	1.9%	.0%
Dell Computer	9.3	9.3	.0	2,372	.5%	.8%	.0%	2.4%
Aries Technology	8.4	.0	7.6	0	.4%	.0%	1.3%	.0%
ICAD	7.8	.0	6.2	0	.4%	.0%	1.1%	.0%
ADRA Systems	7.3	1.8	4.6	90	.4%	.2%	.8%	.1%
CNC Software	5.5	.0	5.5	0	.3%	.0%	1.0%	.0%
Cimatron	4.4	2.0	2.0	143	.2%	.2%	.3%	.1%
Valisys	4.2	.0	4.2	0	.2%	.0%	.7%	.0%
Algor Interactive Systems	3.9	.0	3.4	0	.2%	.0%	.6%	.0%
Everex Systems	3.9	3.9	.0	1,599	.2%	.3%	.0%	1.6%
Cisigraph	3.7	1.2	1.4	44	.2%	.1%	.2%	.0%
Ontos	3.6	.0	3.6	0	.2%	.0%	.6%	.0%
Point Control	3.5	.0	3.5	0	.2%	.0%	.6%	.0%
Mechanical Dynamics	3.4	.0	3.0	0	.2%	.0%	.5%	.0%
Matra Datavision	3.2	1.2	1.5	33	.2%	.1%	.3%	.0%
Micro Engineering Solutions	3.0	.8	1.9	38	.1%	.1%	.3%	.0%
Moda CAD	2.7	.7	1.9	22	.1%	.1%	.3%	.0%
Engineering Mechanics	2.7	.1	2.3	211	.1%	.0%	.4%	.2%
Solbourne	2.2	2.2	.0	238	.1%	.2%	.0%	.2%
CADSI	2.2	.3	1.7	14	.1%	.0%	.3%	.0%
American Small Business Comp.	2.1	.0	2.1	0	.1%	.0%	.4%	.0%
MARC	2.0	.0	2.0	0	.1%	.0%	.3%	.0%
SPATIAL Technology	2.0	.0	2.0	0	.1%	.0%	.3%	.0%

(Continued)

Mechanical Applications Final Market Share

Table 9 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: All Platforms
 Region: North America
 Units: Millions of U.S. Dollars/Actual Units

Company	Market Share							
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Micrografx	1.7	.0	1.7	0	.1%	.0%	.3%	.0%
Clarix	1.6	.0	1.6	0	.1%	.0%	.3%	.0%
Delcam International	1.4	.5	.7	24	.1%	.0%	.1%	.0%
Softdesk	1.2	.0	1.2	0	.1%	.0%	.2%	.0%
Investronica SA	1.2	.9	.1	46	.1%	.1%	.0%	.0%
Wisdom Systems	1.1	.0	.8	0	.1%	.0%	.1%	.0%
Accugraph	1.0	.4	.4	34	.0%	.0%	.1%	.0%
Pathtrace	.9	.2	.6	14	.0%	.0%	.1%	.0%
Evolution Computing	.9	.0	.9	0	.0%	.0%	.2%	.0%
Computational Mechanics	.9	.0	.9	0	.0%	.0%	.2%	.0%
Object Design	.8	.0	.8	0	.0%	.0%	.1%	.0%
Innovative Data Design	.8	.0	.8	0	.0%	.0%	.1%	.0%
Objectivity	.7	.0	.7	0	.0%	.0%	.1%	.0%
GRAPHISOFT	.6	.0	.6	0	.0%	.0%	.1%	.0%
Rasna Corporation	.6	.0	.6	0	.0%	.0%	.1%	.0%
Aura CAD/CAM Systems	.6	.0	.5	0	.0%	.0%	.1%	.0%
Machinery Sales	.6	.0	.6	0	.0%	.0%	.1%	.0%
A.I. Systems	.6	.0	.6	0	.0%	.0%	.1%	.0%
Uniras	.4	.0	.4	0	.0%	.0%	.1%	.0%
Foresight Resources	.4	.0	.4	0	.0%	.0%	.1%	.0%
Ashlar	.3	.0	.3	0	.0%	.0%	.1%	.0%
Ithaca Software	.3	.0	.3	0	.0%	.0%	.1%	.0%
Cascade Graphics	.3	.0	.3	0	.0%	.0%	.1%	.0%
FEES	.3	.0	.3	0	.0%	.0%	.0%	.0%

(Continued)

Table 9 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
Platform: All Platforms
Region: North America
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
A/E Microsystems	.3	.2	.0	25	.0%	.0%	.0%	.0%
Engineering Systems Corp.	.3	.0	.2	0	.0%	.0%	.0%	.0%
Georgia Tech Research Corp.	.3	.0	.3	0	.0%	.0%	.0%	.0%
Mc2 Engineering Software	.2	.0	.2	0	.0%	.0%	.0%	.0%
CAD Centre	.2	.0	.2	0	.0%	.0%	.0%	.0%
Mega CADD	.2	.0	.2	0	.0%	.0%	.0%	.0%
Synthesis	.1	.0	.1	0	.0%	.0%	.0%	.0%
Technische Computer Systeme	.1	.0	.1	3	.0%	.0%	.0%	.0%
Vision 3D	.1	.0	.0	0	.0%	.0%	.0%	.0%
IGC Technology	.1	.0	.1	0	.0%	.0%	.0%	.0%
Engineered Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Zuken	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	254.5	247.0	.0	33,484	12.4%	21.5%	.0%	33.6%
All Companies	2,050.6	1,147.3	576.0	99,561	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	2,034.1	1,141.2	568.3	99,253	99.2%	99.5%	98.6%	99.7%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	16.4	6.1	7.8	307	.8%	.5%	1.3%	.3%
All Hardware Companies	819.2	711.2	2.3	85,963	39.9%	62.0%	.4%	86.3%
All Turnkey & SW Companies	1,231.4	436.2	573.7	13,597	60.1%	38.0%	99.6%	13.7%

Source: Dataquest (September 1992)

Mechanical Applications Final Market Share

Table 10
1991 CAD/CAM/CAE/GIS Final Market Share

Company	Application: Platform: Region: Units:	Mechanical Technical Workstation North America Millions of U.S. Dollars/Actual Units	Market Share									
			Total		Factory		Hardware		Software		Hardware	
			Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue
							Units Shipped				Units Shipped	
Computervision			130.3	45.5	43.4	1,455		14.4%	11.0%	13.5%	7.9%	
EDS			106.8	55.0	34.7	1,540		11.8%	13.2%	10.8%	8.3%	
Hewlett-Packard			102.6	74.5	11.0	4,795		11.4%	17.9%	3.4%	25.9%	
Intergraph			71.6	38.4	13.5	1,143		7.9%	9.3%	4.2%	6.2%	
Silicon Graphics			65.0	57.2	.0	1,584		7.2%	13.8%	.0%	8.6%	
IBM			49.1	27.5	12.0	1,475		5.4%	6.6%	3.7%	8.0%	
Sun Microsystems			42.8	37.0	.0	2,870		4.7%	8.9%	.0%	15.5%	
Schlumberger			34.7	11.9	13.1	369		3.8%	2.9%	4.1%	2.0%	
SDRC			33.4	.0	33.4	0		3.7%	.0%	10.4%	.0%	
Digital			31.0	21.4	.0	1,317		3.4%	5.2%	.0%	7.1%	
Parametric Technology			29.2	.0	26.9	0		3.2%	.0%	8.4%	.0%	
Control Data			23.3	14.2	4.9	317		2.6%	3.4%	1.5%	1.7%	
Alias Research			19.3	.0	17.6	0		2.1%	.0%	5.5%	.0%	
Auto-Trol			17.9	6.6	6.8	224		2.0%	1.6%	2.1%	1.2%	
Gerber Systems			15.9	7.8	5.3	220		1.8%	1.9%	1.6%	1.2%	
Unisys			15.7	8.0	5.5	243		1.7%	1.9%	1.7%	1.3%	
PDA Engineering			15.4	.0	14.8	0		1.7%	.0%	4.6%	.0%	
Cimline			15.4	1.5	10.8	324		1.7%	.4%	3.4%	1.7%	
ICAD			7.8	.0	6.2	0		.9%	.0%	1.9%	.0%	
Swanson Analysis			7.6	.0	7.6	0		.8%	.0%	2.4%	.0%	
Autodesk			7.0	.0	7.0	0		.8%	.0%	2.2%	.0%	
MCS			6.9	.0	6.2	0		.8%	.0%	1.9%	.0%	
Aries Technology			6.7	.0	6.1	0		.7%	.0%	1.9%	.0%	
ADRA Systems			5.6	1.8	3.3	90		.6%	.4%	1.0%	.5%	

(Continued)

Table 10 (Continued)

1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: North America
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Valisys	4.2	.0	4.2	0	.5%	.0%	1.3%	.0%
Ontos	3.6	.0	3.6	0	.4%	.0%	1.1%	.0%
Cisigraph	3.4	1.1	1.3	40	.4%	.3%	.4%	.2%
Matra Datavision	3.2	1.2	1.5	33	.4%	.3%	.5%	.2%
Mechanical Dynamics	2.9	.0	2.5	0	.3%	.0%	.8%	.0%
Cimatron	2.8	1.3	1.3	62	.3%	.3%	.4%	.3%
MacNeal-Schwendler	2.7	.0	2.6	0	.3%	.0%	.8%	.0%
CADKEY	2.2	.0	2.2	0	.2%	.0%	.7%	.0%
SPATIAL Technology	2.0	.0	2.0	0	.2%	.0%	.6%	.0%
CADSI	1.8	.3	1.3	8	.2%	.1%	.4%	.0%
Engineering Mechanics	1.5	.1	1.3	74	.2%	.0%	.4%	.4%
Delcam International	1.4	.5	.7	24	.2%	.1%	.2%	.1%
MARC	1.4	.0	1.4	0	.2%	.0%	.4%	.0%
Micro Engineering Solutions	1.1	.3	.7	10	.1%	.1%	.2%	.1%
Wisdom Systems	1.1	.0	.8	0	.1%	.0%	.2%	.0%
Solbourne	.9	.9	.0	175	.1%	.2%	.0%	.9%
Accugraph	.9	.4	.4	33	.1%	.1%	.1%	.2%
Object Design	.8	.0	.8	0	.1%	.0%	.2%	.0%
Objectivity	.7	.0	.7	0	.1%	.0%	.2%	.0%
Everex Systems	.4	.4	.0	73	.0%	.1%	.0%	.4%
Computational Mechanics	.4	.0	.4	0	.0%	.0%	.1%	.0%
Softdesk	.3	.0	.3	0	.0%	.0%	.1%	.0%
Point Control	.3	.0	.3	0	.0%	.0%	.1%	.0%
A/E Microsystems	.2	.2	.0	21	.0%	.0%	.0%	.1%

(Continued)

Table 10 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
Platform: Technical Workstation
Region: North America
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
CAD Centre	.2	.0	.2	0	.0%	.0%	.1%	.0%
Ithaca Software	.2	.0	.2	0	.0%	.0%	.1%	.0%
FEGS	.2	.0	.1	0	.0%	.0%	.0%	.0%
Technische Computer Systeme	.1	.0	.1	3	.0%	.0%	.0%	.0%
Algor Interactive Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
Georgia Tech Research Corp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
Zuken	.0	.0	.0	0	.0%	.0%	.0%	.0%
Synthesis	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	902.1	415.1	321.0	18,520	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	890.4	411.0	315.5	18,358	98.7%	99.0%	98.3%	99.1%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	11.7	4.1	5.6	162	1.3%	1.0%	1.7%	.9%
All Hardware Companies	195.4	162.1	1.0	9,581	21.7%	39.0%	.3%	51.7%
All Turnkey & SW Companies	706.7	253.0	320.0	8,940	78.3%	61.0%	99.7%	48.3%

Source: Dataquest (September 1992)

Table 11
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Host-Dependent
 Region: North America
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	187.5	101.2	49.7	2,651	33.0%	28.7%	45.9%	27.7%
Digital	98.2	67.8	.0	0	17.3%	19.2%	.0%	.0%
Control Data	42.0	17.2	5.9	134	7.4%	4.9%	5.4%	1.4%
EDS	30.1	15.3	10.0	572	5.3%	4.3%	9.3%	6.0%
MacNeal-Schwendler	14.2	.0	13.6	0	2.5%	.0%	12.6%	.0%
Schlumberger	8.9	2.8	3.7	162	1.6%	.8%	3.4%	1.7%
Computervision	7.4	2.6	2.2	79	1.3%	.7%	2.1%	.8%
PDA Engineering	5.1	.0	5.0	0	.9%	.0%	4.6%	.0%
MCS	5.1	.0	4.4	0	.9%	.0%	4.1%	.0%
SDRC	5.0	.0	5.0	0	.9%	.0%	4.6%	.0%
Swanson Analysis	4.7	.0	4.7	0	.8%	.0%	4.4%	.0%
Unisys	4.7	2.4	1.6	63	.8%	.7%	1.5%	.7%
Intergraph	2.7	1.3	.4	35	.5%	.4%	.4%	.4%
MARC	.6	.0	.6	0	.1%	.0%	.6%	.0%
Mechanical Dynamics	.5	.0	.5	0	.1%	.0%	.4%	.0%
Computational Mechanics	.5	.0	.5	0	.1%	.0%	.4%	.0%
Georgia Tech Research Corp.	.2	.0	.2	0	.0%	.0%	.1%	.0%
FECS	.1	.0	.1	0	.0%	.0%	.1%	.0%
Engineering Systems Corp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%

(Continued)

Table 11 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Host-Dependent
 Region: North America
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Other Companies	149.7	142.2	.0	5,879	26.4%	40.3%	.0%	61.4%
All Companies	567.3	352.9	108.1	9,577	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	566.7	352.9	107.6	9,577	99.9%	100.0%	99.5%	100.0%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	.6	.0	.6	0	.1%	.0%	.5%	.0%
All Hardware Companies	256.8	213.6	1.2	5,910	45.3%	60.5%	1.1%	61.7%
All Turnkey & SW Companies	310.6	139.3	106.9	3,667	54.7%	39.5%	98.9%	38.3%

Source: Dataquest (September 1992)

Table 12
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Server
 Region: North America
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	49.5	27.9	12.0	339	30.7%	29.3%	42.4%	15.0%
Digital	46.4	32.0	.0	374	28.8%	33.6%	.0%	16.6%
Sun Microsystems	20.0	16.3	.0	961	12.4%	17.1%	.0%	42.7%
Intergraph	13.6	6.6	3.3	195	8.4%	6.9%	11.5%	8.7%
Computervision	10.4	4.2	3.2	91	6.4%	4.4%	11.2%	4.0%
MacNeal-Schwendler	7.5	.0	7.2	0	4.6%	.0%	25.3%	.0%
Schlumberger	5.5	1.8	2.2	57	3.4%	1.8%	7.8%	2.5%
Silicon Graphics	4.2	3.4	.0	67	2.6%	3.6%	.0%	3.0%
Control Data	1.3	.6	.2	3	.8%	.7%	.6%	.1%
Solbourne	1.3	1.3	.0	64	.8%	1.3%	.0%	2.8%
Hewlett-Packard	1.3	1.0	.0	96	.8%	1.1%	.0%	4.2%
Cisigraph	.4	.1	.1	4	.2%	.1%	.5%	.2%
Rasna Corporation	.2	.0	.2	0	.1%	.0%	.6%	.0%
A/E Microsystems	.0	.0	.0	2	.0%	.0%	.0%	.1%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	161.3	95.3	28.3	2,252	100.0%	100.0%	100.0%	100.0%
 All N.A.-Based Companies	 160.9	 95.1	 28.1	 2,247	 99.8%	 99.9%	 99.5%	 99.8%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	.4	.1	.1	4	.2%	.1%	.5%	.2%
All Hardware Companies	73.8	54.7	.0	1,682	45.8%	57.4%	.1%	74.7%
All Turnkey & SW Companies	87.5	40.6	28.3	570	54.2%	42.6%	99.9%	25.3%

Source: Dataquest (September 1992)

Table 13
1991 CAD/CAM/CAE/CIS Final Market Share

Company	Application: Platform: Region: Units:	Mechanical Personal Computer North America Millions of U.S. Dollars/Actual Units	Market Share					
			Total		Hardware		Total	
			Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Factory Revenue	Hardware Revenue
Compaq			64.9	64.9	.0	12,663	15.5%	22.9%
Apple Computer			58.9	51.8	.0	12,330	14.0%	18.2%
Autodesk			51.4	.0	51.4	0	12.3%	.0%
IBM			25.0	23.7	.0	5,936	6.0%	8.4%
Hewlett-Packard			20.1	16.1	.0	5,009	4.8%	5.7%
CADAM			18.9	6.8	10.4	1,350	4.5%	2.4%
Dell Computer			9.3	9.3	.0	2,372	2.2%	3.3%
CADKEY			8.8	.0	8.8	0	2.1%	.0%
CNC Software			5.5	.0	5.5	0	1.3%	.0%
Computervision			5.5	.0	5.2	69	1.3%	.0%
Algor Interactive Systems			3.8	.0	3.4	0	.9%	.0%
Everex Systems			3.5	3.5	.0	1,526	.8%	1.2%
Point Control			3.3	.0	3.3	0	.8%	.0%
MCS			3.0	.0	2.7	0	.7%	.0%
Swanson Analysis			2.8	.0	2.8	0	.7%	.0%
Intergraph			2.7	.0	2.6	0	.6%	.0%
Moda CAD			2.7	.7	1.9	22	.6%	.2%
American Small Business Comp.			2.1	.0	2.1	0	.5%	.0%
Micro Engineering Solutions			1.9	.5	1.2	28	.5%	.2%
Aries Technology			1.7	.0	1.5	0	.4%	.0%
ADRA Systems			1.7	.0	1.3	0	.4%	.0%
Micrografix			1.7	.0	1.7	0	.4%	.0%
Cimatron			1.6	.7	.7	81	.4%	.2%
Clarif			1.6	.0	1.6	0	.4%	.0%

(Continued)

Table 13 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: North America
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Investronica SA	1.2	.9	.1	46	.3%	.3%	.1%	.1%
Engineering Mechanics	1.1	.1	1.0	137	.3%	.0%	.8%	.2%
Softdesk	.9	.0	.9	0	.2%	.0%	.8%	.0%
Pathtrace	.9	.2	.6	14	.2%	.1%	.5%	.0%
Evolution Computing	.9	.0	.9	0	.2%	.0%	.8%	.0%
Innovative Data Design	.8	.0	.8	0	.2%	.0%	.6%	.0%
GRAPHISOFT	.6	.0	.6	0	.2%	.0%	.5%	.0%
Aura CAD/CAM Systems	.6	.0	.5	0	.1%	.0%	.4%	.0%
Machinery Sales	.6	.0	.6	0	.1%	.0%	.5%	.0%
A.I. Systems	.6	.0	.6	0	.1%	.0%	.5%	.0%
Schlumberger	.5	.1	.2	15	.1%	.0%	.2%	.0%
MacNeal-Schwendler	.5	.0	.5	0	.1%	.0%	.4%	.0%
CADSI	.4	.1	.3	6	.1%	.0%	.3%	.0%
Rasna Corporation	.4	.0	.4	0	.1%	.0%	.4%	.0%
Uniras	.4	.0	.4	0	.1%	.0%	.4%	.0%
Foresight Resources	.4	.0	.4	0	.1%	.0%	.3%	.0%
Ashlar	.3	.0	.3	0	.1%	.0%	.3%	.0%
Cascade Graphics	.3	.0	.3	0	.1%	.0%	.3%	.0%
Mc2 Engineering Software	.2	.0	.2	0	.1%	.0%	.2%	.0%
Engineering Systems Corp.	.2	.0	.2	0	.1%	.0%	.1%	.0%
Ithaca Software	.2	.0	.2	0	.0%	.0%	.1%	.0%
Mega CADD	.2	.0	.2	0	.0%	.0%	.1%	.0%
Synthesis	.1	.0	.1	0	.0%	.0%	.1%	.0%
Vision 3D	.1	.0	.0	0	.0%	.0%	.0%	.0%

(Continued)

Mechanical Applications Final Market Share

Table 13 (Continued)

1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: North America
 Units: Millions of U.S. Dollars/Actual Units

Company	Market Share							
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IGC Technology	.1	.0	.1	0	.0%	.0%	.1%	.0%
Accugraph	.1	.0	.1	0	.0%	.0%	.1%	.0%
Engineered Software	.1	.0	.1	0	.0%	.0%	.1%	.0%
A/E Microsystems	.0	.0	.0	2	.0%	.0%	.0%	.0%
Other Companies	104.8	104.8	.0	27,605	25.0%	36.9%	.0%	39.9%
All Companies	419.8	284.1	118.6	69,211	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	416.1	282.3	117.1	69,070	99.1%	99.3%	98.8%	99.8%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	3.8	1.9	1.5	141	.9%	.7%	1.2%	.2%
All Hardware Companies	293.2	280.8	.0	68,790	69.8%	98.8%	.0%	99.4%
All Turnkey & SW Companies	126.7	3.3	118.6	421	30.2%	1.2%	100.0%	.6%

Source: Dataquest (September 1992)

Table 14
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Europe
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	606.3	348.1	146.3	17,554	20.7%	23.1%	17.6%	18.4%
Computervision	496.7	201.8	116.1	4,726	17.0%	13.4%	14.0%	5.0%
Hewlett-Packard	282.4	197.9	36.0	15,125	9.7%	13.1%	4.3%	15.9%
Digital	135.1	93.2	.0	1,386	4.6%	6.2%	.0%	1.5%
Control Data	84.8	40.7	13.9	577	2.9%	2.7%	1.7%	.6%
Schlumberger	75.1	25.2	29.1	915	2.6%	1.7%	3.5%	1.0%
Matra Datavision	72.2	25.3	32.4	682	2.5%	1.7%	3.9%	.7%
Siemens Nixdorf Info systems	68.8	34.4	24.1	1,011	2.4%	2.3%	2.9%	1.1%
Compaq	65.0	65.0	.0	12,663	2.2%	4.3%	.0%	13.3%
EDS	60.8	31.0	23.7	1,420	2.1%	2.1%	2.9%	1.5%
Intergraph	57.2	29.3	12.5	830	2.0%	1.9%	1.5%	.9%
Sun Microsystems	42.4	36.1	.0	1,908	1.5%	2.4%	.0%	2.0%
STI-Straessle	38.0	8.7	20.9	357	1.3%	.6%	2.5%	.4%
Silicon Graphics	35.3	31.0	.0	849	1.2%	2.1%	.0%	.9%
Autodesk	35.0	.0	35.0	0	1.2%	.0%	4.2%	.0%
SDRC	31.4	.0	31.4	0	1.1%	.0%	3.8%	.0%
Cisigraph	28.5	9.4	10.8	336	1.0%	.6%	1.3%	.4%
Wiechers Datentechnik	27.0	15.4	8.1	667	.9%	1.0%	1.0%	.7%
Investronica SA	26.5	21.2	2.7	1,060	.9%	1.4%	.3%	1.1%
Apple Computer	24.7	21.7	.0	5,171	.8%	1.4%	.0%	5.4%
Norsk Data	21.7	11.0	3.8	226	.7%	.7%	.5%	.2%
ISICAD	19.9	8.8	7.8	142	.7%	.6%	.9%	.1%
MacNeal-Schwendler	16.9	.0	16.3	0	.6%	.0%	2.0%	.0%
ISYKON Software	16.0	7.2	5.6	274	.5%	.5%	.7%	.3%

(Continued)

Mechanical Applications Final Market Share

Table 14 (Continued)
1991 CAD/CAM/CAE/GES Final Market Share

Application: Platform: Region: Units:	Mechanical All Platforms Europe	Millions of U.S. Dollars/Actual Units	Market Share								
			Total	Hardware		Software		Hardware		Software	
Company			Factory Revenue	Revenue	Revenue	Units Shipped	Factory Revenue	Revenue	Revenue	Revenue	Units Shipped
CAD Lab			15.7	.0	12.6	0	.5%	.0%	1.5%	.0%	.0%
Digital Kienzle			15.7	8.0	4.4	230	.5%	.5%	.5%	.2%	.2%
Kewill Systems			15.5	4.7	8.5	322	.5%	.3%	1.0%	.3%	.3%
Cimatron			14.6	6.6	6.6	463	.5%	.4%	.8%	.5%	.5%
Vero International Software			14.6	.0	13.3	0	.5%	.0%	1.6%	.0%	.0%
Tebis			14.5	2.2	10.1	80	.5%	.1%	1.2%	.1%	.1%
Delcam International			14.3	5.0	7.1	240	.5%	.3%	.9%	.3%	.3%
Fides Industrielle Automation			13.9	2.1	9.7	107	.5%	.1%	1.2%	.1%	.1%
Hahn & Kolb			13.5	8.1	4.1	195	.5%	.5%	.5%	.2%	.2%
Exapt			12.7	6.2	4.3	220	.4%	.4%	.5%	.2%	.2%
CADAM			12.5	4.5	6.8	900	.4%	.3%	.8%	.9%	.9%
PAFEC			12.2	.0	12.2	0	.4%	.0%	1.5%	.0%	.0%
Gerber Systems			12.1	5.9	4.0	168	.4%	.4%	.5%	.2%	.2%
Framasoft			11.6	.0	7.0	0	.4%	.0%	.8%	.0%	.0%
Nestler Electronics			11.0	5.0	6.1	300	.4%	.3%	.7%	.3%	.3%
ItalCad			10.8	5.1	2.6	101	.4%	.3%	.3%	.1%	.1%
ICL			10.2	6.0	3.5	279	.3%	.4%	.4%	.3%	.3%
Ferranti			10.0	3.7	4.6	87	.3%	.2%	.6%	.1%	.1%
Marcus Computer Systems			9.8	5.1	3.3	285	.3%	.3%	.4%	.3%	.3%
Cadiron			9.8	4.9	3.9	151	.3%	.3%	.5%	.2%	.2%
PDA Engineering			9.5	.0	9.1	0	.3%	.0%	1.1%	.0%	.0%
Radan Computational			9.4	3.3	4.7	315	.3%	.2%	.6%	.3%	.3%
Parametric Technology			9.0	.0	8.2	0	.3%	.0%	1.0%	.0%	.0%
Unisys			8.7	4.4	3.0	130	.3%	.3%	.4%	.1%	.1%

(Continued)

(Continued)

Table 14 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Platform: Region: Units:	Mechanical All Platforms Europe Millions of U.S. Dollars/Actual Units	Market Share									
		Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped		Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	
Company											
Swanson Analysis		8.1	.0	8.1	0	.3%	.0%	1.0%	.0%	.0%	.0%
Cimlinec		7.7	.8	5.4	162	.3%	.1%	.6%	.2%	.2%	.2%
Auto-Trol		7.4	2.7	2.8	92	.3%	.2%	.3%	.1%	.1%	.1%
Research Machines		7.2	7.2	.0	1,162	.2%	.5%	.0%	1.2%	1.2%	.0%
DAT Standard Info systemes		6.5	.0	6.1	0	.2%	.0%	.7%	.0%	.0%	.0%
Ziegler Informatics		5.5	.0	5.5	0	.2%	.0%	.7%	.0%	.0%	.0%
Technische Computer Systeme		5.4	1.1	4.3	142	.2%	.1%	.5%	.1%	.1%	.1%
Alias Research		4.8	.0	4.3	0	.2%	.0%	.5%	.0%	.0%	.0%
Serbi		4.6	.0	4.6	0	.2%	.0%	.6%	.0%	.0%	.0%
ADRA Systems		4.1	1.0	2.6	50	.1%	.1%	.3%	.1%	.1%	.1%
XAO Industrie		3.7	1.3	2.2	133	.1%	.1%	.3%	.1%	.1%	.1%
Anilam Electronics		3.2	1.0	1.9	40	.1%	.1%	.2%	.0%	.0%	.0%
MCS		3.1	.0	2.8	0	.1%	.0%	.3%	.0%	.0%	.0%
Dell Computer		3.1	3.1	.0	791	.1%	.2%	.0%	.8%	.8%	.0%
Whesoe Computing Systems		3.1	.0	3.1	0	.1%	.0%	.4%	.0%	.0%	.0%
Olivetti		2.9	2.4	.0	436	.1%	.2%	.0%	.5%	.5%	.0%
FEA		2.8	.7	.7	16	.1%	.0%	.1%	.0%	.0%	.0%
CAM/TEK		2.8	.0	2.3	0	.1%	.0%	.3%	.0%	.0%	.0%
deblis Systems		2.8	.7	1.7	19	.1%	.0%	.2%	.0%	.0%	.0%
Superdraft		2.6	1.2	1.3	142	.1%	.1%	.2%	.1%	.1%	.1%
Catalpa		2.6	.9	1.3	21	.1%	.1%	.2%	.0%	.0%	.0%
MARC		2.5	.0	2.5	0	.1%	.0%	.3%	.0%	.0%	.0%
CADKEY		2.5	.0	2.5	0	.1%	.0%	.3%	.0%	.0%	.0%
Pathrace		2.4	.5	1.6	36	.1%	.0%	.2%	.0%	.0%	.0%

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(Continued)

Table 14 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Europe
 Units: Millions of U.S. Dollars/Actual Units

Company	Market Share							
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Point Control	2.2	.0	2.2	0	.1%	.0%	.3%	.0%
Caroline Informatique	2.2	.4	1.1	17	.1%	.0%	.1%	.0%
ISKA	2.1	1.0	.9	39	.1%	.1%	.1%	.0%
ICAD	2.0	.0	1.6	0	.1%	.0%	.2%	.0%
CNC Software	1.8	.0	1.8	0	.1%	.0%	.2%	.0%
Robocom	1.7	.0	1.7	0	.1%	.0%	.2%	.0%
SPATIAL Technology	1.5	.0	1.5	0	.1%	.0%	.2%	.0%
Aries Technology	1.4	.0	1.3	0	.0%	.0%	.2%	.0%
Computational Mechanics	1.4	.0	1.4	0	.0%	.0%	.2%	.0%
FECS	1.4	.0	1.1	0	.0%	.0%	.1%	.0%
Micrografix	1.4	.0	1.4	0	.0%	.0%	.2%	.0%
Mechanical Dynamics	1.3	.0	1.2	0	.0%	.0%	.1%	.0%
Moda CAD	1.1	.3	.7	9	.0%	.0%	.1%	.0%
CAD Centre	1.0	.0	.8	0	.0%	.0%	.1%	.0%
S.T.L.D. s.r.l.	1.0	.0	1.0	0	.0%	.0%	.1%	.0%
Valisys	.8	.0	.8	0	.0%	.0%	.1%	.0%
CADSI	.8	.1	.6	5	.0%	.0%	.1%	.0%
Vision 3D	.8	.4	.2	6	.0%	.0%	.0%	.0%
Solbourne	.7	.7	.0	78	.0%	.0%	.0%	.1%
ESDU International	.7	.0	.7	0	.0%	.0%	.1%	.0%
Algor Interactive Systems	.7	.0	.6	0	.0%	.0%	.1%	.0%
Rasna Corporation	.6	.0	.6	0	.0%	.0%	.1%	.0%
Graphisoft Software Dev	.5	.0	.5	0	.0%	.0%	.1%	.0%
Everex Systems	.5	.4	.0	184	.0%	.0%	.0%	.2%

(Continued)

Table 14 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
Platform: All Platforms
Region: Europe
Units: Millions of U.S. Dollars/Actual Units

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Foresight Resources	.4	.0	.3	0	.0%	.0%	.0%	.0%
Micro Engineering Solutions	.4	.1	.2	4	.0%	.0%	.0%	.0%
Spectrum Graphics	.3	.1	.2	3	.0%	.0%	.0%	.0%
Evolution Computing	.3	.0	.3	0	.0%	.0%	.0%	.0%
CADWorks	.3	.0	.2	0	.0%	.0%	.0%	.0%
CAD-Capture	.2	.0	.0	0	.0%	.0%	.0%	.0%
Ontos	.2	.0	.2	0	.0%	.0%	.0%	.0%
Wisdom Systems	.2	.0	.1	0	.0%	.0%	.0%	.0%
DAPCO	.2	.0	.1	0	.0%	.0%	.0%	.0%
American Small Business Comp.	.2	.0	.2	0	.0%	.0%	.0%	.0%
Synthesis	.2	.0	.2	0	.0%	.0%	.0%	.0%
Objectivity	.1	.0	.1	0	.0%	.0%	.0%	.0%
Lamp Software	.1	.0	.1	6	.0%	.0%	.0%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.1	0	.0%	.0%	.0%	.0%
A.I. Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
Cascade Graphics	.1	.0	.1	0	.0%	.0%	.0%	.0%
Object Design	.1	.0	.1	0	.0%	.0%	.0%	.0%
Softdesk	.1	.0	.1	0	.0%	.0%	.0%	.0%
Engineered Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Mega CADD	.1	.0	.1	0	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
Zuken	.0	.0	.0	0	.0%	.0%	.0%	.0%
Number One Systems	.0	.0	.0	1	.0%	.0%	.0%	.0%

(Continued)

Mechanical Applications Final Market Share

Table 14 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Europe
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Other Companies	132.3	128.7	.0	19,314	4.5%	8.5%	.0%	20.3%
All Companies	2,925.4	1,509.5	830.1	95,360	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	2,315.4	1,282.4	546.8	85,154	79.1%	85.0%	65.9%	89.3%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	610.0	227.1	283.3	10,206	20.9%	15.0%	34.1%	10.7%
All Hardware Companies	633.9	543.3	2.9	67,483	21.7%	36.0%	.4%	70.8%
All Turnkey & SW Companies	2,291.5	966.1	827.2	27,877	78.3%	64.0%	99.6%	29.2%

Source: Dataquest (September 1992)

Table 15
1991 CAD/CAM/CAB/GIS Final Market Share

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Market Share			
					Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Computervision	432.6	179.1	97.8	3,252	26.9%	24.1%	19.3%	11.8%
Hewlett-Packard	247.7	170.2	36.0	9,279	15.4%	22.9%	7.1%	33.6%
IBM	96.7	52.9	24.9	2,279	6.0%	7.1%	4.9%	8.3%
Marra Datavison	72.2	25.3	32.4	682	4.5%	3.4%	6.4%	2.5%
Siemens Nixdorf Info systems	68.8	34.4	24.1	1,011	4.3%	4.6%	4.8%	3.7%
Schlumberger	52.6	18.0	19.8	560	3.3%	2.4%	3.9%	2.0%
EDS	51.0	26.1	19.8	896	3.2%	3.5%	3.9%	3.2%
Intergraph	45.2	24.3	8.5	688	2.8%	3.3%	1.7%	2.5%
STI-Straesse	38.0	8.7	20.9	357	2.4%	1.2%	4.1%	1.3%
Silicon Graphics	33.2	29.2	.0	810	2.1%	3.9%	.0%	2.9%
Control Data	29.7	18.1	6.2	403	1.8%	2.4%	1.2%	1.5%
Sun Microsystems	29.3	25.3	.0	1,592	1.8%	3.4%	.0%	5.8%
SDRC	27.3	.0	27.3	0	1.7%	.0%	5.4%	.0%
Cisgraph	25.6	8.5	9.7	302	1.6%	1.1%	1.9%	1.1%
Digital	25.0	17.2	.0	1,083	1.6%	2.3%	.0%	3.9%
ISICAD	18.1	8.8	6.1	142	1.1%	1.2%	1.2%	.9%
ISYKON Software	16.0	7.2	5.6	274	1.0%	1.0%	1.1%	1.0%
Digital Klenzie	15.7	8.0	4.4	230	1.0%	1.1%	.9%	.8%
CAD Lab	14.9	.0	12.0	0	.9%	.0%	2.4%	.0%
Delcam International	14.3	5.0	7.1	240	.9%	.7%	1.4%	.9%
Kewill Systems	14.0	4.2	7.7	309	.9%	.6%	1.5%	1.1%
Hahn & Kolb	12.8	7.7	3.9	181	.8%	1.0%	.8%	.7%
Gerber Systems	12.1	5.9	4.0	168	.8%	.8%	.8%	.6%
Fides Industrielle Automation	11.8	1.8	8.3	100	.7%	.2%	1.6%	.4%

(Continued)

Table 15 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application:	Mechanical									
Platform:	Technical Workstation									
Region:	Europe									
Units:	Millions of U.S. Dollars/Actual Units									
	Market Share									
Company	Total		Hardware		Software		Total		Hardware	
	Factory Revenue	Hardware Revenue	Hardware Revenue	Software Revenue	Factory Revenue	Hardware Revenue	Software Revenue	Hardware Revenue	Software Revenue	
Nestler Electronics	11.0	5.0	300	6.1	.7%	1.2%	1.1%			
ItalCad	10.8	5.1	101	2.6	.7%	.5%	.4%			
Franasoft	10.4	.0	0	6.3	.6%	1.2%	.0%			
PAFEC	10.4	.0	0	10.4	.6%	2.0%	.0%			
ICL	10.2	6.0	279	3.5	.6%	.7%	1.0%			
Cimatron	10.1	4.5	227	4.5	.6%	.9%	.8%			
Ferranti	10.0	3.7	87	4.6	.6%	.9%	.3%			
Norsk Data	10.0	5.8	130	2.0	.6%	.4%	.5%			
Marcus Computer Systeme	9.8	5.1	285	3.3	.6%	.7%	1.0%			
Radian Computational	9.3	3.3	310	4.7	.6%	.9%	1.1%			
Parametric Technology	9.0	.0	0	8.2	.6%	1.6%	.0%			
Cimlinc	7.7	.8	162	5.4	.5%	1.1%	.6%			
Auto-Trol	7.4	2.7	92	2.8	.5%	.6%	.3%			
PDA Engineering	7.1	.0	0	6.8	.4%	1.4%	.0%			
Wiechers Datentechnik	7.0	4.0	90	2.1	.4%	.4%	.3%			
Unisys	6.7	3.4	103	2.3	.4%	.5%	.4%			
Technische Computer Systeme	5.4	1.1	142	4.3	.3%	.9%	.5%			
Alias Research	4.8	.0	0	4.3	.3%	.9%	.0%			
Autodesk	4.2	.0	0	4.2	.3%	.8%	.0%			
Swanson Analysis	4.0	.0	0	4.0	.3%	.8%	.0%			
XAO Industrie	3.7	1.3	133	2.2	.2%	.4%	.5%			
Exapt	3.4	1.7	110	1.2	.2%	.2%	.4%			
ADRA Systems	3.1	1.0	50	1.8	.2%	.4%	.2%			
Catalpa	2.6	.9	21	1.3	.2%	.3%	.1%			
									(Continued)	

(Continued)

Table 15 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application:	Mechanical									
Platform:	Technical Workstation									
Region:	Europe									
Units:	Millions of U.S. Dollars/Actual Units									
	Market Share									
	Total			Hardware		Total		Hardware		
Company	Factory Revenue	Hardware Revenue	Software Revenue	Units Shipped	Factory Revenue	Hardware Revenue	Software Revenue	Units Shipped	Factory Revenue	Hardware Revenue
ISKA	2.1	1.0	.9	39	.1%	.1%	.2%	.1%	.1%	.2%
debis Systemhaus	2.1	.5	1.3	11	.1%	.1%	.2%	.0%	.1%	.2%
ICAD	2.0	.0	1.6	0	.1%	.0%	.3%	.0%	.1%	.3%
CAMTEK	2.0	.0	1.6	0	.1%	.0%	.3%	.0%	.1%	.3%
MacNeal-Schwendler	1.9	.0	1.8	0	.1%	.0%	.4%	.0%	.1%	.4%
MARC	1.8	.0	1.8	0	.1%	.0%	.3%	.0%	.1%	.3%
Caroline Informatique	1.6	.3	.8	8	.1%	.0%	.2%	.0%	.1%	.2%
SPATIAL Technology	1.5	.0	1.5	0	.1%	.0%	.3%	.0%	.1%	.3%
MCS	1.4	.0	1.3	0	.1%	.0%	.3%	.0%	.1%	.3%
Aries Technology	1.2	.0	1.0	0	.1%	.0%	.2%	.0%	.1%	.2%
FEA	1.1	.3	.3	3	.1%	.0%	.1%	.0%	.1%	.1%
Mechanical Dynamics	1.1	.0	1.0	0	.1%	.0%	.2%	.0%	.1%	.2%
CAD Centre	1.0	.0	.8	0	.1%	.0%	.2%	.0%	.1%	.2%
Valisys	.8	.0	.8	0	.1%	.0%	.2%	.0%	.1%	.2%
FEGS	.8	.0	.7	0	.1%	.0%	.1%	.0%	.1%	.1%
CADSI	.6	.1	.5	3	.0%	.0%	.1%	.0%	.0%	.1%
CADKEY	.5	.0	.5	0	.0%	.0%	.1%	.0%	.0%	.1%
Spectrum Graphics	.3	.1	.2	3	.0%	.0%	.0%	.0%	.0%	.0%
Whesoc Computing Systems	.3	.0	.3	0	.0%	.0%	.1%	.0%	.0%	.1%
Solbourne	.3	.3	.0	57	.0%	.0%	.0%	.2%	.0%	.2%
Computational Mechanics	.2	.0	.2	0	.0%	.0%	.0%	.0%	.0%	.0%
Serbi	.2	.0	.2	0	.0%	.0%	.0%	.0%	.0%	.0%
Ontos	.2	.0	.2	0	.0%	.0%	.0%	.0%	.0%	.0%
Wisdom Systems	.2	.0	.1	0	.0%	.0%	.0%	.0%	.0%	.0%
										(Continued)

(Continued)

Table 15 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: Europe
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
DAPCO	.2	.0	.1	0	.0%	.0%	.0%	.0%
Point Control	.2	.0	.2	0	.0%	.0%	.0%	.0%
Micro Engineering Solutions	.1	.0	.1	1	.0%	.0%	.0%	.0%
Objectivity	.1	.0	.1	0	.0%	.0%	.0%	.0%
Object Design	.1	.0	.1	0	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.1	0	.0%	.0%	.0%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Everex Systems	.1	.1	.0	8	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
Lamp Software	.0	.0	.0	3	.0%	.0%	.0%	.0%
ESDU International	.0	.0	.0	0	.0%	.0%	.0%	.0%
CADWorks	.0	.0	.0	0	.0%	.0%	.0%	.0%
Algor Interactive Systems	.0	.0	.0	0	.0%	.0%	.0%	.0%
Synthesis	.0	.0	.0	0	.0%	.0%	.0%	.0%
Zuken	.0	.0	.0	0	.0%	.0%	.0%	.0%
Softdesk	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	1,608.7	743.6	505.4	27,597	100.0%	100.0%	100.0%	100.0%
 All N.A.-Based Companies	 1,168.4	 583.5	 303.0	 21,630	 72.6%	 78.5%	 59.9%	 78.4%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	440.3	160.2	202.4	5,967	27.4%	21.5%	40.1%	21.6%
All Hardware Companies	170.5	139.9	1.3	8,662	10.6%	18.8%	.3%	31.4%
All Turnkey & SW Companies	1,438.2	603.8	504.1	18,935	89.4%	81.2%	99.7%	68.6%

Source: Dataquest (September 1992)

Table 16
1991 CAD/CAM/CAB/GIS Final Market Share

Application:	Mechanical	Millions of U.S. Dollars/Actual Units										
Platform:	Host-Dependent											
Region:	Europe											
Units:												
		Total					Market Share					
Company		Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM		369.1	199.3	97.8	4,429	52.8%	52.0%	61.8%	44.8%			
Digital		73.4	50.6	.0	0	10.5%	13.2%	.0%	.0%			.0%
Computervision		54.1	21.0	12.0	1,379	7.7%	5.5%	7.6%	14.0%			
Control Data		53.4	21.9	7.5	170	7.6%	5.7%	4.7%	1.7%			
Schlumberger		13.5	4.3	5.6	246	1.9%	1.1%	3.5%	2.5%			
Norsk Data		11.5	5.1	1.7	91	1.6%	1.3%	1.1%	.9%			
EDS		9.7	4.9	3.9	524	1.4%	1.3%	2.4%	5.3%			
MacNeal-Schwendler		9.7	.0	9.3	0	1.4%	.0%	5.9%	.0%			
Exapt		9.3	4.5	3.2	110	1.3%	1.2%	2.0%	1.1%			
SDRC		4.1	.0	4.1	0	.6%	.0%	2.6%	.0%			
Swanson Analysis		2.5	.0	2.5	0	.4%	.0%	1.6%	.0%			
PDA Engineering		2.4	.0	2.3	0	.3%	.0%	1.4%	.0%			
Fides Industrielle Automation		2.1	.3	1.5	7	.3%	.1%	.9%	.1%			
Unisys		2.0	1.0	.7	27	.3%	.3%	.4%	.3%			
Intergraph		1.7	.8	.3	23	.2%	.2%	.2%	.2%			
Kewill Systems		1.6	.5	.9	14	.2%	.1%	.5%	.1%			
Computational Mechanics		1.2	.0	1.2	0	.2%	.0%	.8%	.0%			
FrameSoft		1.2	.0	.7	0	.2%	.0%	.5%	.0%			
MCS		1.1	.0	.9	0	.2%	.0%	.6%	.0%			
MARC		.8	.0	.8	0	.1%	.0%	.5%	.0%			
Whesoe Computing Systems		.6	.0	.6	0	.1%	.0%	.4%	.0%			
FECS		.6	.0	.5	0	.1%	.0%	.3%	.0%			
debis Systemhaus		.3	.1	.2	2	.0%	.0%	.1%	.0%			
Olivetti		.3	.3	.0	7	.0%	.1%	.0%	.1%			
(Continued)												

(Continued)

Table 16 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
Platform: Host-Dependent
Region: Europe
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
FEA	.3	.1	.1	1	.0%	.0%	.0%	.0%
Mechanical Dynamics	.2	.0	.2	0	.0%	.0%	.1%	.0%
ESDU International	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	72.6	69.0	.0	2,852	10.4%	18.0%	.0%	28.9%
All Companies	699.0	383.5	158.2	9,880	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	670.1	372.8	147.7	9,650	95.9%	97.2%	93.4%	97.7%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	28.9	10.8	10.5	230	4.1%	2.8%	6.6%	2.3%
All Hardware Companies	157.5	124.5	1.6	2,897	22.5%	32.5%	1.0%	29.3%
All Turnkey & SW Companies	541.5	259.1	156.6	6,983	77.5%	67.5%	99.0%	70.7%

Source: Dataquest (September 1992)

Table 17
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
Platform: Server
Region: Europe
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	97.3	54.8	23.6	573	53.3%	52.5%	64.2%	35.3%
Digital	36.7	25.3	.0	303	20.1%	24.3%	.0%	18.7%
Sun Microsystems	13.2	10.7	.0	316	7.2%	10.3%	.0%	19.5%
Intergraph	8.6	4.2	2.1	119	4.7%	4.0%	5.6%	7.3%
Schlumberger	8.3	2.7	3.3	87	4.5%	2.6%	9.1%	5.3%
MacNeal-Schwendler	5.1	.0	4.9	0	2.8%	.0%	13.3%	.0%
Computervision	4.9	1.8	1.4	33	2.7%	1.7%	3.9%	2.0%
Cisigraph	2.9	.9	1.1	33	1.6%	.9%	2.9%	2.1%
Silicon Graphics	2.1	1.8	.0	39	1.2%	1.7%	.0%	2.4%
Control Data	1.7	.8	.2	3	.9%	.8%	.5%	.2%
Hewlett-Packard	1.3	1.0	.0	96	.7%	1.0%	.0%	5.9%
Solbourne	.4	.4	.0	21	.2%	.4%	.0%	1.3%
Rasna Corporation	.2	.0	.2	0	.1%	.0%	.5%	.0%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	182.5	104.4	36.8	1,622	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	179.6	103.4	35.7	1,589	98.4%	99.1%	97.1%	97.9%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	2.9	.9	1.1	33	1.6%	.9%	2.9%	2.1%
All Hardware Companies	54.9	40.2	.0	985	30.1%	38.5%	.1%	60.7%
All Turnkey & SW Companies	127.6	64.1	36.8	638	69.9%	61.5%	99.9%	39.3%

Source: Dataquest (September 1992)

Mechanical Applications Final Market Share

Table 18
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: Europe
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Compaq	65.0	65.0	.0	12,663	14.9%	23.4%	.0%	22.5%
IBM	43.3	41.1	.0	10,273	9.9%	14.8%	.0%	18.3%
Hewlett-Packard	33.5	26.8	.0	5,751	7.7%	9.6%	.0%	10.2%
Autodesk	30.8	.0	30.8	0	7.1%	.0%	23.7%	.0%
Investronica SA	26.5	21.2	2.7	1,060	6.1%	7.6%	2.0%	1.9%
Apple Computer	24.7	21.7	.0	5,171	5.7%	7.8%	.0%	9.2%
Wiechers Datentechnik	20.0	11.4	6.0	577	4.6%	4.1%	4.6%	1.0%
Vero International Software	14.6	.0	13.3	0	3.3%	.0%	10.2%	.0%
Tebis	14.5	2.2	10.1	80	3.3%	.8%	7.8%	.1%
CADAM	12.5	4.5	6.8	900	2.9%	1.6%	5.2%	1.6%
Caditron	9.8	4.9	3.9	151	2.2%	1.8%	3.0%	.3%
Research Machines	7.2	7.2	.0	1,162	1.7%	2.6%	.0%	2.1%
DAT Standard Info systemes	6.5	.0	6.1	0	1.5%	.0%	4.7%	.0%
Ziegler Informatics	5.5	.0	5.5	0	1.3%	.0%	4.3%	.0%
Computervision	5.2	.0	4.9	61	1.2%	.0%	3.8%	.1%
Cimatron	4.5	2.0	2.0	236	1.0%	.7%	1.6%	.4%
Serbi	4.4	.0	4.4	0	1.0%	.0%	3.4%	.0%
Anilam Electronics	3.2	1.0	1.9	40	.7%	.3%	1.5%	.1%
Dell Computer	3.1	3.1	.0	791	.7%	1.1%	.0%	1.4%
Superdraft	2.6	1.2	1.3	142	.6%	.4%	1.0%	.3%
Olivetti	2.5	2.2	.0	429	.6%	.8%	.0%	.8%
Pathtrace	2.4	.5	1.6	36	.5%	.2%	1.2%	.1%
Whesoe Computing Systems	2.2	.0	2.2	0	.5%	.0%	1.7%	.0%
Point Control	2.1	.0	2.1	0	.5%	.0%	1.6%	.0%

(Continued)

Table 18 (Continued)

1991 CAD/CAM/CAE/GIS Final Market Share

Company	Application: Platform: Region: Units:	Mechanical Personal Computer Europe Millions of U.S. Dollars/Actual Units	Market Share							
			Total		Hardware		Software		Total	
			Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue
CADKEY			2.0	.0	2.0	0	.5%	.0%	1.5%	.0%
PAFEC			1.8	.0	1.8	0	.4%	.0%	1.4%	.0%
CNC Software			1.8	.0	1.8	0	.4%	.0%	1.4%	.0%
ISICAD			1.8	.0	1.8	0	.4%	.0%	1.4%	.0%
Intergraph			1.7	.0	1.6	0	.4%	.0%	1.2%	.0%
Robocom			1.7	.0	1.7	0	.4%	.0%	1.3%	.0%
Swanson Analysis			1.5	.0	1.5	0	.3%	.0%	1.2%	.0%
FEA			1.4	.3	.4	12	.3%	.1%	.3%	.0%
Micrografx			1.4	.0	1.4	0	.3%	.0%	1.0%	.0%
Moda CAD			1.1	.3	.7	9	.2%	.1%	.6%	.0%
S.T.L.D. s.r.l.			1.0	.0	1.0	0	.2%	.0%	.7%	.0%
ADRA Systems			.9	.0	.8	0	.2%	.0%	.6%	.0%
CAMTEK			.9	.0	.7	0	.2%	.0%	.5%	.0%
CAD Lab			.8	.0	.6	0	.2%	.0%	.5%	.0%
Schlumberger			.8	.2	.4	22	.2%	.1%	.3%	.0%
Vision 3D			.8	.4	.2	6	.2%	.1%	.1%	.0%
Hahn & Kolb			.7	.4	.2	14	.2%	.1%	.2%	.0%
Caroline Informatique			.6	.1	.3	9	.1%	.0%	.2%	.0%
Algor Interactive Systems			.6	.0	.6	0	.1%	.0%	.4%	.0%
MCS			.6	.0	.6	0	.1%	.0%	.4%	.0%
ESDU International			.6	.0	.6	0	.1%	.0%	.5%	.0%
Graphisoft Software Dev			.5	.0	.5	0	.1%	.0%	.4%	.0%
Rasna Corporation			.4	.0	.4	0	.1%	.0%	.3%	.0%
Everex Systems			.4	.4	.0	175	.1%	.1%	.0%	.3%

(Continued)

Table 18 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: Europe
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Foresight Resources	.4	.0	.3	0	.1%	.0%	.3%	.0%
debis Systemhaus	.3	.1	.2	6	.1%	.0%	.2%	.0%
MacNeal-Schwendler	.3	.0	.3	0	.1%	.0%	.3%	.0%
Evolution Computing	.3	.0	.3	0	.1%	.0%	.2%	.0%
Aries Technology	.3	.0	.3	0	.1%	.0%	.2%	.0%
CADWorks	.3	.0	.2	0	.1%	.0%	.2%	.0%
Norsk Data	.2	.1	.0	6	.1%	.0%	.0%	.0%
Micro Engineering Solutions	.2	.1	.1	3	.0%	.0%	.1%	.0%
CAD-Capture	.2	.0	.0	0	.0%	.0%	.0%	.0%
American Small Business Comp.	.2	.0	.2	0	.0%	.0%	.1%	.0%
CADSI	.2	.0	.1	2	.0%	.0%	.1%	.0%
Synthesis	.2	.0	.2	0	.0%	.0%	.1%	.0%
A.I. Systems	.1	.0	.1	0	.0%	.0%	.1%	.0%
Radan Computational	.1	.0	.1	5	.0%	.0%	.0%	.0%
Lamp Software	.1	.0	.1	4	.0%	.0%	.1%	.0%
Cascade Graphics	.1	.0	.1	0	.0%	.0%	.1%	.0%
Masta Corporation	.1	.0	.0	0	.0%	.0%	.0%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Engineered Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Mega CADD	.1	.0	.1	0	.0%	.0%	.0%	.0%
Softdesk	.0	.0	.0	0	.0%	.0%	.0%	.0%
Number One Systems	.0	.0	.0	1	.0%	.0%	.0%	.0%

(Continued)

Table 18 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: Europe
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Other Companies	59.7	59.7	.0	16,463	13.7%	21.5%	.0%	29.3%
All Companies	435.2	278.0	129.7	56,261	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	297.3	222.7	60.4	52,285	68.3%	80.1%	46.6%	92.9%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	138.0	55.2	69.3	3,976	31.7%	19.9%	53.4%	7.1%
All Hardware Companies	251.0	238.8	.0	54,939	57.7%	85.9%	.0%	97.7%
All Turnkey & SW Companies	184.2	39.2	129.7	1,321	42.3%	14.1%	100.0%	2.3%

Source: Dataquest (September 1992)

Table 19
1991 CAD/CAM/CAE/GE Final Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Asia
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	404.9	230.9	98.4	11,206	18.8%	18.2%	16.3%	17.4%
NEC	198.6	133.7	49.0	9,679	9.2%	10.5%	8.1%	15.0%
Nihon Unisys	183.5	122.9	23.9	1,761	8.5%	9.7%	3.9%	2.7%
Fujitsu	181.6	114.4	49.0	4,086	8.4%	9.0%	8.1%	6.3%
Hitachi	135.0	64.8	56.7	3,966	6.3%	5.1%	9.4%	6.2%
Hewlett-Packard	102.3	72.0	12.8	5,516	4.8%	5.7%	2.1%	8.6%
Toshiba—NO OEM	72.5	38.2	27.0	2,431	3.4%	3.0%	4.5%	3.8%
Computervision	72.0	30.5	29.6	717	3.3%	2.4%	4.9%	1.1%
Silicon Graphics	66.5	63.2	.0	1,502	3.1%	5.0%	.0%	2.3%
Hitachi Zosen Info Systems	59.1	45.6	1.7	606	2.8%	3.6%	.3%	.9%
Mutoh Industries—NO OEM	48.5	26.3	17.7	1,332	2.3%	2.1%	2.9%	2.1%
Hakuto	47.1	28.3	18.9	1,562	2.2%	2.2%	3.1%	2.4%
Mitsubishi Electric	40.9	31.4	5.5	787	1.9%	2.5%	.9%	1.2%
Sun Microsystems	35.2	29.9	.0	1,741	1.6%	2.4%	.0%	2.7%
CADAM	33.1	11.3	18.6	2,250	1.5%	.9%	3.1%	3.5%
Digital	32.2	22.2	.0	313	1.5%	1.7%	.0%	.5%
Sumitomo Denko Workstation	31.2	31.2	.0	1,739	1.5%	2.5%	.0%	2.7%
Sharp System Products—NO OEM	31.2	16.2	15.0	205	1.4%	1.3%	2.5%	.3%
SDRC	29.3	.0	29.3	0	1.4%	.0%	4.8%	.0%
Tokyo Electron—NO OEM	26.8	8.8	12.9	99	1.2%	.7%	2.1%	.2%
Mitsui Engineering	21.8	15.2	4.4	145	1.0%	1.2%	.7%	.2%
Toyo Information Systems—NO OEM	19.8	12.1	5.8	211	.9%	.9%	1.0%	.3%
Graphtec Engineering	14.8	7.4	6.6	319	.7%	.6%	1.1%	.5%
Omron	13.9	12.6	1.4	402	.6%	1.0%	.2%	.6%

(Continued)

Table 19 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Platform: Region: Units:	Mechanical All Platforms Asia Millions of U.S. Dollars/Actual Units	Market Share											
		Total		Hardware		Software		Hardware		Software		Hardware	
		Factory Revenue	Revenue	Revenue	Units Shipped	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Units Shipped
Company													
MacNeal-Schwendler		12.7	.0	12.2	0	.6%	.0%	2.0%	.0%			.0%	.0%
Autodesk		11.7	.0	11.7	0	.5%	.0%	1.9%	.0%			.0%	.0%
Control Data		11.7	5.6	1.9	79	.5%	.4%	.3%	.4%			.1%	.1%
Intergraph		10.5	5.3	2.3	151	.5%	.4%	.4%	.4%			.2%	.2%
Apple Computer		10.4	9.2	.0	2,188	.5%	.7%	.0%	.7%			3.4%	.0%
Design Automation		10.2	.0	10.2	0	.5%	.0%	1.7%	.0%			.0%	.0%
Wacom		9.7	2.0	6.8	155	.4%	.2%	1.1%	.2%			.2%	.2%
Parametric Technology		9.0	.0	8.2	0	.4%	.0%	1.4%	.0%			.0%	.0%
Andor		8.5	2.1	6.1	77	.4%	.2%	1.0%	.2%			.1%	.1%
EDS		7.4	3.8	2.4	74	.3%	.3%	.4%	.3%			.1%	.1%
Schlumberger		6.7	2.3	2.6	82	.3%	.2%	.4%	.2%			.1%	.1%
Alias Research		5.6	.0	5.1	0	.3%	.0%	.8%	.0%			.0%	.0%
Sony		5.6	4.9	.0	325	.3%	.4%	.0%	.4%			.5%	.0%
MARC		5.5	.0	5.5	0	.3%	.0%	.9%	.0%			.0%	.0%
Swanson Analysis		4.9	.0	4.9	0	.2%	.0%	.8%	.0%			.0%	.0%
Fides Industrielle Automation		4.6	.7	3.2	53	.2%	.1%	.5%	.1%			.1%	.1%
Compaq		4.2	4.2	.0	826	.2%	.3%	.0%	.3%			1.3%	.1%
ADRA Systems		4.1	1.0	2.6	50	.2%	.1%	.4%	.1%			.1%	.1%
Unisys		4.0	2.0	1.4	60	.2%	.2%	.2%	.2%			.1%	.1%
Matra Datavision		4.0	1.5	1.9	42	.2%	.1%	.3%	.1%			.1%	.1%
ICAD		3.3	.0	2.6	0	.2%	.0%	.4%	.0%			.0%	.0%
CADIX		3.2	1.3	1.6	24	.1%	.1%	.3%	.1%			.0%	.0%
Century Research Center		2.9	1.6	1.1	12	.1%	.1%	.2%	.1%			.0%	.0%
Cimatron		2.9	1.3	1.3	95	.1%	.1%	.2%	.1%			.1%	.1%

(Continued)

(Continued)

Table 19 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Asia
 Units: Millions of U.S. Dollars/Actual Units

Company	Market Share							
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Mechanical Dynamics	2.8	.0	2.5	0	.1%	.0%	.4%	.0%
Delcam International	2.7	.9	1.3	45	.1%	.1%	.2%	.1%
Framasoft	2.6	.0	1.6	0	.1%	.0%	.3%	.0%
Cimlinc	2.6	.3	1.8	54	.1%	.0%	.3%	.1%
Point Control	2.2	.0	2.2	0	.1%	.0%	.4%	.0%
Kubota Computer	2.0	1.3	.7	113	.1%	.1%	.1%	.2%
Ricoh—NO OEM	1.9	.0	1.6	0	.1%	.0%	.3%	.0%
Aries Technology	1.8	.0	1.6	0	.1%	.0%	.3%	.0%
Cisigraph	1.7	.6	.6	20	.1%	.0%	.1%	.0%
PDA Engineering	1.6	.0	1.5	0	.1%	.0%	.3%	.0%
SPATIAL Technology	1.5	.0	1.5	0	.1%	.0%	.2%	.0%
Anilam Electronics	1.4	.4	.8	18	.1%	.0%	.1%	.0%
MCS	1.4	.0	1.2	0	.1%	.0%	.2%	.0%
Auto-Trol	1.1	.4	.4	13	.0%	.0%	.1%	.0%
Gerber Systems	.9	.4	.3	12	.0%	.0%	.0%	.0%
ISICAD	.8	.4	.3	6	.0%	.0%	.1%	.0%
Zuken	.8	.3	.5	5	.0%	.0%	.1%	.0%
CNC Software	.7	.0	.7	0	.0%	.0%	.1%	.0%
Whessoe Computing Systems	.7	.0	.7	0	.0%	.0%	.1%	.0%
Rasna Corporation	.6	.0	.6	0	.0%	.0%	.1%	.0%
Valisys	.6	.0	.6	0	.0%	.0%	.1%	.0%
CADSI	.5	.1	.4	3	.0%	.0%	.1%	.0%
Moda CAD	.4	.1	.3	4	.0%	.0%	.0%	.0%
Micro Engineering Solutions	.4	.1	.2	4	.0%	.0%	.0%	.0%

(Continued)

Table 19 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Asia
 Units: Millions of U.S. Dollars/Actual Units

Company	Market Share							
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Investronica SA	.3	.2	.0	11	.0%	.0%	.0%	.0%
Technische Computer Systeme	.3	.1	.2	8	.0%	.0%	.0%	.0%
CADKEY	.3	.0	.3	0	.0%	.0%	.0%	.0%
CADWorks	.3	.0	.2	0	.0%	.0%	.0%	.0%
Solbourne	.3	.3	.0	27	.0%	.0%	.0%	.0%
Superdraft	.2	.1	.1	13	.0%	.0%	.0%	.0%
Object Design	.2	.0	.2	0	.0%	.0%	.0%	.0%
CAD Centre	.1	.0	.1	0	.0%	.0%	.0%	.0%
Wisdom Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
Everex Systems	.1	.1	.0	55	.0%	.0%	.0%	.1%
Pathtrace	.1	.0	.1	2	.0%	.0%	.0%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
PAFEC	.1	.0	.1	0	.0%	.0%	.0%	.0%
Softdesk	.1	.0	.1	0	.0%	.0%	.0%	.0%
Algor Interactive Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
Objectivity	.1	.0	.1	0	.0%	.0%	.0%	.0%
American Small Business Comp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
Foresight Resources	.0	.0	.0	0	.0%	.0%	.0%	.0%
Mega CADD	.0	.0	.0	0	.0%	.0%	.0%	.0%

(Continued)

Table 19 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Asia
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Other Companies	48.5	47.3	.0	7,191	2.3%	3.7%	.0%	11.2%
All Companies	2,149.8	1,271.1	605.4	64,472	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	957.0	542.7	269.5	34,126	44.5%	42.7%	44.5%	52.9%
All Asian-Based Companies	1,171.1	722.5	323.7	30,040	54.5%	56.8%	53.5%	46.6%
All European-Based Companies	21.8	5.8	12.2	306	1.0%	.5%	2.0%	.5%
All Hardware Companies	312.9	281.4	.4	27,768	14.6%	22.1%	.1%	43.1%
All Turnkey & SW Companies	1,836.9	989.7	605.0	36,704	85.4%	77.9%	99.9%	56.9%

Source: Dataquest (September 1992)

Table 20

1991 CAD/CAM/CAPP/CAE Final Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: Asia
 Units: Millions of U.S. Dollars/Actual Units

Company	Market Share					
	Total			Hardware		
	Factory Revenue	Hardware Revenue	Software Revenue	Shipped Units	Factory Revenue	Hardware Revenue
NEC	99.3	54.6	36.7	3,112	9.6%	8.9%
Hewlett-Packard	89.2	61.5	12.8	3,401	8.6%	10.1%
Fujitsu	74.4	46.9	20.1	1,804	7.2%	7.7%
Hitachi	67.5	32.4	28.4	1,334	6.5%	5.3%
Silicon Graphics	66.5	63.2	.0	1,502	6.4%	10.3%
IBM	65.6	36.8	16.1	1,800	6.3%	6.0%
Computervision	62.0	25.3	27.4	587	6.0%	4.1%
Nihon Unisys	58.7	39.3	7.6	728	5.7%	6.4%
Hitachi Zosen Info Systems	55.6	45.6	1.7	606	5.4%	7.5%
Toshiba—NO OEM	42.0	21.0	16.8	477	4.1%	3.4%
Mitsubishi Electric	29.8	25.4	2.1	330	2.9%	4.1%
Sumitomo Denko Workstation	29.1	29.1	.0	1,577	2.8%	4.8%
Sharp System Products—NO OEM	27.1	14.1	13.0	168	2.6%	2.3%
Tokyo Electron—NO OEM	26.8	8.8	12.9	99	2.6%	1.4%
SDRC	25.5	.0	25.5	0	2.5%	.0%
Sun Microsystems	24.0	20.7	.0	1,391	2.3%	3.4%
Mitsui Engineering	19.8	13.9	4.0	112	1.9%	2.3%
Mutoh Industries—NO OEM	17.0	8.2	5.8	223	1.6%	1.3%
Toyo Information Systems—NO OEM	15.8	9.9	4.5	187	1.5%	1.6%
Graphtec Engineering	14.8	7.4	6.6	319	1.4%	1.2%
Omron	13.9	12.6	1.4	402	1.3%	2.1%
Parametric Technology	9.0	.0	8.2	0	.9%	.0%
Intergraph	8.3	4.4	1.6	118	.8%	.7%
Digital	5.8	4.0	.0	245	.6%	.7%

(Continued)

Table 20 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Company	Application: Platform: Region: Units:	Mechanical Technical Workstation Asia Millions of U.S. Dollars/Actual Units	Market Share							
			Total		Hardware		Software		Total	
			Factory Revenue	Shipped Units	Hardware Revenue	Hardware Units Shipped	Software Revenue	Software Units Shipped	Factory Revenue	Hardware Revenue
EDS			5.7		3.0		1.9		.6%	.5%
Alias Research			5.6		.0		5.1		.5%	.0%
Sony			5.6		4.9		.0		.5%	.8%
Schlumberger			4.7		1.6		1.8		.5%	.3%
Control Data			4.1		2.5		.9		.4%	.4%
Matra Datavision			4.0		1.5		1.9		.4%	.2%
Fides Industrielle Automation			3.9		.6		2.8		.4%	.1%
MARC			3.9		.0		3.9		.4%	.0%
Hakuto			3.3		2.0		1.3		.3%	.3%
ICAD			3.3		.0		2.6		.3%	.0%
CADIX			3.2		1.3		1.6		.3%	.2%
ADRA Systems			3.1		1.0		1.8		.3%	.2%
Unisys			3.1		1.6		1.1		.3%	.3%
Delcam International			2.7		.9		1.3		.3%	.2%
Cimline			2.6		.3		1.8		.2%	.0%
Swanson Analysis			2.5		.0		2.5		.2%	.0%
Framasoft			2.4		.0		1.5		.2%	.0%
Mechanical Dynamics			2.4		.0		2.1		.2%	.0%
Ricoh—NO OEM			1.9		.0		1.6		.2%	.0%
Canatron			1.9		.8		.8		.2%	.1%
Century Research Center			1.5		.8		.6		.1%	.1%
Kubota Computer			1.5		1.0		.5		.1%	.2%
Gisigraph			1.5		.5		.6		.1%	.1%
SPATIAL Technology			1.5		.0		1.5		.1%	.0%

(Continued)

Table 20 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: Asia
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Aries Technology	1.4	.0	1.3	0	.1%	.0%	.4%	.0%
MacNeal-Schwendler	1.4	.0	1.3	0	.1%	.0%	.4%	.0%
Autodesk	1.4	.0	1.4	0	.1%	.0%	.5%	.0%
Wacom	1.3	.3	1.0	13	.1%	.1%	.3%	.1%
PDA Engineering	1.2	.0	1.1	0	.1%	.0%	.4%	.0%
Auto-Trol	1.1	.4	.4	13	.1%	.1%	.1%	.1%
Gerber Systems	.9	.4	.3	12	.1%	.1%	.1%	.1%
Zuken	.8	.3	.5	5	.1%	.0%	.2%	.0%
ISICAD	.8	.4	.3	6	.1%	.1%	.1%	.0%
MCS	.6	.0	.6	0	.1%	.0%	.2%	.0%
Valisys	.6	.0	.6	0	.1%	.0%	.2%	.0%
CADSI	.4	.1	.3	2	.0%	.0%	.1%	.0%
Technische Computer Systeme	.3	.1	.2	8	.0%	.0%	.1%	.0%
Object Design	.2	.0	.2	0	.0%	.0%	.1%	.0%
Point Control	.2	.0	.2	0	.0%	.0%	.1%	.0%
CAD Centre	.1	.0	.1	0	.0%	.0%	.0%	.0%
Micro Engineering Solutions	.1	.0	.1	1	.0%	.0%	.0%	.0%
Wisdom Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
Solbourne	.1	.1	.0	20	.0%	.0%	.0%	.1%
PAFEC	.1	.0	.1	0	.0%	.0%	.0%	.0%
Whessoe Computing Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
CADKEY	.1	.0	.1	0	.0%	.0%	.0%	.0%
Objectivity	.1	.0	.1	0	.0%	.0%	.0%	.0%

(Continued)

Mechanical Applications Final Market Share

Table 20 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: Asia
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
CADWorks	.0	.0	.0	0	.0%	.0%	.0%	.0%
Softdesk	.0	.0	.0	0	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
Everex Systems	.0	.0	.0	3	.0%	.0%	.0%	.0%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	1,036.6	611.1	304.7	21,628	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	408.9	227.2	126.7	9,412	39.4%	37.2%	41.6%	43.5%
All Asian-Based Companies	610.7	379.5	168.6	12,014	58.9%	62.1%	55.3%	55.5%
All European-Based Companies	17.0	4.4	9.4	203	1.6%	.7%	3.1%	.9%
All Hardware Companies	160.2	146.2	.2	6,960	15.5%	23.9%	.1%	32.2%
All Turnkey & SW Companies	876.4	464.9	304.5	14,668	84.5%	76.1%	99.9%	67.8%

Source: Dataquest (September 1992)

Table 21
1991 CAD/CAM/CAE/CES Final Market Share

Application: Mechanical
 Platform: Host-Dependent
 Region: Asia
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	250.4	135.2	66.4	3,513	39.6%	36.0%	44.8%	45.4%
Nihon Unisys	124.8	83.6	16.2	1,033	19.7%	22.3%	10.9%	13.4%
Fujitsu	78.1	49.2	21.1	1,316	12.3%	13.1%	14.2%	17.0%
NEC	53.6	40.8	8.6	126	8.5%	10.9%	5.8%	1.6%
Hitachi	21.6	10.4	9.1	363	3.4%	2.8%	6.1%	4.7%
Digital	17.8	12.3	.0	0	2.8%	3.3%	.0%	.0%
Computervision	9.7	5.2	1.9	130	1.5%	1.4%	1.3%	1.7%
Control Data	7.4	3.0	1.0	23	1.2%	.8%	.7%	.3%
Toshiba—NO OEM	7.3	3.6	2.9	125	1.1%	1.0%	2.0%	1.6%
MacNeal-Schwendler	7.2	.0	7.0	0	1.1%	.0%	4.7%	.0%
Mitsubishi Electric	6.5	3.1	1.8	21	1.0%	.8%	1.2%	.3%
Toyo Information Systems—NO OEM	4.1	2.2	1.3	24	.6%	.6%	.9%	.3%
SDRC	3.8	.0	3.8	0	.6%	.0%	2.6%	.0%
Hitachi Zosen Info Systems	3.6	.0	.0	0	.6%	.0%	.0%	.0%
MARC	1.7	.0	1.7	0	.3%	.0%	1.1%	.0%
EDS	1.6	.8	.5	20	.3%	.2%	.4%	.3%
Swanson Analysis	1.6	.0	1.6	0	.2%	.0%	1.0%	.0%
Century Research Center	1.4	.8	.5	2	.2%	.2%	.4%	.0%
Schlumberger	1.2	.4	.5	22	.2%	.1%	.4%	.3%
Unisys	.9	.5	.3	12	.1%	.1%	.2%	.2%
Fides Industrielle Automation	.7	.1	.5	3	.1%	.0%	.3%	.0%
Kubota Computer	.5	.3	.2	16	.1%	.1%	.1%	.2%
MCS	.5	.0	.4	0	.1%	.0%	.3%	.0%
Mechanical Dynamics	.4	.0	.4	0	.1%	.0%	.2%	.0%

(Continued)

Table 21 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Host-Dependent
 Region: Asia
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
PDA Engineering	.4	.0	.4	0	.1%	.0%	.3%	.0%
Intergraph	.3	.1	.0	5	.0%	.0%	.0%	.1%
Framasoft	.2	.0	.1	0	.0%	.0%	.1%	.0%
Whessoe Computing Systems	.1	.0	.1	0	.0%	.0%	.1%	.0%
Other Companies	24.9	23.7	.0	980	3.9%	6.3%	.0%	12.7%
All Companies	632.2	375.2	148.2	7,737	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	329.8	181.2	85.9	4,706	52.2%	48.3%	57.9%	60.8%
All Asian-Based Companies	301.4	193.9	61.7	3,027	47.7%	51.7%	41.6%	39.1%
All European-Based Companies	1.0	.1	.7	3	.2%	.0%	.5%	.0%
All Hardware Companies	44.3	36.6	.2	985	7.0%	9.8%	.1%	12.7%
All Turnkey & SW Companies	587.9	338.6	148.0	6,752	93.0%	90.2%	99.9%	87.3%

Source: Dataquest (September 1992)

Table 22
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
Platform: Server
Region: Asia
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	65.9	37.1	16.0	413	63.3%	58.7%	72.8%	33.5%
Sun Microsystems	11.2	9.2	.0	351	10.8%	14.5%	.0%	28.4%
Digital	8.6	5.9	.0	68	8.2%	9.3%	.0%	5.5%
Toshiba—NO OEM	5.1	4.6	.0	83	4.9%	7.2%	.0%	6.7%
MacNeal-Schwendler	3.8	.0	3.7	0	3.7%	.0%	16.6%	.0%
Mutoh Industries—NO OEM	2.4	1.8	.6	75	2.3%	2.9%	2.8%	6.1%
Sumitomo Denko Workstation	2.2	2.2	.0	162	2.1%	3.5%	.0%	13.1%
Intergraph	1.6	.8	.4	28	1.5%	1.2%	1.7%	2.2%
Sharp System Products—NO OEM	1.6	.8	.8	7	1.5%	1.3%	3.4%	.6%
Schlumberger	.8	.3	.3	8	.7%	.4%	1.5%	.6%
Hewlett-Packard	.4	.3	.0	30	.4%	.5%	.0%	2.4%
Control Data	.2	.1	.0	0	.2%	.2%	.1%	.0%
Cisigraph	.2	.1	.1	2	.2%	.1%	.3%	.2%
Rasna Corporation	.2	.0	.2	0	.2%	.0%	.8%	.0%
Solbourne	.2	.2	.0	7	.1%	.2%	.0%	.6%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	104.1	63.2	22.0	1,235	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	92.7	53.7	20.6	905	89.0%	85.1%	93.5%	73.3%
All Asian-Based Companies	11.3	9.4	1.4	327	10.8%	14.8%	6.2%	26.5%
All European-Based Companies	.2	.1	.1	2	.2%	.1%	.3%	.2%
All Hardware Companies	23.0	18.2	.0	730	22.1%	28.7%	.0%	59.1%
All Turnkey & SW Companies	81.1	45.0	22.0	504	77.9%	71.3%	100.0%	40.9%

Source: Dataquest (September 1992)

Table 23
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: Asia
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Hitachi	45.9	22.0	19.3	2,269	12.2%	9.9%	14.8%	6.7%
NEC	45.7	38.4	3.7	6,441	12.1%	17.3%	2.8%	19.0%
Hakuto	43.8	26.3	17.5	1,499	11.6%	11.9%	13.4%	4.4%
CADAM	33.1	11.3	18.6	2,250	8.8%	5.1%	14.2%	6.6%
Mutoh Industries—NO OEM	29.1	16.3	11.4	1,034	7.7%	7.4%	8.7%	3.1%
Fujitsu	29.1	18.3	7.8	965	7.7%	8.3%	6.0%	2.8%
IBM	23.1	21.9	.0	5,479	6.1%	9.9%	.0%	16.2%
Toshiba—NO OEM	18.1	9.1	7.2	1,747	4.8%	4.1%	5.6%	5.2%
Hewlett-Packard	12.7	10.2	.0	2,086	3.4%	4.6%	.0%	6.2%
Apple Computer	10.4	9.2	.0	2,188	2.8%	4.1%	.0%	6.5%
Autodesk	10.3	.0	10.3	0	2.7%	.0%	7.9%	.0%
Design Automation	10.2	.0	10.2	0	2.7%	.0%	7.8%	.0%
Andor	8.5	2.1	6.1	77	2.3%	1.0%	4.6%	.2%
Wacom	8.4	1.6	5.8	141	2.2%	.7%	4.4%	.4%
Mitsubishi Electric	4.5	3.0	1.5	435	1.2%	1.3%	1.2%	1.3%
Compaq	4.2	4.2	.0	826	1.1%	1.9%	.0%	2.4%
Sharp System Products—NO OEM	2.5	1.3	1.2	31	.7%	.6%	.9%	.1%
Point Control	2.1	.0	2.1	0	.6%	.0%	1.6%	.0%
Mitsui Engineering	2.0	1.4	.4	33	.5%	.6%	.3%	.1%
Anilam Electronics	1.4	.4	.8	18	.4%	.2%	.6%	.1%
Cimatron	1.1	.5	.5	54	.3%	.2%	.4%	.2%
ADRA Systems	.9	.0	.8	0	.2%	.0%	.6%	.0%
Swanson Analysis	.9	.0	.9	0	.2%	.0%	.7%	.0%
CNC Software	.7	.0	.7	0	.2%	.0%	.6%	.0%

(Continued)

Table 23 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
Platform: Personal Computer
Region: Asia
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Whessoe Computing Systems	.5	.0	.5	0	.1%	.0%	.4%	.0%
Rasna Corporation	.4	.0	.4	0	.1%	.0%	.3%	.0%
Moda CAD	.4	.1	.3	4	.1%	.0%	.2%	.0%
Aries Technology	.4	.0	.3	0	.1%	.0%	.2%	.0%
Intergraph	.3	.0	.3	0	.1%	.0%	.2%	.0%
Investronica SA	.3	.2	.0	11	.1%	.1%	.0%	.0%
MCS	.3	.0	.2	0	.1%	.0%	.2%	.0%
MacNeal-Schwendler	.3	.0	.2	0	.1%	.0%	.2%	.0%
CADWorks	.3	.0	.2	0	.1%	.0%	.2%	.0%
Superdraft	.2	.1	.1	13	.1%	.0%	.1%	.0%
Computervision	.2	.0	.2	0	.1%	.0%	.2%	.0%
CADKEY	.2	.0	.2	0	.1%	.0%	.2%	.0%
Micro Engineering Solutions	.2	.1	.1	3	.1%	.0%	.1%	.0%
Pathtrace	.1	.0	.1	2	.0%	.0%	.1%	.0%
Everex Systems	.1	.1	.0	53	.0%	.1%	.0%	.2%
CADSI	.1	.0	.1	2	.0%	.0%	.1%	.0%
Algor Interactive Systems	.1	.0	.1	0	.0%	.0%	.1%	.0%
ISICAD	.1	.0	.1	0	.0%	.0%	.1%	.0%
Softdesk	.1	.0	.1	0	.0%	.0%	.1%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
American Small Business Comp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
Schlumberger	.1	.0	.0	2	.0%	.0%	.0%	.0%
PAFEC	.0	.0	.0	0	.0%	.0%	.0%	.0%
Mega CADD	.0	.0	.0	0	.0%	.0%	.0%	.0%

(Continued)

Mechanical Applications Final Market Share

Table 23 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: Asia
 Units: Millions of U.S. Dollars/Actual Units

Company	Market Share							
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Foresight Resources	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	23.6	23.6	.0	6,211	6.3%	10.6%	.0%	18.3%
All Companies	376.9	221.6	130.4	33,873	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	125.6	80.6	36.4	19,102	33.3%	36.4%	27.9%	56.4%
All Asian-Based Companies	247.7	139.8	92.1	14,672	65.7%	63.1%	70.6%	43.3%
All European-Based Companies	3.6	1.3	2.0	98	1.0%	.6%	1.5%	.3%
All Hardware Companies	85.4	80.5	.0	19,092	22.7%	36.3%	.0%	56.4%
All Turnkey & SW Companies	291.5	141.2	130.4	14,780	77.3%	63.7%	100.0%	43.6%

Source: Dataquest (September 1992)

Table 24
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Rest of World
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	17.3	11.5	3.2	1,354	15.4%	17.0%	11.2%	20.3%
Digital	10.5	7.2	.0	105	9.3%	10.7%	.0%	1.6%
Intergraph	10.1	5.2	2.2	153	9.0%	7.7%	7.7%	2.3%
Hewlett-Packard	8.7	6.0	1.2	498	7.7%	8.9%	4.3%	7.5%
Computervision	7.6	2.6	2.7	79	6.7%	3.8%	9.4%	1.2%
Compaq	7.1	7.1	.0	1,376	6.3%	10.5%	.0%	20.6%
Engineering Mechanics	4.9	.2	4.2	393	4.4%	.4%	14.7%	5.9%
Control Data	3.3	1.6	.5	23	3.0%	2.4%	1.9%	.3%
EDS	3.1	1.6	1.0	48	2.8%	2.4%	3.6%	.7%
Cimatron	2.4	1.1	1.1	79	2.2%	1.6%	3.9%	1.2%
Siemens Nixdorf Info systems	2.3	1.2	.8	34	2.0%	1.7%	2.8%	.5%
Delcam International	2.0	.7	1.0	34	1.8%	1.1%	3.6%	.5%
SDRC	2.0	.0	2.0	0	1.8%	.0%	7.1%	.0%
Sun Microsystems	1.7	1.4	.0	102	1.5%	2.1%	.0%	1.5%
Claris	1.6	.0	1.6	0	1.4%	.0%	5.5%	.0%
CNC Software	1.1	.0	1.1	0	1.0%	.0%	3.9%	.0%
MacNeal-Schwendler	1.1	.0	1.1	0	1.0%	.0%	3.7%	.0%
Autodesk	1.1	.0	1.1	0	.9%	.0%	3.7%	.0%
Apple Computer	1.0	.8	.0	199	.8%	1.3%	.0%	3.0%
Vero International Software	.9	.0	.9	0	.8%	.0%	3.0%	.0%
ADRA Systems	.8	.2	.5	10	.7%	.3%	1.8%	.1%
Pathtrace	.6	.1	.4	8	.5%	.2%	1.3%	.1%
Swanson Analysis	.4	.0	.4	0	.3%	.0%	1.3%	.0%
Aries Technology	.4	.0	.3	0	.3%	.0%	1.1%	.0%

(Continued)

Table 24 (Continued)

1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Rest of World
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Unisys	.3	.2	.1	5	.3%	.3%	.4%	.1%
Whessoe Computing Systems	.3	.0	.3	0	.3%	.0%	1.2%	.0%
Superdraft	.2	.1	.1	13	.2%	.1%	.4%	.2%
Investronica SA	.2	.2	.0	8	.2%	.2%	.1%	.1%
Aura CAD/CAM Systems	.1	.0	.1	0	.1%	.0%	.3%	.0%
Engineering Systems Corp.	.1	.0	.1	0	.1%	.0%	.2%	.0%
Mc2 Engineering Software	.1	.0	.1	0	.1%	.0%	.3%	.0%
Ithaca Software	.1	.0	.1	0	.1%	.0%	.3%	.0%
Georgia Tech Research Corp.	.1	.0	.1	0	.1%	.0%	.2%	.0%
American Small Business Comp.	.1	.0	.1	0	.1%	.0%	.2%	.0%
Softdesk	.1	.0	.1	0	.1%	.0%	.2%	.0%
Algor Interactive Systems	.0	.0	.0	0	.0%	.0%	.1%	.0%
Moda CAD	.0	.0	.0	0	.0%	.0%	.1%	.0%
Ziegler Informatics	.0	.0	.0	0	.0%	.0%	.1%	.0%
Innovative Data Design	.0	.0	.0	0	.0%	.0%	.1%	.0%
CAD Centre	.0	.0	.0	0	.0%	.0%	.1%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
FEA	.0	.0	.0	0	.0%	.0%	.0%	.0%
Vision 3D	.0	.0	.0	0	.0%	.0%	.0%	.0%
Fides Industrielle Automation	.0	.0	.0	0	.0%	.0%	.0%	.0%
Foresight Resources	.0	.0	.0	0	.0%	.0%	.0%	.0%
ESDU International	.0	.0	.0	0	.0%	.0%	.0%	.0%
Graphisoft Software Dev	.0	.0	.0	0	.0%	.0%	.0%	.0%

(Continued)

Table 24 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Rest of World
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Other Companies	18.9	18.3	.0	2,147	16.8%	27.2%	.0%	32.2%
All Companies	112.7	67.2	28.5	6,669	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	103.6	63.8	23.8	6,492	91.8%	95.0%	83.5%	97.3%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	9.2	3.3	4.7	178	8.2%	5.0%	16.5%	2.7%
All Hardware Companies	47.6	42.2	.1	5,452	42.2%	62.8%	.4%	81.8%
All Turnkey & SW Companies	65.2	25.0	28.4	1,217	57.8%	37.2%	99.6%	18.2%

Source: Dataquest (September 1992)

Table 25

1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: Rest of World
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Intergraph	8.0	4.3	1.5	128	18.4%	21.0%	10.5%	12.1%
Hewlett-Packard	7.9	5.4	1.2	324	18.3%	26.2%	8.5%	30.8%
Computervision	6.4	2.3	2.1	71	14.7%	11.0%	14.4%	6.7%
Engineering Mechanics	2.9	.1	2.4	138	6.6%	.7%	17.0%	13.1%
EDS	2.4	1.3	.8	35	5.6%	6.1%	5.5%	3.3%
Siemens Nixdorf Info systems	2.3	1.2	.8	34	5.3%	5.6%	5.7%	3.2%
IBM	2.1	1.2	.5	64	4.9%	5.8%	3.6%	6.1%
Delcam International	2.0	.7	1.0	34	4.7%	3.5%	7.1%	3.3%
Digital	1.9	1.3	.0	82	4.5%	6.6%	.0%	7.8%
SDRC	1.8	.0	1.8	0	4.1%	.0%	12.3%	.0%
Cimatron	1.6	.7	.7	34	3.6%	3.4%	4.9%	3.3%
Control Data	1.2	.7	.2	16	2.7%	3.5%	1.7%	1.5%
Sun Microsystems	1.1	1.0	.0	77	2.6%	4.8%	.0%	7.3%
ADRA Systems	.6	.2	.4	10	1.4%	1.0%	2.5%	.9%
Aries Technology	.3	.0	.3	0	.7%	.0%	1.8%	.0%
Unisys	.3	.1	.1	4	.6%	.6%	.6%	.4%
Swanson Analysis	.2	.0	.2	0	.4%	.0%	1.3%	.0%
Autodesk	.1	.0	.1	0	.3%	.0%	.9%	.0%
MacNeal-Schwendler	.1	.0	.1	0	.3%	.0%	.8%	.0%
Georgia Tech Research Corp.	.0	.0	.0	0	.1%	.0%	.3%	.0%
CAD Centre	.0	.0	.0	0	.1%	.0%	.2%	.0%
Whesoe Computing Systems	.0	.0	.0	0	.1%	.0%	.2%	.0%
Softdesk	.0	.0	.0	0	.0%	.0%	.1%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.1%	.1%

(Continued)

Table 25 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: Rest of World
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
FEA	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	.0	.0	.0	2	.0%	.0%	.0%	.2%
All Companies	43.3	20.4	14.3	1,054	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	37.4	17.9	11.7	951	86.2%	87.5%	81.9%	90.3%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	6.0	2.6	2.6	103	13.8%	12.5%	18.1%	9.7%
All Hardware Companies	5.4	4.2	.1	344	12.6%	20.8%	.3%	32.7%
All Turnkey & SW Companies	37.9	16.2	14.3	709	87.4%	79.2%	99.7%	67.3%

Source: Dataquest (September 1992)

Table 26
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Host-Dependent
 Region: Rest of World
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	8.2	4.4	2.2	115	26.1%	20.1%	54.5%	18.0%
Digital	5.7	4.0	.0	0	18.3%	18.0%	.0%	.0%
Control Data	2.1	.9	.3	7	6.7%	3.9%	7.3%	1.0%
EDS	.7	.4	.2	13	2.2%	1.6%	5.8%	2.0%
MacNeal-Schwendler	.6	.0	.6	0	2.0%	.0%	15.2%	.0%
Computervision	.4	.1	.1	3	1.2%	.6%	2.8%	.5%
Intergraph	.3	.2	.1	4	1.0%	.7%	1.3%	.6%
SDRC	.3	.0	.3	0	.8%	.0%	6.6%	.0%
Swanson Analysis	.1	.0	.1	0	.4%	.0%	3.0%	.0%
Unisys	.1	.0	.0	1	.3%	.2%	.8%	.2%
Whessee Computing Systems	.1	.0	.1	0	.2%	.0%	1.5%	.0%
Georgia Tech Research Corp.	.0	.0	.0	0	.1%	.0%	.8%	.0%
Engineering Systems Corp.	.0	.0	.0	0	.1%	.0%	.3%	.0%
Fides Industrielle Automation	.0	.0	.0	0	.1%	.0%	.3%	.0%
Other Companies	12.7	12.1	.0	498	40.6%	54.9%	.0%	77.7%
All Companies	31.2	21.9	4.0	642	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	31.1	21.9	3.9	641	99.7%	100.0%	98.2%	100.0%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	.1	.0	.1	0	.3%	.0%	1.8%	.0%
All Hardware Companies	18.9	16.2	.1	500	60.4%	73.7%	1.5%	77.9%
All Turnkey & SW Companies	12.4	5.8	3.9	142	39.6%	26.3%	98.5%	22.1%

Source: Dataquest (September 1992)

Table 27
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Server
 Region: Rest of World
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Digital	2.8	1.9	.0	23	34.7%	41.2%	.0%	19.7%
IBM	2.2	1.3	.5	33	27.6%	27.4%	37.7%	28.6%
Intergraph	1.5	.7	.4	22	18.8%	15.8%	26.1%	19.0%
Sun Microsystems	.5	.4	.0	25	6.6%	9.2%	.0%	22.1%
Computervision	.5	.2	.2	5	6.3%	4.1%	12.3%	4.1%
MacNeal-Schwendler	.3	.0	.3	0	4.1%	.0%	23.2%	.0%
Hewlett-Packard	.1	.1	.0	7	1.1%	1.5%	.0%	6.0%
Control Data	.1	.0	.0	0	.7%	.9%	.7%	.1%
Other Companies	.0	.0	.0	1	.0%	.0%	.0%	.5%
All Companies	8.1	4.7	1.4	115	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	8.1	4.7	1.4	115	100.0%	100.0%	100.0%	100.0%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Hardware Companies	3.5	2.5	.0	79	43.7%	54.1%	.0%	68.6%
All Turnkey & SW Companies	4.5	2.2	1.4	36	56.3%	45.9%	100.0%	31.4%

Source: Dataquest (September 1992)

Table 28
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: Rest of World
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Compaq	7.1	7.1	.0	1,376	23.4%	35.1%	.0%	28.3%
IBM	4.8	4.6	.0	1,141	16.0%	22.7%	.0%	23.5%
Engineering Mechanics	2.1	.1	1.8	255	6.9%	.5%	19.8%	5.2%
Claris	1.6	.0	1.6	0	5.2%	.0%	17.7%	.0%
CNC Software	1.1	.0	1.1	0	3.7%	.0%	12.5%	.0%
Apple Computer	1.0	.8	.0	199	3.2%	4.2%	.0%	4.1%
Autodesk	.9	.0	.9	0	3.1%	.0%	10.5%	.0%
Vero International Software	.9	.0	.9	0	3.1%	.0%	9.6%	.0%
Cimatron	.9	.4	.4	45	2.9%	2.0%	4.5%	.9%
Hewlett-Packard	.7	.5	.0	167	2.2%	2.6%	.0%	3.4%
Pathtrace	.6	.1	.4	8	1.9%	.6%	4.2%	.2%
Computervision	.3	.0	.3	0	1.1%	.0%	3.7%	.0%
Intergraph	.3	.0	.3	0	1.0%	.0%	3.2%	.0%
Superdraft	.2	.1	.1	13	.8%	.5%	1.2%	.3%
Whesoe Computing Systems	.2	.0	.2	0	.8%	.0%	2.7%	.0%
Investronica SA	.2	.2	.0	8	.7%	.7%	.2%	.2%
ADRA Systems	.2	.0	.2	0	.6%	.0%	1.7%	.0%
Aura CAD/CAM Systems	.1	.0	.1	0	.3%	.0%	1.0%	.0%
Mc2 Engineering Software	.1	.0	.1	0	.3%	.0%	.9%	.0%
Ithaca Software	.1	.0	.1	0	.3%	.0%	.9%	.0%
American Small Business Comp.	.1	.0	.1	0	.2%	.0%	.8%	.0%
Swanson Analysis	.1	.0	.1	0	.2%	.0%	.8%	.0%
Aries Technology	.1	.0	.1	0	.2%	.0%	.7%	.0%
Engineering Systems Corp.	.1	.0	.1	0	.2%	.0%	.6%	.0%

(Continued)

Table 28 (Continued)
1991 CAD/CAM/CAE/GIS Final Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: Rest of World
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Softdesk	.1	.0	.1	0	.2%	.0%	.6%	.0%
Algor Interactive Systems	.0	.0	.0	0	.1%	.0%	.5%	.0%
Innovative Data Design	.0	.0	.0	0	.1%	.0%	.5%	.0%
Ziegler Informatics	.0	.0	.0	0	.1%	.0%	.5%	.0%
Moda CAD	.0	.0	.0	0	.1%	.0%	.3%	.0%
MacNeal-Schwendler	.0	.0	.0	0	.1%	.0%	.2%	.0%
Vision 3D	.0	.0	.0	0	.1%	.0%	.0%	.0%
FEA	.0	.0	.0	0	.0%	.0%	.0%	.0%
ESDU International	.0	.0	.0	0	.0%	.0%	.1%	.0%
Foresight Resources	.0	.0	.0	0	.0%	.0%	.1%	.0%
Graphisoft Software Dev.	.0	.0	.0	0	.0%	.0%	.1%	.0%
Other Companies	6.3	6.3	.0	1,646	20.8%	31.0%	.0%	33.9%
All Companies	30.1	20.1	8.9	4,859	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	27.0	19.4	6.8	4,784	89.6%	96.1%	76.9%	98.5%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	3.1	.8	2.1	75	10.4%	3.9%	23.1%	1.5%
All Hardware Companies	19.7	19.3	.0	4,529	65.5%	95.6%	.0%	93.2%
All Turnkey & SW Companies	10.4	.9	8.9	330	34.5%	4.4%	100.0%	6.8%

Source: Dataquest (September 1992)

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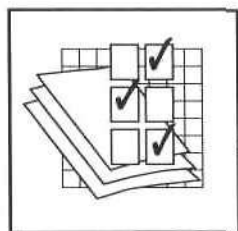
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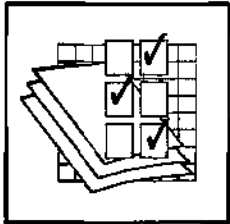


User Wants and Needs

CAD/CAM/CAE
Mechanical Applications
CCAM-MEC-UW-9201
October 26, 1992

Dataquest®

Mechanical Applications



User Wants and Needs

**CAD/CAM/CAE
Mechanical Applications**

**CCAM-MEC-UW-9201
October 26, 1992**

Dataquest®

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Chapter 1

Executive Summary

Introduction

Dataquest expects the worldwide market for mechanical CAD/CAM/CAE software revenue to be \$2.1 billion for 1992 and to grow at a 5 percent compound annual growth rate (CAGR) in the next five years. The market is fueled by a growing perception that this technology is indispensable in a design and manufacturing environment, independent of industry or location. CAD/CAM/CAE tools have moved out of the hands of the experts and are now being used by every job description and for hundreds of applications across the enterprise. The market penetration by site size, job description, and department is explored in detail in this report to better understand the dynamics of the user environment.

No dramatic new technology that will obsolete everything in use is seen on the horizon. Software functionality is steadily improving, with a focus on ease of use and enhanced ability to deal with complex designs and optimization. Economics are forcing the issue: new systems replace older ones because of significant improvements in hardware price/performance. Maintenance costs on some old systems are more than the cost to purchase some new systems. In any case, the result is an evolutionary growth with little increase in mechanical CAD/CAM/CAE budgets.

The diversity of tasks considered under the mechanical CAD/CAM/CAE umbrella is immense. All major subapplications are explored in this survey to better understand the work profile and market penetration in each category. Mechanical CAD/CAM/CAE applications are measured in context with support functions and other computer-related tasks. A view of the total work environment of the typical mechanical CAD/CAM/CAE user also is developed.

Study Objectives

Dataquest's goal is to provide a comprehensive understanding of the mechanical CAD/CAM/CAE market by collecting and analyzing data from vendor and end-user perspectives. This study examines the mechanical CAD/CAM/CAE market from the perspective of purchasers and consumers of these products.

This study was designed to identify and gather information about the current work environment of the typical user, with job function and

work activity considered. Answers from a series of questions designed to determine market penetration from several viewpoints help reveal the impact of mechanical CAD/CAM/CAE tools on these processes. The study also determines level of user satisfaction with the major tools and elicits suggestions for improvement in user productivity.

The specific study objectives were as follows:

- To identify the demographic characteristics of today's mechanical CAD/CAM/CAE end users, their budgets, implementation levels, experience base, and staffing expectations.
- To determine the level of new design and revision activity with perception of need for analysis to support high-quality design.
- To determine the typical environment of use considering software and hardware products installed.
- To evaluate effective use of mechanical CAD/CAM/CAE versus domestic and overseas users in competitive companies.
- To determine the level of interest in mechanical CAD/CAM/CAE subapplications considering volume of work and percentage of work accomplished with CAD/CAM/CAE tools.
- To evaluate the role of support in an organization. (Who is doing it, how much, and what kind?)
- To determine the hours spent in using CAD/CAM/CAE and other computer-related applications.
- To identify the mechanical CAD/CAM/CAE products being used and determine the relative level of satisfaction of each software product. Having identified the products being used, determine the suggestions from the user for this vendor to make the CAD/CAM/CAE tools more useful in increasing user productivity.
- To evaluate the requirement to share data between different departments and tools.

Major Findings

Major findings of the survey are as follows:

- Most users would recommend their mechanical CAD/CAM/CAE tools to a friend.
- Most users believe that they are more effective in the use of their mechanical CAD/CAM/CAE systems than are their Japanese, European, or U.S. competition by a factor of 3 or 4.
- Many users are seasoned veterans, with the majority having more than five years of experience using mechanical CAD/CAM/CAE tools. Many of these people are learning to use their third or fourth product.
- The largest untapped market for mechanical CAD/CAM/CAE is at sites with more than 500 technical professionals. Market penetration in this group is less than 30 percent.

- The automotive and aerospace industries dominate the market, with more systems installed and above-average penetration of the potential user base.
- New product design starts have increased slightly since 1988 (based on Dataquest survey data). During the same period, the level of product revision has dropped, indicating real productivity in using mechanical CAD/CAM/CAE, thus allowing better-quality designs.
- Vendor growth in a flat market will be fueled by users that expect to increase the number of new products learned in the next two years by 37 percent.
- The 1992 budget for mechanical CAD/CAM/CAE hardware and software is about the same as last year. Design engineers, new product development, and the industrial machinery industry all are more optimistic about budget levels.
- Three of four users believe that today's designs are more complex than those of two years ago and most believe that they require a higher level of analysis to ensure a quality result. Customer demands, new materials, and computer-aided design have caused or contributed to the increase.
- A large majority of users work with two or more computers at work and are using a computer at home.
- A 44-hour work week is typical, with 24 hours of that time spent using mechanical CAD/CAM/CAE.
- Product detail or functional design is the most common subapplication, followed closely by product conceptual design and documentation or drafting. Together these subapplications represent more than 70 percent of the work hours in mechanical CAD/CAM/CAE.
- Spreadsheets and word processors are used an average of 8 hours per week in the engineering environment by the typical mechanical CAD/CAM/CAE user.

Methodology

Earlier survey activity identified the need to develop insight into several issues that are sensitive to the sample distribution for industry and department of respondent, site size, and platform type used. This survey focused on a set of respondents selected from a filtered but random population. An attempt was made as the survey progressed to steer the interviewers toward sites with the designated profile, to have the resulting population match the desired characteristics.

The specific sample characteristics desired were as follows:

- Match distribution of installed base in the United States by industry. The education and government sectors were intentionally ignored in the sample.
- Match the installed base distribution model for platform type used.

- Use representation from each major department in the typical end-user organization.
- Use a wide sample distribution of user sites measured by number of employees.
- Interview users that collectively use a large variety of mechanical CAD/CAM/CAE software tools.

The survey sample was selected from the Dataquest CAD/CAM/CAE end-user database, from contact names provided by vendors, and from company contacts identified with The Dun & Bradstreet Corporation million-dollar directory. A phone survey was conducted in August and September 1992 in the United States.

We suggest that users of this information evaluate the results at two levels: What the total group of respondents say, and what each group with statistical significance reports. These groups are highlighted in the survey results.

A follow-up study is offered as a consulting project for specific vendors that would like to compare users of their products with the total population and users of competitive products. Only two vendors have a large enough sample size to make statistically valid comparison within the original sample. These are highlighted later in the report.

Structure of Report

The report is divided into three major sections. First, the demographics of the respondents are defined. Second, the site-specific questions and then the individual responses are analyzed. A sample questionnaire is included in the appendix. A total of 208 interviews were completed.

Project Team: Michael Seely and Kim Kisling

Chapter 2

Respondent Demographics ---

The target population in this study is users of mechanical CAD/CAM/CAE tools in the United States. The respondents represented a wide range of job titles from all major departments and from all major manufacturing industries. Table 2-1 identifies the respondent sample distribution by industry, job title, and department.

Respondents' Role in Their Organizations

The majority of respondents hold the title of department manager. Following closely are the titles of system manager, project engineer, and design engineer. These people represented more than two-thirds of the respondent base (see Figure 2-1). These job classifications are expected to provide good insight into use of equipment, budgets, and site penetration levels. Sufficient responses were given in each of these job title groups to allow comparison, providing further insight into the decision-making process and work environment in mechanical CAD/CAM/CAE.

Representation by Industry

Figure 2-2 shows distribution of the respondents' company by industry. The intention of having the survey distribution match the Dataquest market model for installed base was partially successful. In general, the distribution matched. Unfortunately the total number of completed surveys was insufficient to allow statistically valid comparison among all industries. Comparison is made among the aerospace, automotive, and industrial machine industries. The education and government sectors were intentionally excluded from this survey primarily because of the interest in comparing product engineering and manufacturing engineering activities.

Respondents by Department

Figure 2-3 shows the distribution of responses by department. Because the full sample is used for comparison by department, the sample size is quite large, which allows for comparison among all major user departments using CAD/CAM/CAE tools in the typical company.

Respondents Experience Base

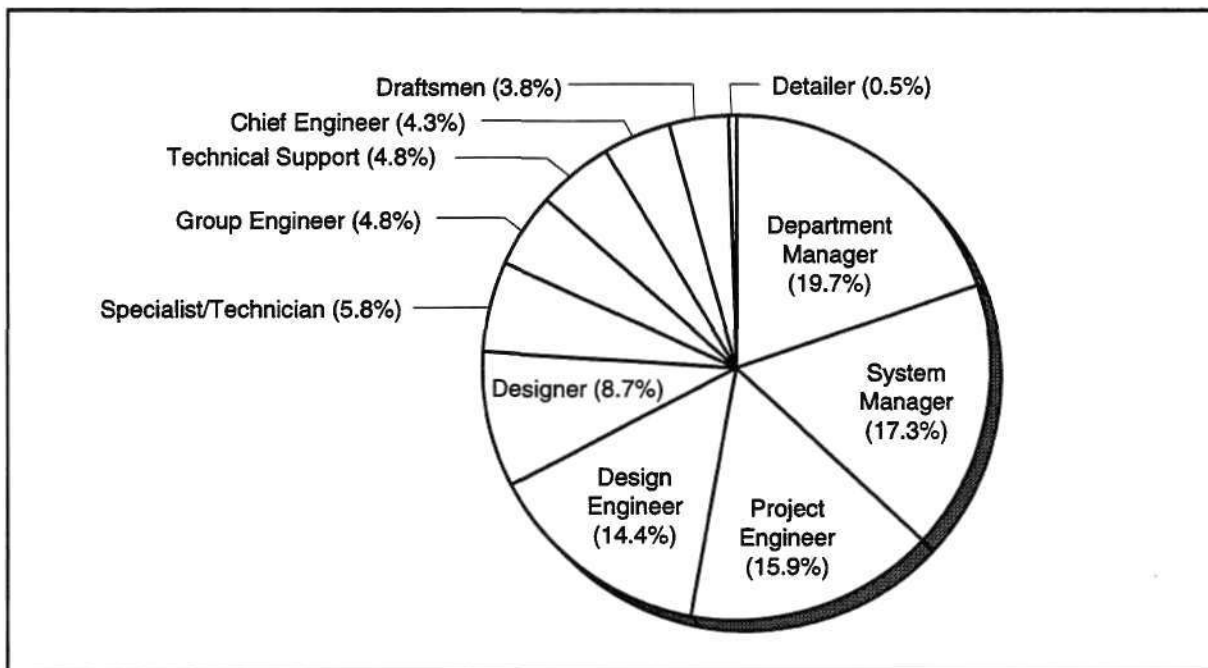
Figure 2-4 answers the question "How long, in years, have you been using mechanical CAD/CAM/CAE software?" The average answer was 7.9 years. In general, the more senior engineers and management

Table 2-1
Survey Respondent Data

Industry	Number of Responses	Percentage of Total	Job Title	Number of Responses	Percentage of Total	Department	Number of Responses	Percentage of Total
Aerospace	46	22.1	Chief Engineer	9	4.3	Design/Computing Service Group	58	27.9
			Department Manager	41	19.7			
Automotive	54	26.0	System Manager	36	17.3	R&D, New Product Development	37	17.8
Computers and Peripherals	8	3.8	Group Engineer	10	4.8	Product Engineering	68	32.7
			Project Engineer	33	15.9			
Service/Design Consulting	11	5.3	Design Engineer	30	14.4	Manufacturing Engineering	42	20.2
Electrical and Electronic Machinery	22	10.6	Specialist/Technician	12	5.8	Plant Operations	3	1.4
			Designer	18	8.7			
Fabricated Metal Parts	16	7.7	Technical Support	10	4.8			
Industrial Machinery	32	15.4	Draftsmen	8	3.8			
			Detailer	1	0.5			
Manufacturing	19	9.1						
Other								
Total	208			208			208	

Source: Dataquest (October 1992)

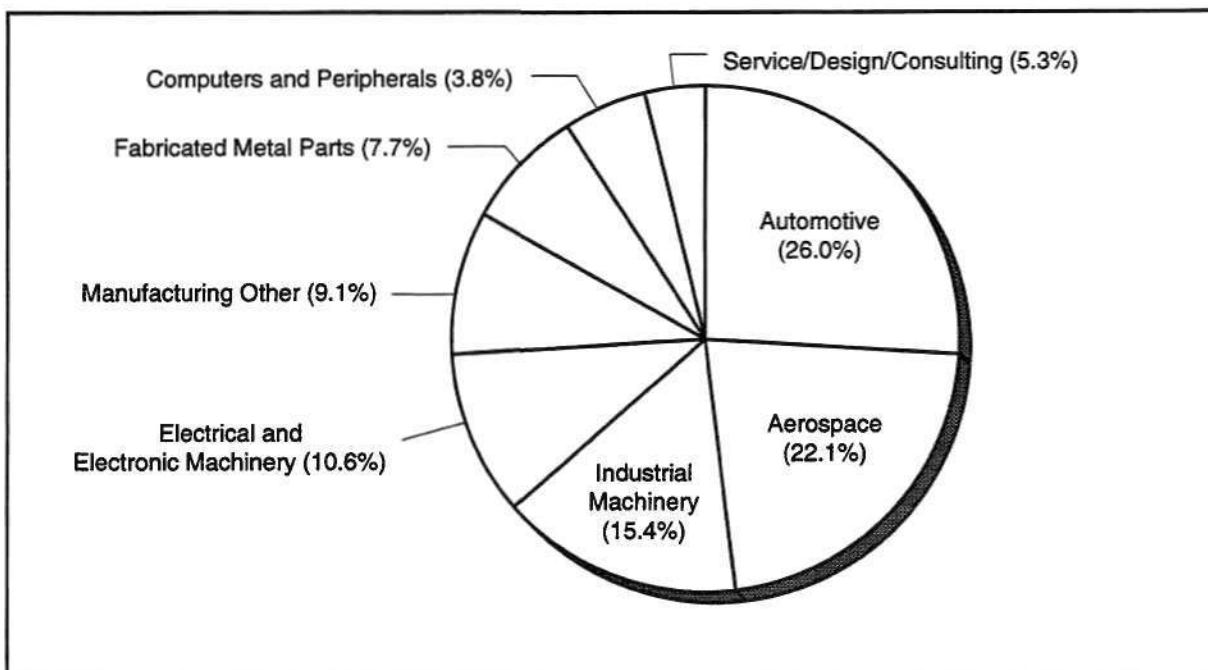
Figure 2-1
Respondents' Job Function



Source: Dataquest (October 1992)

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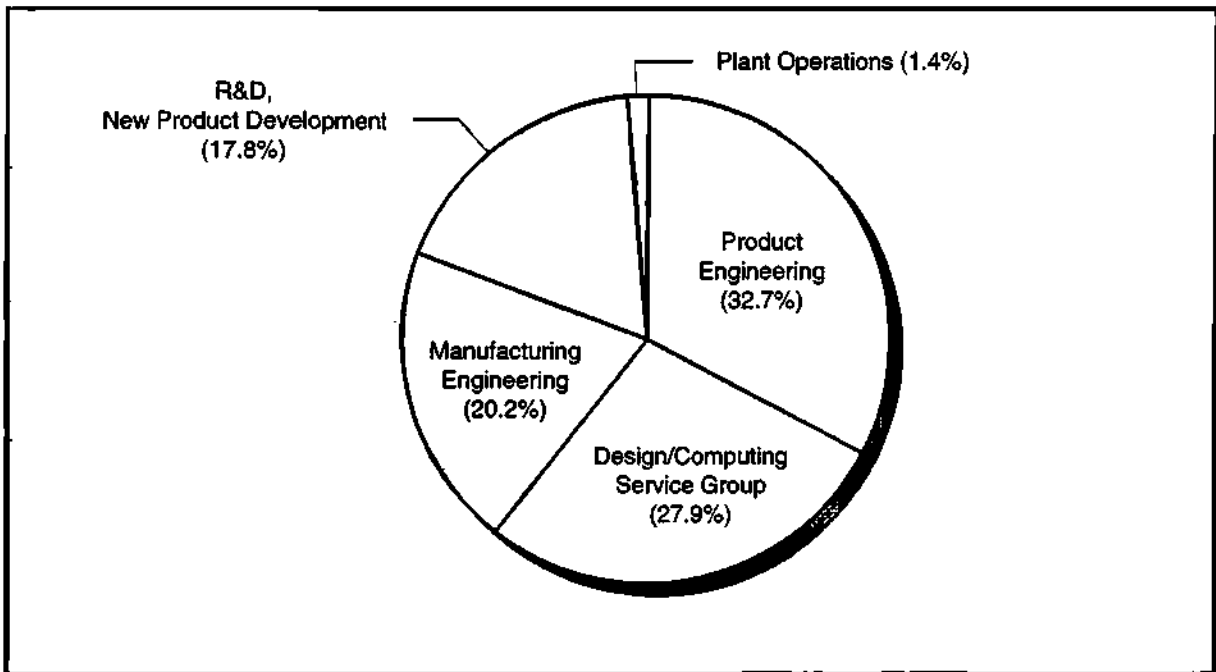
Figure 2-2
Respondents' Primary Business (N = 208)



Source: Dataquest (October 1992)

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Figure 2-3
Respondents, by Department



Source: Dataquest (October 1992)

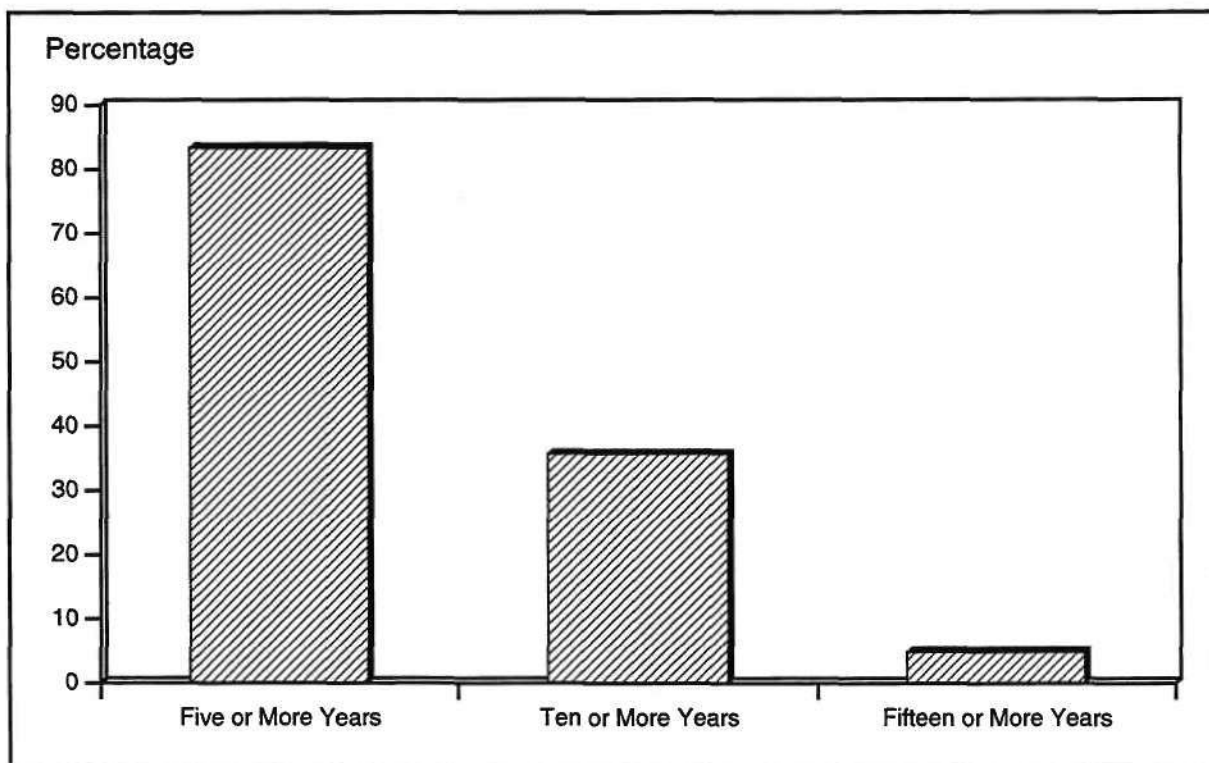
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staff had more years of experience, but overall the group is quite experienced. (More evidence of this is shown later when the number of software products learned and used is measured.) Table 2-2 shows the average experience base of each reporting group.

Summary

This survey group is judged to have significant experience in using mechanical CAD/CAM/CAE and should be well suited to make the distinctions requested. Readers should keep in mind that the total population of this survey is dominated by department managers, system managers, and project engineers in the automotive, aerospace, and industrial machinery industries.

Figure 2-4
Respondents' Experience Base



Source: Dataquest (October 1992)

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Table 2-2
Experience Base of Respondents
(N=30 or More in Each Group)

How long, in years, have you been using mechanical CAD/CAM/CAE software?

Total Respondents	Mean (Years)
By Job Title	7.9
Department Manager	8.7
Systems Manager	8.6
Project Engineer	7.3
Design Engineer	7.8
By Industry	
Aerospace	8.6
Automotive	6.5
Industrial Machinery	8.3
By Department	
Design/Computing Service	9.0
R&D, New Product Development	8.8
Product Engineering	7.4
Manufacturing Engineering	6.9

Source: Dataquest (October 1992)

Chapter 3

Survey Analysis at Site Level ---

A series of questions were used to determine changes in employment in three categories: total employment of the company; the group of technical professionals; and the number of trained mechanical CAD/CAM/CAE users. A historical perspective and forecast was formed by evaluating the changes from 1990 to 1992, and from 1992 to 1994. Another set of questions asked about the number of seats used. Together the responses allow for a reasonable calculation of the penetration of CAD/CAM/CAE technology into these companies.

Employment History and Forecast, by Industry

Table 3-1 shows the full survey sample for all industries. Only the aerospace, automotive, and industrial machinery industries had more than 30 respondents, which, for this survey, are necessary for statistical significance. The other industries can be evaluated with a lower confidence.

Aerospace

The drop in total employment in the aerospace industry dropped by more than 16 percent CAGR from 1990 to 1992, and is expected to have a negative 7.6 percent CAGR from 1992 to 1994. The pool of technical professionals receded in the last two years, but a significant 16 percent growth is expected in the next two years. The number of CAD/CAM/CAE users has held relatively steady. More than 55 percent of these users are working full time on a system.

Automotive

Automotive employment in the past two years grew in all areas except number of technical professionals, which had a modest 2 percent drop. CAD/CAM/CAE users grew a significant 10 percent in the last two years and are forecast to grow 7.6 percent in the next two. More than 64 percent of these users are working full time.

Industrial Machinery

The survey showed flat to downward growth in industrial machinery employment, with the exception of CAD/CAM/CAE users, where a whopping 24 percent CAGR took place and another 21 percent is expected.

Table 3-1
History and Forecast of Employment

Changes in total employment, technical professionals, and number of users during the last two years and forecast for the next two.

By Industry	By year			Percentage Change CAGR from	
	1990	1992	1994	1990 to 1992	1992 to 1994
Aerospace (N=46)					
Total	134,675	94,492	80,670	-16.2	-7.6
Technical Professionals	16,272	14,986	20,218	-4.0	16.2
CAD Users	6,582	6,804	6,513	1.7	-2.2
Percentage Full-Time Users		55.1			
Automotive (N=54)					
Total	25,920	27,252	29,198	2.5	3.5
Technical Professionals	3,809	3,652	3,776	-2.1	1.7
CAD Users	746	903	1,045	10.0	7.6
Percentage Full-Time Users		64.6			
Computers and Peripherals (N=8)					
Total	36,900	35,280	34,700	-2.2	-0.8
Technical Professionals	9,840	9,566	9,570	-1.4	0.0
CAD Users	940	1,076	1,340	7.0	11.6
Service/Design Consulting (N=11)					
Total	1,810	1,665	1,765	-4.1	3.0
Technical Professionals	860	769	779	-5.4	0.6
CAD Users	113	167	170	21.6	0.9
Electrical and Electronic Machinery (N=22)					
Total	9,185	8,660	8,930	-2.9	1.5
Technical Professionals	2,780	2,811	2,919	0.6	1.9
CAD Users	284	309	337	4.3	4.4

(Continued)

Table 3-1
History and Forecast of Employment (Continued)

Changes in total employment, technical professionals, and number of users during the last two years and forecast for the next two.

By Industry	By year			Percentage Change CAGR from	
	1990	1992	1994	1990 to 1992	1992 to 1994
Fabricated Metal Parts (N=16)					
Total	3,555	3,824	4,139	3.7	4.0
Technical Professionals	435	423	440	-1.4	2.0
CAD Users	121	161	226	15.4	18.5
Industrial Machinery (N=32)					
Total	10,135	9,503	10,310	-3.2	4.2
Technical Professionals	1,760	1,732	1,710	-0.8	-0.6
CAD Users	326	505	747	24.5	21.6
Percent Full-Time Users		68.8			
Manufacturing Other (N=19)					
Total	29,878	28,186	28,643	-2.9	0.8
Technical Professionals	12,853	13,043	13,100	0.7	0.2
CAD Users	3,166	3,243	3,276	1.2	0.5
Total (N=208)					
Total	252,058	208,862	198,355	-9.0	-2.5
Technical Professionals	48,609	46,982	52,512	-1.7	5.7
CAD Users	12,278	13,168	13,654	3.6	1.8
Percentage Full-Time Users		65.8			

Source: Dataquest (October 1992)

Overall

The total employment population in the survey saw a 9 percent drop in total employment, a 1.7 percent drop in technical professionals, and a 3.6 percent growth in CAD/CAM/CAE users from 1990 to 1992. Continued reduction in total employment is expected, but more technical professionals and CAD/CAM/CAE users are planned. It is unclear why the forecast for 1992 to 1994 shows a 5.7 percent increase in technical professionals and only a 1.8 percent increase in CAD/CAM/CAE users. Table 3-1 shows CAGRs for history and a forecast of all industries in the survey. The N value shows the number of respondents from each industry. The three largest response groups are compared throughout the survey analysis.

Site Penetration

Table 3-2 compares in detail seats installed to the number of trained users and technical professionals. The total population of technical professionals, by Dataquest definition, sets the size of the total available market. Understanding the distribution, size, and user environment of each group will identify the best market opportunities for growth for mechanical CAD/CAM/CAE tools.

As a business opportunity for mechanical CAD/CAM/CAE, one group stands above the rest. Figure 3-1 dramatically shows a large difference between the number of trained users and the total number of technical professionals at very large sites. This group has a large installed base of trained users and support people that can help the new users learn the effective use of mechanical CAD/CAM/CAE. Benefits to the company will be magnified by a higher percentage of users having access to this technology, with a better organization and elimination of many duplicate systems.

Table 3-2 shows the detailed analysis of site penetration data considering the ratio of seats installed to the number of technical professionals. Someday this ratio will become 100 percent, when every eligible user in an organization actually uses a system. The number of trained users by technical professionals indicates the level of penetration of the technology into the organization. Comparing the number of seats installed by trained users indicates the amount of sharing taking place. A future survey should ask how this number might grow beyond 100 percent. Perhaps, if portable CAD, task-specific workstations optimized for a special task such as styling and the ordinary design/analysis/simulation workstations are considered, this number could go well beyond one per customer.

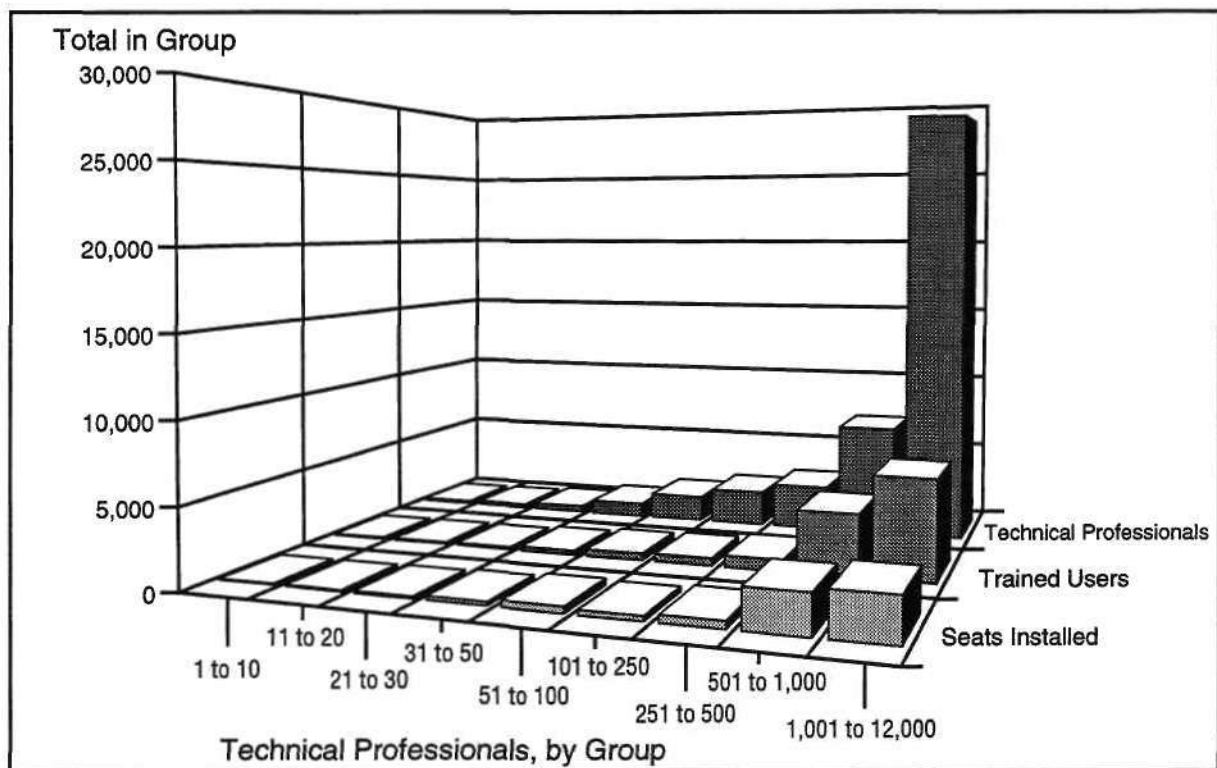
The potential benefits hold true for all sites, regardless of size, but large sites now have the lowest penetration levels, which indicates the highest potential market. This ratio is 21 to 28 percent at sites with more than 500 technical professionals. The penetration ratio at small sites is in the 30 to 60 percent range.

Table 3-2
Mechanical CAD/CAM/CAE Market Penetration, by Site Size

Number of Technical Professionals at Site	N	Seats Installed	Trained Users	Technical Professionals
1 to 10	25	85	90	150
11 to 20	15	95	106	241
21 to 30	15	123	121	403
31 to 50	21	237	267	886
51 to 100	22	408	443	1,653
101 to 250	13	309	493	2,250
251 to 500	9	453	729	2,875
501 to 1,000	10	2,365	3,855	7,150
1,001 to 12,000	8	2,620	6,240	28,600
Total	138	6,695	12,344	44,208
CAD/CAM/CAE Penetration by Site				
Number of Technical Professionals at Site		Seats Installed by Technical Professionals (%)	Trained Users by Technical Professionals (%)	Seats Installed by Trained Users (%)
1 to 10		56.7	60.0	94.4
11 to 20		39.4	44.0	89.6
21 to 30		30.5	30.0	101.7
31 to 50		26.7	30.1	88.8
51 to 100		24.7	26.8	92.1
101 to 250		13.7	21.9	62.7
251 to 500		15.8	25.4	62.1
501 to 1,000		33.1	53.9	61.3
1,001 to 12,000		9.2	21.8	42.0
Total		15.1	27.9	54.2

Source: Dataquest (October 1992)

Figure 3-1
Market Penetration, by Site Size



Source: Dataquest (October 1992)

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1992 Budget for Software and Hardware

Recessionary times have an impact on budgets for all but a top few items on the executive board priority list. From a strategic standpoint, investment in CAD/CAM/CAE tools has been on the list for many years. This year is no exception, but the dynamics have changed. We believe that the decision makers will look at a mix of strategies over the next few years, ranging from large purchases of 200 to 500 seats to a wait-and-see approach of buying no new seats this year. No dramatic new technology is seen on the horizon that will obsolete the current products. Steady improvement in price/performance of hardware leads to the oldest systems being replaced with the newest, as economics force the issue. Maintenance costs on some old systems may justify system updates more so than the purchase of some new systems. In any case, the result is evolutionary growth with little increase in mechanical CAD/CAM/CAE budgets. The good news is that this budget allocation in 1991 generated more than \$7.2 billion in mechanical CAD/CAM/CAE products sold worldwide.

The data in Table 3-3 show that about 40 percent of the respondents see the budget reality of 1992 unchanged from last year. A few more expect higher budgets with higher growth rates than the group that expects lower budgets. This should yield a slight growth in total

Table 3-3
Budget Plan for 1992 (N=30 or More in Each Group)

Is the overall budget for CAD/CAM/CAE software/hardware higher, lower, or about the same as last year?

	Software			Hardware		
	Higher (%)	Same (%)	Lower (%)	Higher (%)	Same (%)	Lower (%)
Total Respondents	35.2	42.6	22.2	34.5	40.9	24.5
Mean % higher or lower	51.9	-	46.5	45.1	-	45.6
By Job Title						
Department Manager	23.7	57.9	18.4	24.4	56.7	18.9
Systems Manager	24.2	36.4	39.4	31.2	34.4	34.4
Project Engineer	37.0	48.2	14.8	29.6	48.2	22.2
Design Engineer	52.0	28.0	20.0	53.9	23.1	23.1
By Industry						
Aerospace	24.9	42.5	32.5	24.4	39.1	36.6
Automotive	27.7	48.9	23.4	34.1	43.2	22.7
Industrial Machinery	40.0	43.3	16.6	34.5	48.3	17.2
By Department						
Design/Computing Service	38.8	38.8	22.5	43.8	29.1	27.1
R&D, New Product Development	48.3	31.0	20.7	41.4	34.5	24.1
Product Engineering	31.2	46.9	21.9	30.0	48.3	21.7
Manufacturing Engineering	28.1	46.9	25.0	25.0	46.9	28.1

Source: Dataquest (October 1992)

expenditure. A closer look at the expectations of department managers and systems managers indicates a less optimistic view, however, and they may be in a better position to know the expenditure approval situation. The industrial machinery industry has the highest growth forecast, compared to automotive and aerospace. In fact, all the other industries indicated higher software and hardware budgets. R&D and new product development has the highest department growth expectation.

Chapter 4

Survey Analysis at Respondent Level ---

One of the first issues to explore at the individual respondent level is an understanding of the design work load. This was measured by asking for the number of new design projects and existing product enhancements or revisions completed. Table 4-1, which shows all average score ratings for each job title, industry, and department, reveals several interesting observations.

New Design and Enhancements

The amount of new design work actually produced by different job titles varies widely. Department managers are still very much involved in the design process. They contributed to 34 new design projects, on average. Design engineers follow closely, then there is a large drop to systems and project engineers. It appears that systems and project engineers are too busy dealing with computer system and project management issues to maintain serious design activity. This illustrates why the CAD/CAM/CAE selling cycle must include department managers and design engineers in the evaluation. The automotive industry had the highest level of new design activity; manufacturing engineering has an even higher average. The cascade effect is apparent, where a new product design will cause even more design work in manufacturing for the corresponding tool and fixture design.

Comparing these data with a Dataquest 1988 survey of essentially the same group of designers and engineers in the same industries shows interesting changes over time. Figure 4-1 shows the distribution of new product design activity in three groups: those that did 1 to 4 new designs per year, 5 to 15, and more than 15. A case can be made for a significant improvement in CAD/CAM/CAE systems productivity and ease of use. The overall work load or volume of new design work seems to be even or slightly higher in 1992. The number of people doing more than 15 new designs increased and the group doing only 1 to 4 grew more than 7 percent. The more experienced staff is now doing more designs in the same period and the group doing only a few designs per year represents a larger portion of the user base. This makes the ease-of-use argument.

The product enhancement and revision data support the view that CAD/CAM/CAE is improving the productivity of the average user (see Figure 4-2). The distribution of revision activity has definitely dropped. In 1988, each category from a low level of revision activity to more than 150 changes per year had about 30 percent of the users

Table 4-1
New Design, Revision, and Analysis Activity (N=30 or More in Each Group)

How many new product designs and product enhancements do you work on each year?

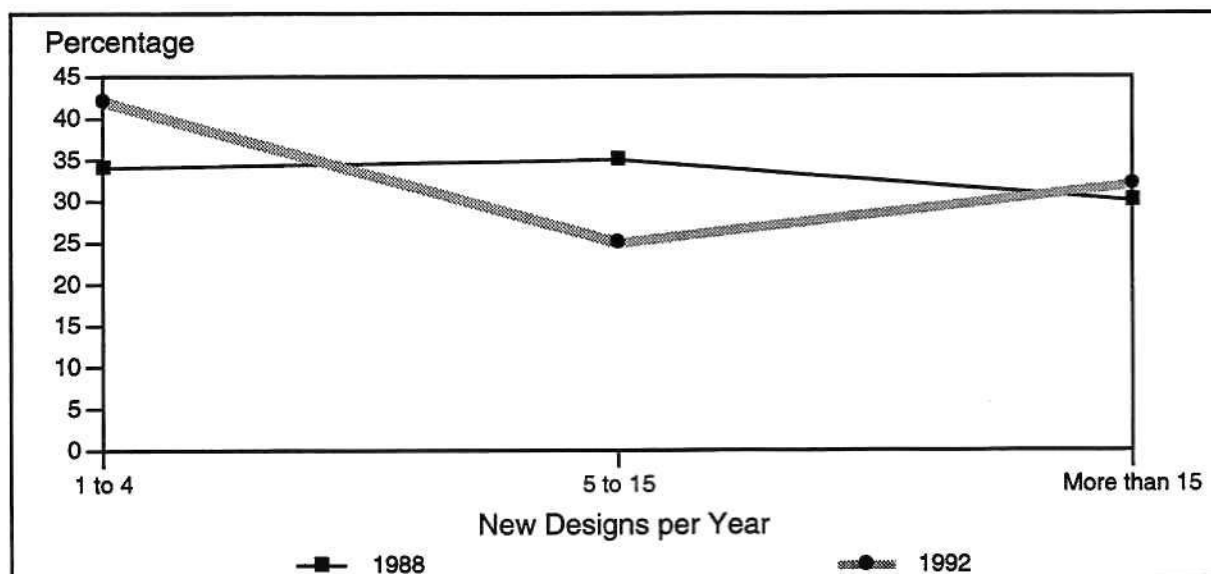
Are the designs of today more complex?

Will this design activity require more analysis?

	New Designs Mean	Revisions Mean	Designs Are More Complex (%)	Needs More Analysis (%)
Total Respondents	42.3	87.1	77.8	74.0
By Job Title				
Department Manager	34.1	97.3	73.2	80.5
Systems Manager	4.9	152.8	83.3	80.6
Project Engineer	5.6	19.9	69.7	63.6
Design Engineer	30.3	37.9	76.7	86.6
By Industry				
Aerospace	17.0	38.7	80.4	73.9
Automotive	114.1	86.9	77.8	75.9
Industrial Machinery	4.5	64.6	78.1	75.1
By Department				
Design/Computing Service	14.5	36.2	75.9	79.3
R&D, New Product Development	13.8	86.1	83.8	70.2
Product Engineering	18.5	71.8	73.4	75.0
Manufacturing Engineering	140.7	100.9	83.3	69.1

Source: Dataquest (October 1992)

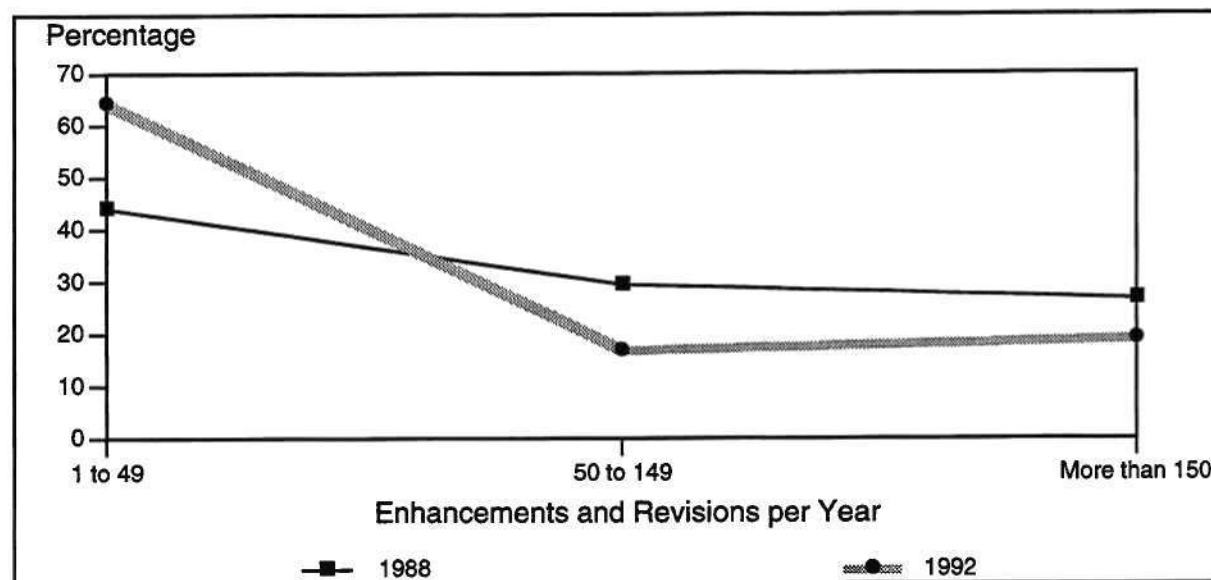
Figure 4-1
New Product Designs



Source: Dataquest (October 1992)

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Figure 4-2
Product Enhancements and Revisions



Source: Dataquest (October 1992)

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in each group. Now the lowest level—1 to 49 changes—has grown to more than 60 percent of the total. This suggests that better designs are being produced the first time, requiring fewer revisions as the design progresses into the manufacturing and delivery process. This trend is also supported by the shortening of product life cycles. In some cases, especially in consumer products, the product could be out of production before half the product is purchased.

Need for More Analysis

Another consistent message from the 1992 survey was the increasing complexity in design tasks and the requirement to perform more analysis. More than 70 percent of the respondents believed that the designs of today are more complex than the designs of two years ago. This was consistent across job, department, and industry. In fact, 26 percent believed that the designs were much more complex.

Common reasons for this increase in design complexity were as follows:

- Customer demands
- Designs are smaller, lighter, and take more heat
- Market is tougher
- New materials complicate the design process
- Standards such as increased safety have resulted in more complex designs
- Company is moving to more complex designs and software allows it
- Quality tolerances are tighter
- Government regulations
- Designs have been simplified but tolerances have made designs more complex
- Materials have become more advanced, as has the design process
- Ability of CAD/CAM/CAE to program NC machines

The survey asked if this design activity requires more or less analysis than two years ago to ensure high-quality designs. The statistics were about the same: more than 70 percent of all respondents said more analysis was being done. The reasons were similar to the list cited. The quality issue was emphasized in the responses, with more than one-third agreeing that quality was a primary concern in the design and analysis process. Many noted that more analysis was being done because CAD/CAM/CAE tools enable it.

Common reasons for the need for more analysis were as follows:

- Need for better quality
- Customer is more demanding

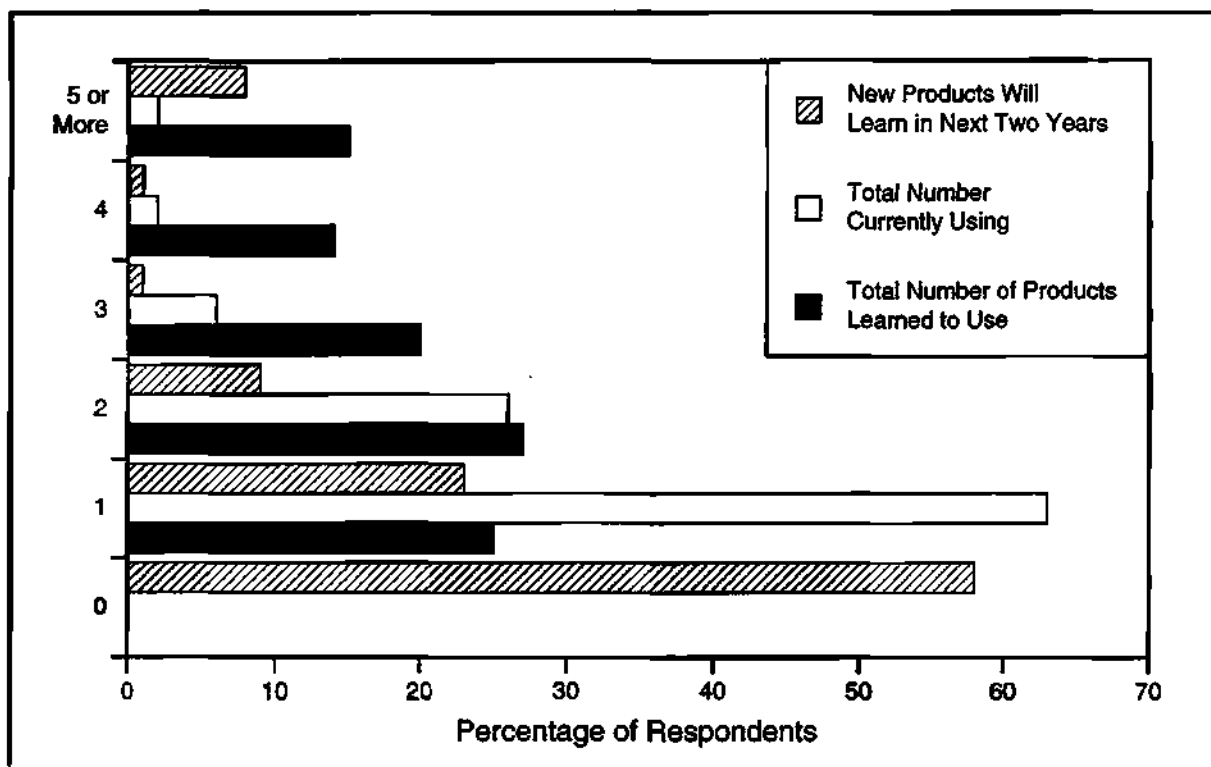
- Safety
- Design complexity requires more analysis
- CAD system has allowed better-quality analysis
- Integration between electrical and mechanical
- Getting into more futuristic designs

CAD/CAM/CAE Product Usage Profile

A key element to understanding the dynamics of the mechanical CAD/CAM/CAE market is the transition of users as they learn new tools and discard the old. This survey asked a series of questions to determine the rate of change through history and to forecast the change in the next two years. Figure 4-3 shows the number of products learned, the number in current use, and the number expected to be learned in the next two years.

About 20 percent said that they had learned to use one to three different products. A surprising 29 percent said they had learned four or more products. Having learned to use a product certainly did not

Figure 4-3
CAD/CAM/CAE Product Usage Profile



Source: Dataquest (October 1992)

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ensure that it would be used forever. More than 63 percent said they were using only one product now; 26 percent said they were using two, thus leaving only 11 percent for the hearty lot using three or more products. Many of these people are involved in system support or training activities, as will be seen later.

An important distinction here determines the number of products expected to be learned in the next two years. As shown in Table 4-2, a 37 percent increase is expected over the number currently in use. The 208 survey respondents together learned 895 major packages. Of those, 36 percent were still being used, representing 323 respondents. Another 191 packages are expected to be learned in the next two years.

Table 4-3 shows the mean score values for the same questions. Department managers are the least likely to learn a new system. Industrial machinery will also be less active than other industries. The most interested in learning to use a new system are systems managers, project engineers, and respondents in the aerospace industry.

To help understand why these changes are taking place, we asked vendor satisfaction questions later in the survey. First we focused on systems used and time spent.

Computers Used at Work and at Home

Table 4-4 shows the environment by job title, industry, and department. About half of the respondent used one or two computers at work on a regular basis, and one at home. Systems managers not surprisingly used the most systems at work, but this was not by a large margin. Department managers and respondents in the aerospace industry were the most likely to use two or more systems at work.

Table 4-2
Total Product Usage Profile

Current Profile	Number of Packages	Percentage of Total
Number of Packages Learned	573	64
Number of Packages in Use Now	323	36
Total	895	-
Profile in 2 Years		
Number of Packages in Use Now	323	63
Number of Packages that Will Be Learned in Next Two Years	191	37
New Total	514	-

Source: Dataquest (October 1992)

Table 4-3
Total Product Usage Profile, Mean Values
(N=30 or More in Each Group)

How many different major mechanical CAD/CAM/CAE software products have you learned to use?

Of these, how many are you still using on a regular basis?

How many new major products do you think you will learn to use in the next two years?

	Have Learned	Still Using	How Many New?
Total Respondents	2.9	1.5	0.6
By Job Title			
Department Manager	2.6	1.4	0.4
Systems Manager	3.1	1.8	0.7
Project Engineer	3.2	1.6	0.7
Design Engineer	3.0	1.6	0.6
By Industry			
Aerospace	3.0	1.4	0.8
Automotive	2.7	1.7	0.6
Industrial Machinery	2.5	1.2	0.3
By Department			
Design/Computing Service	3.5	1.9	0.6
R&D, New Product Development	3.0	1.6	0.5
Product Engineering	2.4	1.3	0.6
Manufacturing Engineering	2.5	1.4	0.6

Source: Dataquest (October 1992)

The best way to find someone at home working on a computer is to find someone from manufacturing engineering—almost 80 percent of these people are using a computer at home. This group was also one of the highest in multiple systems in use at work.

Table 4-4
Computer Systems Used at Work and Home (Percentage of Respondents Using One or More Computers)

How many different computer systems do you use on a regular basis at work and at home?

	Used at Work					Used at home		
	1	2	3	4	5 or More	0	1	2 or More
Total Respondents	22.7	33.7	26.0	8.2	9.4	38.5	57.7	3.8
By Job Title								
Department Manager	12.2	46.3	24.4	7.3	9.8	39.0	53.7	7.3
Systems Manager	13.9	27.8	38.9	5.6	13.8	22.2	75	2.8
Project Engineer	33.3	33.3	30.3	3.0	0.1	39.4	60.6	0
Design Engineer	23.3	36.7	26.7	10.0	3.3	46.7	50	3.3
By Industry								
Aerospace	10.9	43.5	28.3	8.7	8.6	41.3	52.2	6.5
Automotive	37.0	24.1	18.5	7.4	13.0	51.9	46.3	1.8
Industrial Machinery	21.9	34.4	34.4	3.1	6.2	40.6	53.1	6.3
By Department								
Design/Computing Service	20.7	27.6	25.9	12.1	13.7	37.9	58.6	3.5
R&D, New Product Development	21.6	27.0	32.4	8.1	10.9	27.0	67.6	5.4
Product Engineering	30.9	38.2	19.1	5.9	5.9	52.9	41.2	5.9
Manufacturing Engineering	11.9	40.5	31.0	7.1	9.5	21.4	78.6	0

N=30 or More in Each Group
 Source: Dataquest (October 1992)

Activity Allocation to CAD/CAM/CAE

We asked how many hours per week were spent using CAD/CAM/CAE tools and the amount of time spent on other tasks. The implication was that this represented the full work period. The average work week was 44 hours. Systems managers exceeded that, with an average score of 47 hours. CAD/CAM/CAE tools may make the manufacturing and design process more efficient, but the systems require significant attention to keep them working properly. Industrial machinery and R&D had the highest ratings in each group. The CAD/CAM/CAE users on average work on the systems 24 hours per week.

Table 4-5 and Figure 4-4 show the mean score values and percentage of respondents that worked 10, 20, or 30 or more hours per week on a CAD/CAM/CAE system. It is worth noting that almost 30 percent of all respondents said they work more than 30 hours per week on a system. This group also stated that they believed an average of 65 percent of all users at their site worked more than 30 hours per week.

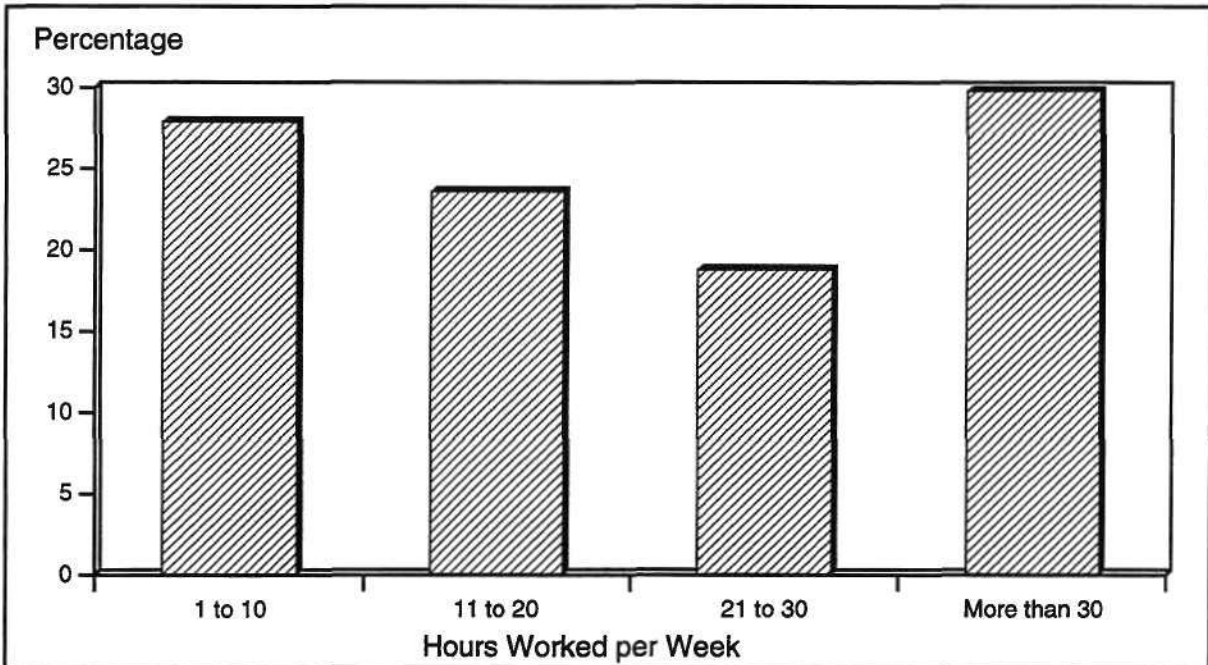
Table 4-5
Work Week Analysis (N=30 or More in Each Group)

**How many hours a week do you spend using
CAD/CAM/CAE tools and how many on other tasks?**

	Hours per Week Using CAD/CAM/CAE (Mean)	Hours per Week on Other Tasks (Mean)	Total
Total Respondents	24.1	19.9	44.0
By Job Title			
Department Manager	20.1	25.0	45.1
Systems Manager	22.7	24.3	47.0
Project Engineer	18.7	23.4	42.1
Design Engineer	25.1	16.9	42.0
By Industry			
Aerospace	23.6	18.4	42.0
Automotive	25.5	19.2	44.7
Industrial Machinery	23.6	22.6	46.2
By Department			
Design/Computing Service	19.3	24.6	43.9
R&D, New Product Development	27.1	17.9	45.0
Product Engineering	22.8	21.2	44.0
Manufacturing Engineering	29.0	15.3	44.3

Source: Dataquest (October 1992)

Figure 4-4
CAD/CAM/CAE Activity Allocation



Source: Dataquest (October 1992)

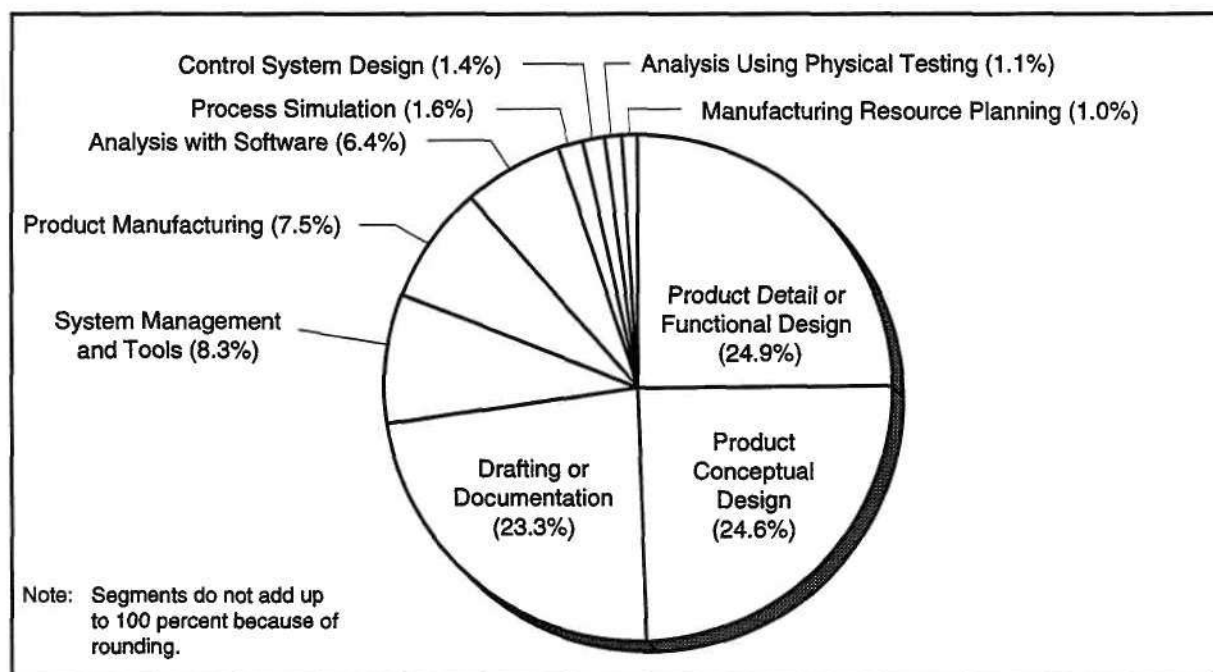
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Mechanical CAD/CAM/CAE Subapplication Task Analysis

The major subapplications of mechanical CAD/CAM/CAE are product detail or functional design, conceptual design, and drafting. These three subapplications make up more than 72 percent of the total work hours. The remaining subapplications cover everything from system management to resource planning. Figure 4-5 shows the full list with distribution of total hours worked in each subapplication by the total population in the survey and provides an accurate evaluation of the actual work activity on today's mechanical CAD/CAM/CAE systems.

Figure 4-6 shows the mean results of the question, "What percentage of these hours are spent using CAD/CAM/CAE tools?" The percentage penetration for this group is high. These experienced users use CAD/CAM/CAE for almost all of the activity where it is appropriate. For the major subapplications, the percentage of work done using CAD/CAM/CAE is more than 86 percent. Many responses indicated 100 percent use in more than one subapplication. The lowest response in CAD/CAM/CAE percentage use was for analysis using physical testing. Strictly speaking, this category is not a CAD/CAM/CAE application by definition, but this response indicates that 44 percent of the time physical test data is brought back to a CAD/CAM/CAE system for correlation or further analysis. Material resource planning

Figure 4-5
Distribution of End-User Hours, by Application



Source: Dataquest (October 1992)

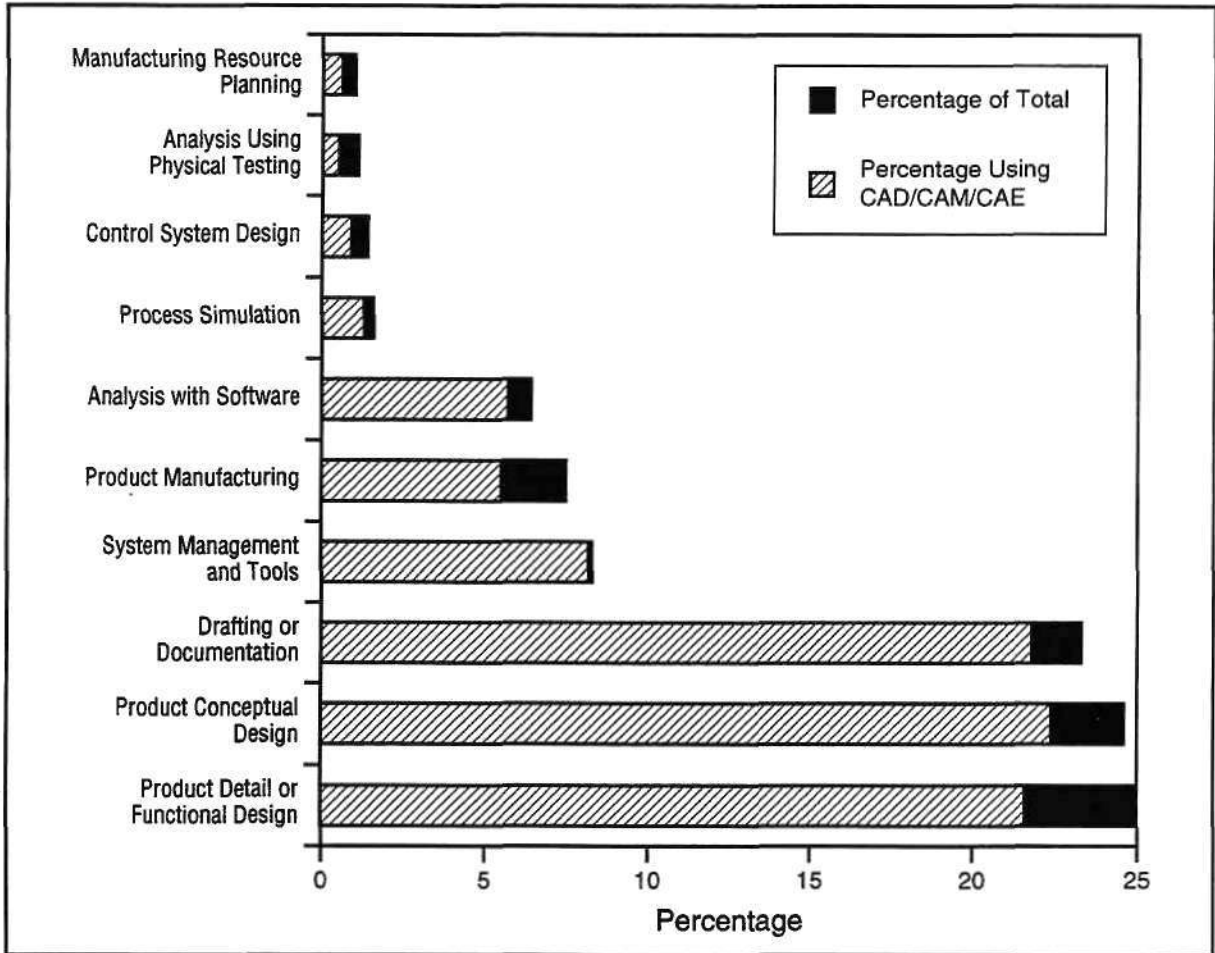
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(MRP), a long-standing manufacturing application, has more than 50 percent penetration with CAD/CAM/CAE tools. Popular solutions for MRP software are not typically sold by CAD/CAM/CAE vendors. The 50 percent penetration value indicates a significant sharing of data on the shop floor.

Table 4-6 shows CAD/CAM/CAE activity allocation and contains the data found in Figures 4-5 and 4-6. This table has a wealth of information concerning the distribution of work activity in the mechanical CAD/CAM/CAE application area. It looks a bit daunting, but a brief description will explain the process.

The column on the far left lists all mechanical CAD/CAM/CAE subapplications and the individual work tasks that make up each. The next column indicates the number of respondents in the survey that said they spend any time doing this task. The Percentage of Respondents column at the subapplication level shows the percentage of total respondents that do that kind of work. The percentage at the task level indicates the percentage of people in that subapplication that do that task. In other words, 42.5 percent of the people doing product conceptual design are doing industrial design.

Figure 4-6
Penetration of Mechanical CAD/CAM/CAE Applications



Source: Dataquest (October 1992)

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Average hours of work for each task and subapplication are shown next. For example, the 29 people who do any mass properties calculation spend an average 1.4 hours per week doing this task. We asked for the percentage of this work being done using CAD/CAM/CAE tools at the subapplication level, and then calculated the total hours in each subapplication. The respondents do a total of 5,515 hours of work using CAD/CAM/CAE tools every week. The final column shows the percentage of total hours for each subapplication.

Table 4-6
CAD/CAM/CAE Activity Allocation

Do you perform any of the following tasks?

Subapplication Task	Number of Respondents	Percentage of Respondents	Hours per Week	Percentage Using CAD/CAM/CAE	Percentage of Hours on CAD	CAD Hours per Person	Total CAD Hours in Survey
Product Conceptual Design	106	51.0	14.7	86.9		12.8	1,354.1
Industrial Design	45	42.5	5.9		39.8		
Styling	24	22.6	2.0		13.8		
Other	45	42.5	6.8		46.4		
Product Detail or Functional Design	107	51.4	14.1	91.0		12.8	1,372.9
Component Design	66	61.7	6.6		46.8		
Assembly Verification	64	59.8	4.6		32.6		
Linkage Design	28	26.2	1.2		8.6		
Other	13	12.1	1.7		11.9		
Control System Design	21	10.1	5.5	66.8		3.7	77.2
Electromechanical Design	6	28.6	3.0		55.1		
Mechatronics	1	4.8	0.6		11.1		
Other	4	19.0	2.1		37.8		
Analysis with Software	61	29.3	6.5	89.0		5.8	352.9
Mass Properties	29	47.5	1.4		21.5		
Structural	43	70.5	2.9		43.9		
Thermal	19	31.1	0.8		11.9		
Other	14	23.0	1.5		22.7		
Analysis Using Physical Testing	23	11.1	5.9	44.4		2.6	60.3
Vibration	4	17.4	1.5		25.8		
Thermal	4	17.4	1.1		18.8		
Stress	7	30.4	2.7		45.4		
Other	1	4.3	0.6		10.0		

(Continued)

Table 4-6
CAD/CAM/CAE Activity Allocation (Continued)

Do you perform any of the following tasks?

Subapplication Task	Number of Respondents	Percentage of Respondents	Hours per Week	Percentage Using CAD/CAM/CAE	Percentage of Hours on CAD	CAD Hours per Person	Total CAD Hours in Survey
Drafting or Documentation	108	51.9	12.7	93.6		11.9	1,283.8
Detail Drafting	72	66.7	6.7		52.6		
Schematics	36	33.3	1.7		13.1		
Technical Illustration	47	43.5	2.6		20.8		
Other	17	15.7	1.7		13.6		
Product Manufacturing	45	21.6	12.5	73.8		9.2	415.1
Tool Design	20	44.4	5.2		41.9		
Fixture Design	14	31.1	3.1		24.7		
Other	13	28.9	4.2		33.4		
Process Simulation	19	9.1	5.7	79.4		4.5	86.0
NC Tool Path Generation	10	52.6	3.1		55.0		
Process Planning	7	36.8	1.7		30.7		
Other	2	10.5	0.8		14.3		
Manufacturing Resource Planning	19	9.1	5.3	57.4		3.0	57.8
Materials	3	15.8	1.5		27.8		
Equipment	5	26.3	2.2		41.7		
Scheduling	2	10.5	0.7		13.9		
Other	2	10.5	0.9		16.7		
System Management and Tools	29	13.9	15.8	99.3		15.7	455.0
Product Data Management					100.0		
System Tools							5,515.0
Total							5,060.0

Source: Dataquest (October 1992)

Sales Targets for Subapplications

For those selling point solutions for any of these products, the following list should be of interest. It shows the rank order of job classification that does an above average of this kind of work.

- Product conceptual design
 - Chief engineer, design engineer, designer
- Product detail or functional design
 - Design engineer, designer, project or group engineer, specialist/technician
- Control system design
 - Designer, specialist/technician, department manager
- Analysis using software
 - Group engineer, project engineer, designer, systems manager
- Analysis using physical testing
 - Project engineer, design engineer, department manager
- Drafting or documentation
 - Technical support, draftsmen, designer, specialists/technician, department manager
- Product manufacturing
 - Department manager, specialist/technician
- Process simulation
 - Design engineer, project engineer, chief engineer, group engineer
- Manufacturing resource planning
 - Department manager, design engineer, project engineer
- System management and tools
 - Systems manager, department manager, technical support, specialist/technician

Activity Allocation to System Support Activities

Of the 208 respondents to the survey, 61 percent said they provide some system support activities. Training was the most common task, with 82 percent doing some for an average of 4.6 hours per week (see Table 4-7 and Figure 4-7 for details). Systems managers, department managers, and project/design engineers provide more than 70 percent of all system support activities. Half of these people were doing some product data management for 6.3 hours per week, a considerable work

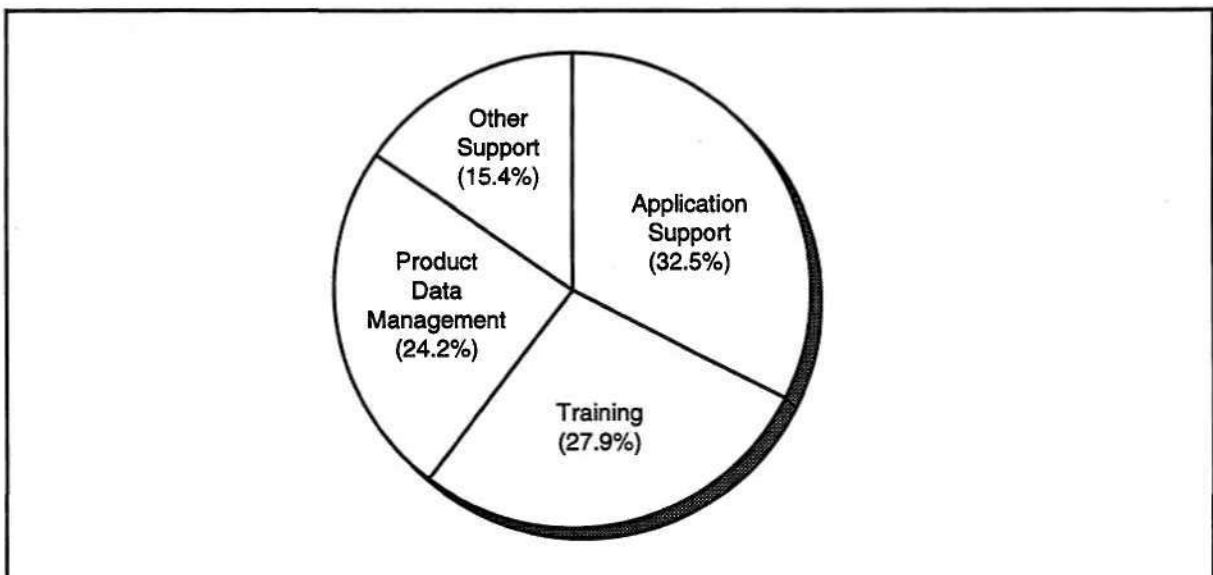
Table 4-7
Allocation of System Support Activities

Do you perform any system support activities?

	N	Percentage Doing Work	Hours per Week
61.1 Percent Said Yes	127		
Training	104	81.9	4.6
Product Data Management	66	52.0	6.3
Application Software Development	62	48.8	9.0
Other Support Activity	39	30.7	6.8

Source: Dataquest (October 1992)

Figure 4-7
Allocation of System Support Activity



Source: Dataquest (October 1992)

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load. Half of this group is more than 30 percent of the total group of users, which means that more than 30 percent of all mechanical CAD/CAM/CAE users are spending more than 6 hours per week doing product data management. It is very important not to lose design information, but it should not take that much overhead to manage the process. This certainly is an area that could benefit from a more Mac-like approach. About the same size group said it was doing

application software development with an average of 9 hours per week activity. In all, for every 100 hours spent using mechanical CAD/CAM/CAE applications, another 34 hours are used in system support for training, product data management, application software development, and other support activities.

Other Computer-Related Tasks

Word processors and spreadsheets have invaded the world of the engineer. Well over half of all respondents said they were using these applications more than 5 hours per week (see Table 4-8). Other categories have higher percentages. More than 75 percent of the department managers spent 11 hours per week at these tasks. No major difference was noted among the different groups. Managers used more and engineers used less than average. Word processing was lower in the automotive industry. Spreadsheet use was lower in manufacturing engineering.

Competitive Assessment of CAD/CAM/CAE Use by Competition, by Region

Every survey has a question or two that resists fulfilling the enlightenment task. This following question is a good example: Do you believe your competition is more effective in using mechanical CAD/CAM/CAE tools than your company? This question needs to be asked in our upcoming European and Asian surveys to gain the required insight into this competitive issue. In any case, respondents answered in the negative by a margin of about 4:1 for U.S.- and Europe-based competition. A 3:1 vote was cast for the Japan-based competition (see Table 4-9). Clearly, many U.S.-based users of mechanical CAD/CAM/CAE technology believe that they are very effective in implementation.

A surprisingly large number of respondents said that they did not have any competition from Europe or Asia. Closer analysis finds niche manufacturing operations that are so specialized or have a dominant market position that they have no ready competition. About one-third of each industry group believed that it did not have any significant competition from overseas vendors.

Platforms Being Used and Networked

As expected, the sample mirrors the known demographics in type of platform installed but was biased toward technical workstation and away from PC-based products. However, the sample was large enough in each group to be representative of mechanical CAD/CAM/CAE tools operating in each environment. Most users selected multiple suppliers of hardware platforms. The names mentioned most often were, in order: IBM clone, Digital Equipment Corporation, IBM, Sun Microsystems, Hewlett-Packard, Apple, and Compaq.

Most of the CAD/CAM/CAE seats in the survey are networked (see Table 4-10). Host-based seats are by definition networked to the host. Over 90 percent of the technical workstations and over 60 percent of the PCs are networked.

Table 4-8
Other Computer-Related Applications (N=30 or More in Each Group)

What other computer-related applications are you performing?

	Percentage Doing Task		Hours Doing Task (Mean)		
	Spreadsheets	Word Processing	None	Spreadsheets	Word Processing
Total Respondents	55.8	66.3	26.4	3.6	4.4
By Job Title					
Department Manager	75.6	78.0	9.8	4.3	6.7
Systems Manager	69.4	80.6	16.7	2.6	4.0
Project Engineer	45.5	60.6	30.3	4.8	4.4
Design Engineer	43.3	60.0	36.7	3.3	2.6
By Industry					
Aerospace	47.8	65.2	26.1	2.6	4.6
Automotive	46.3	48.1	40.7	3.8	3.7
Industrial Machinery	59.4	78.1	18.8	3.5	4.8
By Department					
Design/Computing Service	63.8	75.9	22.4	3.4	5.2
R&D, New Product Development	51.4	62.2	27.0	2.5	4.4
Product Engineering	58.8	67.6	27.9	5.5	5.6
Manufacturing Engineering	47.6	57.1	26.2	2.8	2.3

Source: Dataquest (October 1992)

Table 4-9
Competitive Effectiveness in Mechanical CAD/CAM/CAE
Use (Percentage)

Do you believe that your competition in the United States, Europe, or Japan is more effective in using mechanical CAD/CAM/CAE tools than your company?

	Yes	No	No Competition in This Region
U.S.-Based Competition	15.4	60.1	-
Europe-Based Competition	4.8	19.7	31.3
Japan-Based Competition	4.8	16.3	38.0

Source: Dataquest (October 1992)

Table 4-10
U.S.-Based Seat Demographics

	CAD/CAM/CAE Industry Service Database	This Survey	Percentage Networked
Personal Computers	63	36	62
Technical Workstations	21	51	92
Host-Based Terminals	16	13	-

Source: Dataquest (October 1992)

Software Products Being Used: Autodesk and EDS Comparison

More than 40 different software products were mentioned in the survey as being used regularly. This, unfortunately, diluted the ability to comment on several interesting issues raised in the survey. Specifically, these issues considered frequency of use, level of user satisfaction, recommendations for improvement, and effectiveness in data conversion.

These issues will be addressed. However, vendors will not be compared, with the following exception. Both Autodesk and EDS-Unigraphics had more than 50 respondents in the survey, which allows some discussion that sheds light on the current environment. Autodesk well represents the PC-based CAD/CAM/CAE experience. EDS-Unigraphics represents well a seasoned vendor with a large installed base with a mature and diverse set of product offerings.

Questions not appearing in the following list were either similar in response or not piquant.

- Industry use
 - Autodesk: More in automotive and industrial machinery
 - EDS: More in aerospace
- Job title
 - Autodesk: More project and design engineers
 - EDS: More department managers and systems managers
- Department
 - Autodesk: More in product engineering
 - EDS: More R&D, new product development
 - Even in design/computing service group and manufacturing engineering
- Years of experience
 - Autodesk: 7 years
 - EDS: 9 years
- Products learned to use
 - Autodesk: 2.1
 - EDS: 2.8
- Products currently in use
 - Autodesk: 1.2
 - EDS: 1.4
- New products to be learned in next two years
 - Autodesk: 0.5
 - EDS: 0.4
- Hours of CAD/CAM/CAE work per week
 - Autodesk: 25.2
 - EDS: 23.5
- New product design per year
 - Autodesk: 2.6
 - EDS: 10.3

- Product enhancement and revisions per year
 - Autodesk: 78
 - EDS: 67
- Mechanical CAD/CAM/CAE subapplication Tasks (see Table 4-11)
- Would recommend use to a friend
 - Autodesk: 81 percent yes
 - EDS: 98 percent yes
 - Honorable mention: Adra Systems had 16 users comment; 94 percent yes
- Total number of CAD/CAM/CAE users in 1990, average for site
 - Autodesk: 11
 - EDS: 107
- Current number of CAD/CAM/CAE users
 - Autodesk: 12
 - EDS: 125
- Anticipated number of CAD/CAM/CAE users in 1994
 - Autodesk: 14.3
 - EDS: 137

Table 4-11
Mechanical CAD/CAM/CAE Subapplication Tasks

	More Autodesk Users Doing:	More EDS Users Doing:
Product Conceptual Design	X	
Product Detail or Functional Design	X	
Control Systems Design	X	
Analysis Using Software		X
Analysis Using Physical Testing	X	
Drafting or Documentation	X	
Product Manufacturing		X
Process Simulation		X
MRP		X
Systems Management and Tools		X

Source: Dataquest (October 1992)

- Percentage of users that are full time (more than 6 hours per day)
 - Autodesk: 63 percent
 - EDS: 72 percent
- Total number of seats at site
 - Autodesk: 12
 - EDS: 87

In summary, the average values for the Autodesk and EDS-Unigraphics users are amazingly similar, although the following few significant differences did occur:

- The Autodesk users typically worked at smaller sites
- The Unigraphics users do a lot more new design work
- The Unigraphics users do more manufacturing-related work

User Productivity Suggestions for Vendor Implementation

Many suggestions were given for vendor improvements to impact user productivity. As stated earlier, no vendor-specific suggestions will be identified because of sample distribution. Common or creative suggestions, in random order, are as follows:

- Need better manuals
- Remove bugs
- Good product but lots of bugs; they took care of previous problems but there are always new ones when a new release comes out
- Pay more attention to current customers than new customers
- Supply a complete package; don't nickel and dime me
- Improve 3-D
- Open ear to what users have to say
- Vendor should take more interest in product
- Need more integrated design tools
- Need more complete system, less reliance on third-party software
- Could be more friendly
- 24-hour hotline
- Too expensive; would like everything in one package
- Make FEA modeling more automatic
- Improve response time

Data Conversion Problems

On average, 25 percent of the sites said that data conversion was a serious problem. The aerospace respondents were higher, at 30 percent. The industrial machinery group had a low 13-percent vote. No vendor was strongly identified as the culprit. A few that did get several votes were mentioned by other respondents as one of the vendors doing a good job in this area. IGES was mentioned several times as a problem area. It is expected that any site shipping data from one system to another is probably using the same name brand to improve the necessary communication. Other sites forced into cross-vendor communication see a significant problem, which is causing a productivity bottleneck in at least 25 percent of the sites. We expect this issue to increase in importance over the long term.

Chapter 5

Findings and Recommendations ---

We offer our findings and recommendations in the following sections.

For the Vendors

Findings and recommendations for vendors are as follows:

- Find a way to get the large number of technical professionals working at the larger sites excited about using mechanical CAD/CAM/CAE. This by far represents the largest untapped market for new system sales. All of these big sites already have more than one different system installed, which highlights the importance of the incumbent vendors to work together to ensure that this site is effective in its use of this technology. Anything less will open the door for competitive systems to be installed, or worse, the customer may become noncompetitive.
- Do not overlook growth industries with a high probability of the need to use CAD/CAM/CAE technology. This survey identified the industrial machinery group as an above-average growth opportunity. Other industries have strong potential as well, such as fabricated metal parts, electrical and electronic machinery, and computers and peripherals. In fact, almost every industry is doing well except the aerospace industry, considering the forecast for growth in the population of mechanical CAD/CAM/CAE users.
- Read and heed the list of suggestions made earlier in this report. The users know what they need for the short term. Invest some time and effort into "what-if" scenarios to help define the products to be made 5 and 10 years from now.

For the Users

Findings and recommendations for users are as follows:

- Develop a technology enrichment plan that systematically removes old systems from use and replaces them with the best of the best. The price competition common in this industry borders on insanity. The resulting marginal profit levels may not allow the vendors to make investment for R&D, high-quality product releases, and high-quality services. But take advantage of the situation. Buy the latest technology at bargain prices, realizing that almost any vendor in this business can fall on its sword.

- Be aggressive in using this technology. Get your experts with their hands in their pockets involved. In this case, the automation of a group effort is exponentially better than the incremental improvement of the individuals. Get all the oars in the water.
- Understand the full cost of ownership. Some vendors are clever in getting in the door with low installation fees and then charging high monthly service fees. Check a full three-year cost of ownership and support cost model. Size the tool for the job.

For the Investors

Findings and recommendations for investors are as follows:

- Find the people who understand this business and have demonstrated an ability to move with it.
- The market needs to invest more than \$10,000 for every engineer, designer, and technician on an annual basis for the foreseeable future. Expenditure is below this level and is growing, which will fuel long-term growth in the user base.
- The design, analysis, and manufacturing industry is becoming more complex, more diverse, and cross-pollinated with ideas from other technical applications. Developments in multimedia and virtual reality will have an impact on mechanical CAD/CAM/CAE. Understand what the next-generation products will look like, because they will obsolete any product over five years old.
- Education and training are perhaps the biggest stumbling blocks to the full potential of mechanical CAD/CAM/CAE. The users need to break through the mental mush of focusing on how they get specific commands to work or how to get the plotter to run. Think about what is possible from a personal value-added scenario. Users need tools that help them do tomorrow's job better. This may sound like the better mouse trap story, but a company such as Parametric Technology, with an 80 percent annual growth rate, makes the point. Find the next Parametric.

Appendix A

Survey Questionnaire

General Information

Hello, this is _____ from Dataquest Incorporated. We're conducting a study on the use of Mechanical CAD/CAM/CAE software and your input would be most important to us.

Would you be the person who is familiar with the design or manufacturing engineering tasks being performed with the Mechanical CAD/CAM/CAE software that has been selected to be used at your location?

If not, is there someone else at your location I might speak to who is familiar with the tools that are being used?

Do you have a few minutes to answer some questions? (if needed: *this is not a sales call and your answers will be kept completely confidential.*)

- Q.1 Which industry best describes your company's business? (ENTER ALL THAT APPLY)
- Aerospace ☐
- Automotive ☐
- Computers and Peripherals ☐
- Service\Design\Consulting ☐
- Electrical and Electronic Machinery ☐
- Fabricated Metal Parts ☐
- Industrial Machinery ☐
- Manufacturing Other (specify): _____
- Q.2 Which job title best describes your position? (ONE RESPONSE)
- Chief Engineer ☐
- Department Manager ☐
- System Manager ☐
- Group Engineer ☐
- Project Engineer ☐
- Design Engineer ☐
- Specialist/Analyst ☐
- Designer ☐
- Technician ☐
- Draftsmen ☐
- Detailer ☐
- Other (specify): _____
- Q.3 Of the following, which department most closely describes the one in which you work? (ONE RESPONSE)
- Design/Computing Service Group ☐
- R&D, New Product Development ☐
- Product Engineering ☐
- Manufacturing Engineering ☐
- Quality Control ☐
- Plant Operations ☐
- Other (specify): _____
- Q.4 How long, in years, have you been using Mechanical CAD/CAM/CAE software? _____
- Q.5 How many different major Mechanical CAD/CAM/CAE software products have you learned to use? Of these, how many are you currently using on a regular basis? How many new major products do you think you will learn in the next two years?
- Total learned to use _____
- Total currently use _____
- Total NEW in two years _____

- Q.6 How many different computer systems do you use on a regular basis?
At work _____
At home _____
- Q.7 How many hours per week do you typically spend using any CAD/CAM/CAE tool and how many hours per week do you typically spend doing other work related tasks such as meetings, writing reports, doing lab tests, and administration?
CAD/CAM/CAE (hrs. per week) _____
Other tasks (hrs. per week) _____
Total hours _____
- Q.8 How many new product designs do you work on each year? _____
- Q.9 How many product enhancements and revisions do you work on each year? _____
- Q.10 Do you believe that the designs of today are more or less complex than the designs two years ago? (ONE RESPONSE)
Much more complex ☐
Somewhat more complex ☐
About the same ☐
A bit less complex ☐
A lot less complex ☐
Don't know/refusal ☐
- Q.10a What's the cause/reason for that? _____
- Q.11 Does your design activity now require more or less analysis than two years ago to insure high-quality designs? (ONE RESPONSE)
A lot more analysis ☐
Somewhat more analysis ☐
About the same ☐
A bit less analysis ☐
A lot less analysis ☐
Don't know/refusal ☐
- Q.11a What's the reason for that? _____
- Q.12 Do you believe that your U.S.-based competition is more effective in using Mechanical CAD/CAM/CAE tools than your company? (using software to improve quality/reliability, etc.)
Yes (why?) _____
No (why?) _____
Don't know/refusal ☐

- Q.13 Do you believe that your European-based competition is more effective in using Mechanical CAD/CAM/CAE tools than your company?

Yes (why?) _____

No (why?) _____

Don't know/refusal _____

No European-based competition ☐

- Q.14 Do you believe that your Japan-based competition is more effective in using Mechanical CAD/CAM/CAE tools than your company?

Yes (why?) _____

No (why?) _____

Don't know/refusal _____

No Japan-based competition..... ☐

- Q.15 Do you perform any of the following tasks? (ENTER ALL THAT APPLY)

Product conceptual design

Overall, how many hours per week are spent on product conceptual design? _____

What percent of those hours are spent using CAD/CAM/CAE tools? _____

What percent of those CAD/CAM hours using CAD/CAM/CAE tools for product conceptual design are spent doing (FILL IN % - MUST EQUAL 100%):

Industrial design _____

Styling _____

Other (specify): _____

Don't know/refusal _____

Product detail or functional design

Overall, how many hours per week are spent on product detail/functional design? _____

What percent of those hours are spent using CAD/CAM/CAE tools? _____

What percent of those CAD/CAM hours using CAD/CAM/CAE tools for product detail or functional design are spent doing (FILL IN % - MUST EQUAL 100%):

Component design _____

Assembly verification _____

Linkage design _____

Other (specify): _____

Don't know/refusal _____

Control System Design

Overall, how many hours per week are spent on Control System design? _____

What percent of those hours are spent using CAD/CAM/CAE tools? _____

What percent of those CAD/CAM hours using CAD/CAM/CAE tools for control system design are spent doing (FILL IN % - MUST EQUAL 100%):

Electromechanical design _____

Mechatronics _____

Other (specify): _____

Don't know/refusal _____

Analysis (using software)

Overall, how many hours per week are spent on Analysis (using software)? _____

What percent of those hours are spent using CAD/CAM/CAE tools? _____

What percent of those CAD/CAM hours using CAD/CAM/CAE tools for analysis (using software) are spent doing (FILL IN % - MUST EQUAL 100%):

Mass properties _____

Structural _____

Thermal _____

Other (specify): _____

Don't know/refusal _____

Analysis (using physical testing)

Overall, how many hours per week are spent on Analysis (using physical testing)? _____

What percent of those hours are spent using CAD/CAM/CAE tools? _____

What percent of those CAD/CAM hours using CAD/CAM/CAE tools for analysis (using physical testing) are spent doing (FILL IN % - MUST EQUAL 100%):

Vibration _____

Thermal _____

Stress _____

Other (specify): _____

Don't know/refusal _____

Drafting or Documentation

Overall, how many hours per week are spent on Drafting or Documentation? _____

What percent of those hours are spent using CAD/CAM/CAE tools? _____

What percent of those CAD/CAM hours using CAD/CAM/CAE tools for drafting or documentation are spent doing (FILL IN % - MUST EQUAL 100%):

Detail drafting _____

Schematics _____

Technical illustration _____

Other (specify): _____

Don't know/refusal _____

Product Manufacturing

Overall, how many hours per week are spent on Product Manufacturing? _____

What percent of those hours are spent using CAD/CAM/CAE tools? _____

What percent of those CAD/CAM hours using CAD/CAM/CAE tools for product manufacturing are spent doing (FILL IN % - MUST EQUAL 100%):

Tool design _____

Fixture design _____

Other (specify): _____

Don't know/refusal _____

Process Simulation

Overall, how many hours per week are spent on Process Simulation?_____

What percent of those hours are spent using CAD/CAM/CAE tools?_____

What percent of those CAD/CAM hours using CAD/CAM/CAE tools for process simulation are spent doing (FILL IN % - MUST EQUAL 100%):

NC tool path generation_____

Process planning_____

Other (specify):_____

Don't know/refusal_____

Manufacturing Resource Planning

Overall, how many hours per week are spent on Manufacturing Resource Planning?_____

What percent of those hours are spent using CAD/CAM/CAE tools?_____

What percent of those CAD/CAM hours using CAD/CAM/CAE tools for manufacturing resource planning are spent doing (FILL IN % - MUST EQUAL 100%):

Materials_____

Equipment_____

Scheduling_____

Other (specify):_____

Don't know/refusal_____

Other—with CAD/CAM/CAE (specify):_____

Overall, how many hours per week are spent on Other (with CAD/CAM/CAE)?_____

What percent of those hours are spent using CAD/CAM/CAE tools?_____

Q.16 Do you perform any system support activities? (IF THE ANSWER IS "Yes" ASK THE FOLLOWING QUESTION)_____

Q.16a Of the following, which system support activities do you perform and for how many hours per week?

Training_____

Product Data Management_____

Application Software Development_____

Other support activity_____

Q.17 What other computer-related applications are you performing and how many hours per week do you perform them?

Spreadsheets_____

Wordprocessing_____

Other business applications—What kind?_____

Other technical applications—What kind?_____

None_____

- Q.18 Who are the manufacturers of the computers that you use regularly and what platform(s) do you use?
Surveyor use checkmark

Manufacturers Used	Platforms Used			
	PC	Technical Workstations	Server	Host
Apollo				
Apple				
Compaq				
Control Data				
Dell				
Digital				
Fujitsu				
Hewlett-Packard				
Hitachi				
IBM				
IBM Clone				
Intergraph				
Prime/Computervision				
NEC				
Nihon Unisys				
Silicon Graphics				
Sony				
Sun				
Tektronix				
Unisys				
Other (specify)				

Q.19 Which software products are you using or which software products would you recommend?

Manufacturers Used Regularly	Daily	Weekly	Monthly	Quarterly	Would Recommend		
Adra Systems	1	2	3	4	Yes	No	DK
Aries Technology	1	2	3	4	Yes	No	DK
Ashlar	1	2	3	4	Yes	No	DK
Autodesk	1	2	3	4	Yes	No	DK
Autotrol Technology	1	2	3	4	Yes	No	DK
CADKEY	1	2	3	4	Yes	No	DK
CADSI	1	2	3	4	Yes	No	DK
Cimline	1	2	3	4	Yes	No	DK
Computervision CADDs	1	2	3	4	Yes	No	DK
Computervision Calma	1	2	3	4	Yes	No	DK
Computervision Medusa	1	2	3	4	Yes	No	DK
Control Data	1	2	3	4	Yes	No	DK
EDS- Unigraphics	1	2	3	4	Yes	No	DK
Generic Software	1	2	3	4	Yes	No	DK
Gerber Systems	1	2	3	4	Yes	No	DK
Hewlett Packard ME Series	1	2	3	4	Yes	No	DK
IBM—Catia	1	2	3	4	Yes	No	DK
IBM—CADAM	1	2	3	4	Yes	No	DK
IBM—CAEDS	1	2	3	4	Yes	No	DK
ICAD	1	2	3	4	Yes	No	DK
Intergraph	1	2	3	4	Yes	No	DK
MacNeal-Schwendler	1	2	3	4	Yes	No	DK
Matra Datavision	1	2	3	4	Yes	No	DK
MCS	1	2	3	4	Yes	No	DK
Mechanical Dynamics	1	2	3	4	Yes	No	DK
Parametric Technology	1	2	3	4	Yes	No	DK
PDA Engineering	1	2	3	4	Yes	No	DK
RASNA	1	2	3	4	Yes	No	DK
Schlumberger	1	2	3	4	Yes	No	DK
SDRC	1	2	3	4	Yes	No	DK
SRAC	1	2	3	4	Yes	No	DK
Swanson Analysis	1	2	3	4	Yes	No	DK
Wisdom Systems	1	2	3	4	Yes	No	DK
Other:_____	1	2	3	4	Yes	No	DK
Other:_____	1	2	3	4	Yes	No	DK
Other:_____	1	2	3	4	Yes	No	DK
Other:_____	1	2	3	4	Yes	No	DK

DK = Don't know

- Q.20 Which one of these products do you use most often?_____
- Q.21 What are a few suggestions for this vendor that would significantly improve the product:
Your productivity?:_____
Your departments productivity?:_____
Any overall suggestions?:_____
- Q.22 Is data conversion between users of different software a serious problem in your company?
Which vendor is causing the most trouble?_____
In your opinion, who is the best?_____

SITE RELATED QUESTIONS:

- Q.23 What was the total number of employees at this business location in 1990, what is the current (1992) number, and what do you anticipate two years from now (1994)?
1990_____
- Current_____
- 1994_____
- Q.24 What was the total number of technical professionals at this business location in 1990, what is the current number, and what do you anticipate two years from now (1994)?
1990_____
- Current_____
- 1994_____
- Q.25 What was the total number of trained CAD/CAM/CAE users at this business location in 1990, what is the current number, and what do you anticipate two years from now (1994)?
1990_____
- Current_____
- 1994_____
- Q.25a What percent of your current CAD/CAM/CAE users are full-time users (6+ hrs./day)?

- Q.26a What are the total number of CAD/CAM/CAE seats at your site?_____
- Q.26b What percent of those seats are (FILL IN % - MUST EQUAL 100%):
Personal computers_____
- Workstations_____
- Terminals on a mainframe_____

Q.26c What percent of your personal computers are networked?_____

Q.26d What percent of your workstations are networked?_____

Q.27 Is the OVERALL budget for CAD/CAM/CAE software higher, lower, or about the same as last year? (FILL IN PERCENTS)

Higher_____

Lower_____

The same_____

Don't know/refusal..... ☐

Q.28 Is the OVERALL budget for CAD/CAM/CAE hardware higher, lower, or about the same as last year? (FILL IN PERCENTS)

Higher_____

Lower_____

The same_____

Don't know/refusal..... ☐

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Market Statistics

**CAD/CAM/CAE
Mechanical Applications**

CCAM-MEC-MS-9203

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October 26, 1992**

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Market Statistics

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**CAD/CAM/CAE
CCAM-MEC-MS-9203**

File behind the *Market Statistics* tab inside the
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Mechanical Applications Forecast Update

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Note: All tables show estimated data.

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Note: All tables show estimated data.

Mechanical Applications Forecast Update

Introduction

Proving no more immune to the current economic environment than the economy as a whole, the CAD/CAM/CAE/GIS market turned in a relatively sluggish performance during the first half of 1992—continuing the trend of 1991. Financial results comparing first-half 1992 results for a select group of publicly held CAD/CAM/CAE/GIS companies showed flat-to-negative growth results. As a result of this and other factors, the updated compound annual growth rate (CAGR) for CAD/CAM/CAE/GIS total factory revenue during the forecast period, 1991 to 1996, has been lowered to 7 percent from our previous forecast of more than 9 percent last spring. Table 1 shows the updated forecast for the CAD/CAM/CAE/GIS market by region.

This forecast update is based on the CAD/CAM/CAE/GIS group's recently updated market information. (The 1991 market totals will match in both the market share tables and forecast tables.) Any changes in market conditions have also been incorporated into this updated forecast. The following analysis outlines the reasons supporting this CAD/CAM/CAE/GIS market forecast.

This document contains Dataquest's detailed forecast information on the CAD/CAM/CAE/GIS industry. Included in this document are the following:

- Five-year historical data
- Five-year forecast data

Table 1
CAD/CAM/CAE/GIS Market, by Region

	1991	1992	1993	1994	1995	1996	CAGR (%) 1991-1996
Worldwide							
Revenue	14,850	15,303	16,311	17,740	19,411	21,050	7.2
Systems	589,615	650,470	729,670	810,890	881,380	945,880	9.9
Seats	619,932	674,800	750,780	829,200	897,430	960,090	9.1
North America							
Revenue	5,027	5,141	5,415	5,834	6,313	6,803	6.2
Systems	240,985	265,850	290,470	315,390	336,940	358,450	8.3
Seats	252,860	275,470	298,720	322,610	343,350	364,230	7.6
Europe							
Revenue	5,486	5,689	6,122	6,666	7,325	7,929	7.6
Systems	208,812	229,300	261,950	294,250	320,240	340,700	10.3
Seats	219,677	238,080	269,800	301,100	326,300	346,100	9.5
Asia							
Revenue	4,039	4,131	4,370	4,768	5,219	5,673	7.0
Systems	124,271	135,870	152,540	170,120	185,890	200,850	10.1
Seats	130,964	141,020	156,790	173,630	188,830	203,330	9.2
Rest of World							
Revenue	298	343	404	472	553	645	16.7
Systems	15,547	19,450	24,710	31,130	38,310	45,880	24.2
Seats	16,430	20,230	25,470	31,850	38,950	46,420	23.1

Source: Dataquest (October 1992)

More detailed data on this market may be requested through our client inquiry service.

Forecast Assumptions

Following are the main forces, worldwide and by region, driving the CAD/CAM/CAE/GIS forecast.

Worldwide Forecast Drivers

The worldwide CAD/CAM/CAE/GIS market will maintain consistent, steady growth during the next five years. Figure 1 shows the forecast change in mix among hardware, software, and services.

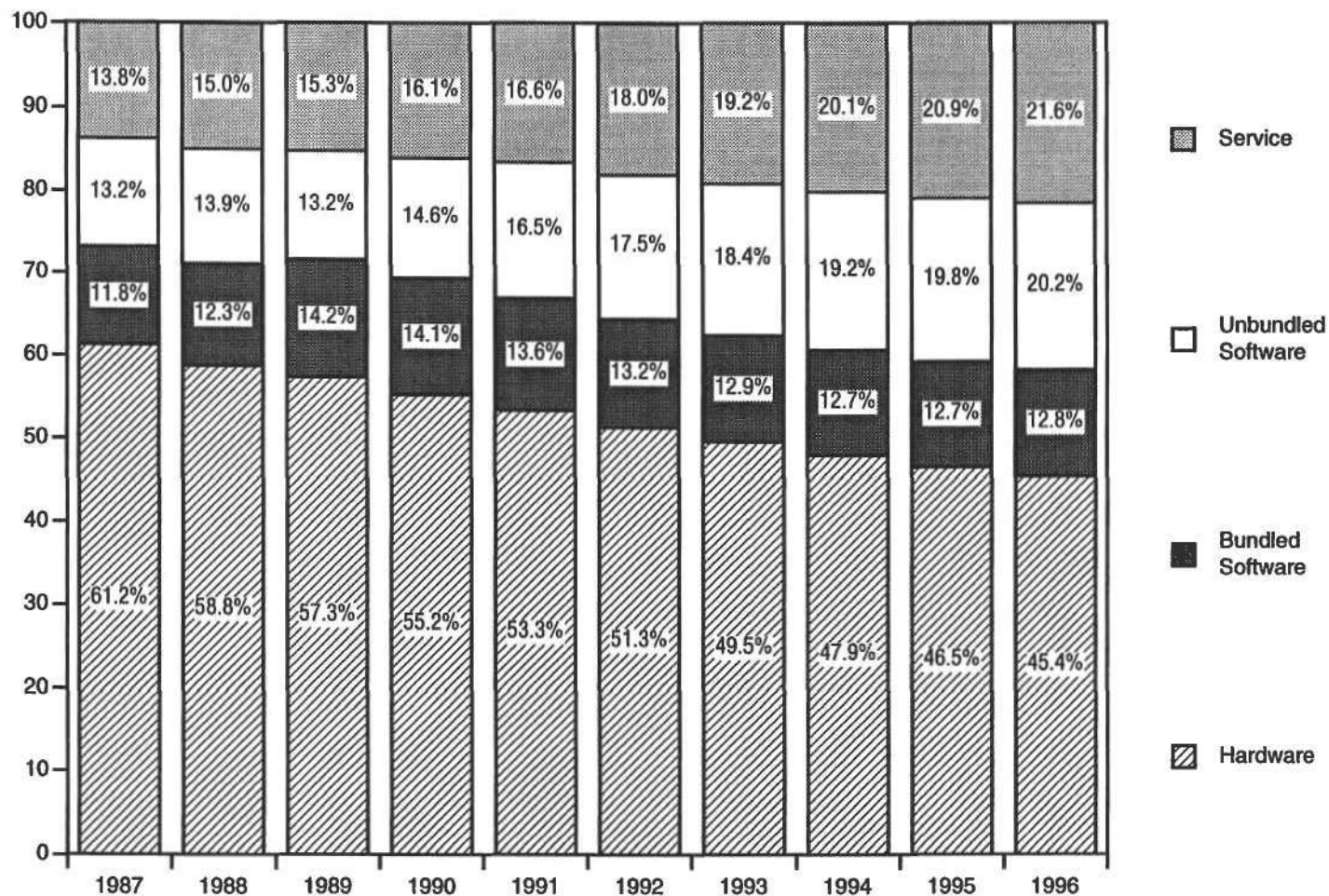
The following are the main forces driving the CAD/CAM/CAE/GIS worldwide forecast:

- Globalization of world markets is driving economic restructuring for the major regions—the United States, the European Community (EC) and Japan—to a degree unprecedented since the 1930s. Growth will be limited in the short term as CAD/CAM/CAE/GIS buyers assess market conditions. There is a sense of cautious optimism that the world economy will gradually improve, rather than get worse, beginning in mid-1993.
- CAD/CAM/CAE/GIS systems will continue to give buyers a competitive edge. As time-to-market requirements shrink, demand for design automation tools will continue to increase.
- The recent currency fluctuations, specifically the sharp decline of the U.S. dollar in relation to many European currencies and the Japanese yen, will offset sluggish economic growth for multinational corporations, particularly those with a high percentage of costs denominated in dollars. While many companies are hedging their profits to limit the effects of the currency fluctuations, some are utilizing the changes in exchange rates to reprice their products. In the current period of a rapidly declining dollar, U.S.-based multinationals may lower overseas prices to stimulate demand. This would be particularly true of the PC companies, which are striving to rapidly increase unit volume gains. For companies that have much of their cost structure denominated in dollars, the impact of currency will be highly leveraged. In the case of more mature companies that for the most part have established major manufacturing facilities overseas and therefore much of their cost structures are in foreign currency, the leverage from the change in the dollar is much less. Recent currency-rate changes may drive CAD/CAM/CAE/GIS growth internationally in the short term; long-term effects could be highly variable.
- Market demand will be limited by vendors' inability to fully meet demand for highly integrated software systems. We believe that the industry business model is evolving to a structure where large software vendors will function increasingly as application software integrators. Much of the innovation in new niche products can be expected to come from the small software vendors, who will be dependent on their OEM relationships with major software vendors. These alliances will ultimately reduce the total cost of software development, thus strengthening industry profitability. However, design problems being addressed will become increasingly complex, and meaningful success in integrating software will lag market demand.
- Increased flexibility in software portability will improve market stability during the next few years. Because the majority of software vendors have ported their products to multiple platforms, platform choice has become less of an issue. Software vendors are now poised to leverage their portability as new, faster hardware platforms become available. Those software vendors that do so will have a selling advantage.
- The "late majority" buyers for CAD/CAM/CAE/GIS will be coming to market during the next five years, driving additional growth. However, conservative buyers will favor market leaders. These conservative buyers are the "late majority" buyers who do not buy until the weight of the majority seems to legitimize the product. For vendors, therefore, the value of having high market share as well as financial clout will increase.

Figure 1

History and Forecast for the CAD/CAM/CAE/GIS Market: Hardware, Software, and Services

Percentage



Note: Columns may not add up to 100 percent because of rounding.

Source: Dataquest (October 1992)

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North American Forecast Drivers

The North American market was flat in 1991 at \$5.0 billion and is forecast to grow at a 6 percent CAGR through 1996 (see Figure 2). The main factors driving the North American forecast are the following:

- According to The Dun & Bradstreet Corporation's latest monthly survey of 1,000 manufacturers' nationwide, manufacturers' modest expectations for improvements in operating conditions were essentially unchanged, despite reports of improved conditions in the past few months. However, the one bright spot in the recent survey is that manufacturers' expectations to increase capacity in the next three months rose sharply. This bodes well for increases in capital spending. With the cost of capital so low, many companies are seeking to invest in systems and equipment that boost productivity. Market growth will increase as manufacturers invest in CAD/CAM/CAE/GIS systems.
- Market growth will be limited for the second half of 1992 and most of 1993 as businesses wait for the outcome of the November election and the implementation of new fiscal policies. Fiscal policy proposals include restoring investment tax credits, accelerating depreciation for many investments, and reducing capital gains. The budget deficit issue will also have to be addressed. Most likely, after the elections, some form of tax increases and/or spending cuts will occur. A Republican win would favor defense spending, which would help EDA and mechanical sales; a Democratic win would favor infrastructure spending (such as roads and bridges), which is more likely to benefit sales to AEC and GIS applications. Businesses will postpone purchases until they have a better indication of what the new policies will be and how they will affect their investment decisions.
- Market growth will be reduced because of decreasing average selling prices (ASPs). The United States is a large market with more developed distribution channels and larger order sizes than in other regions. Streamlined distribution channels leave fewer places for profit to hide; therefore, ASPs have declined more sharply. In contrast, Europe is the sum of many smaller country markets, each with its own customs and

requirements. Because of these special requirements, ASPs have not been as pressured to decline in European markets; therefore, North American unit shipments will continue to grow significantly, while revenue will grow at a slower rate because of strong price competition.

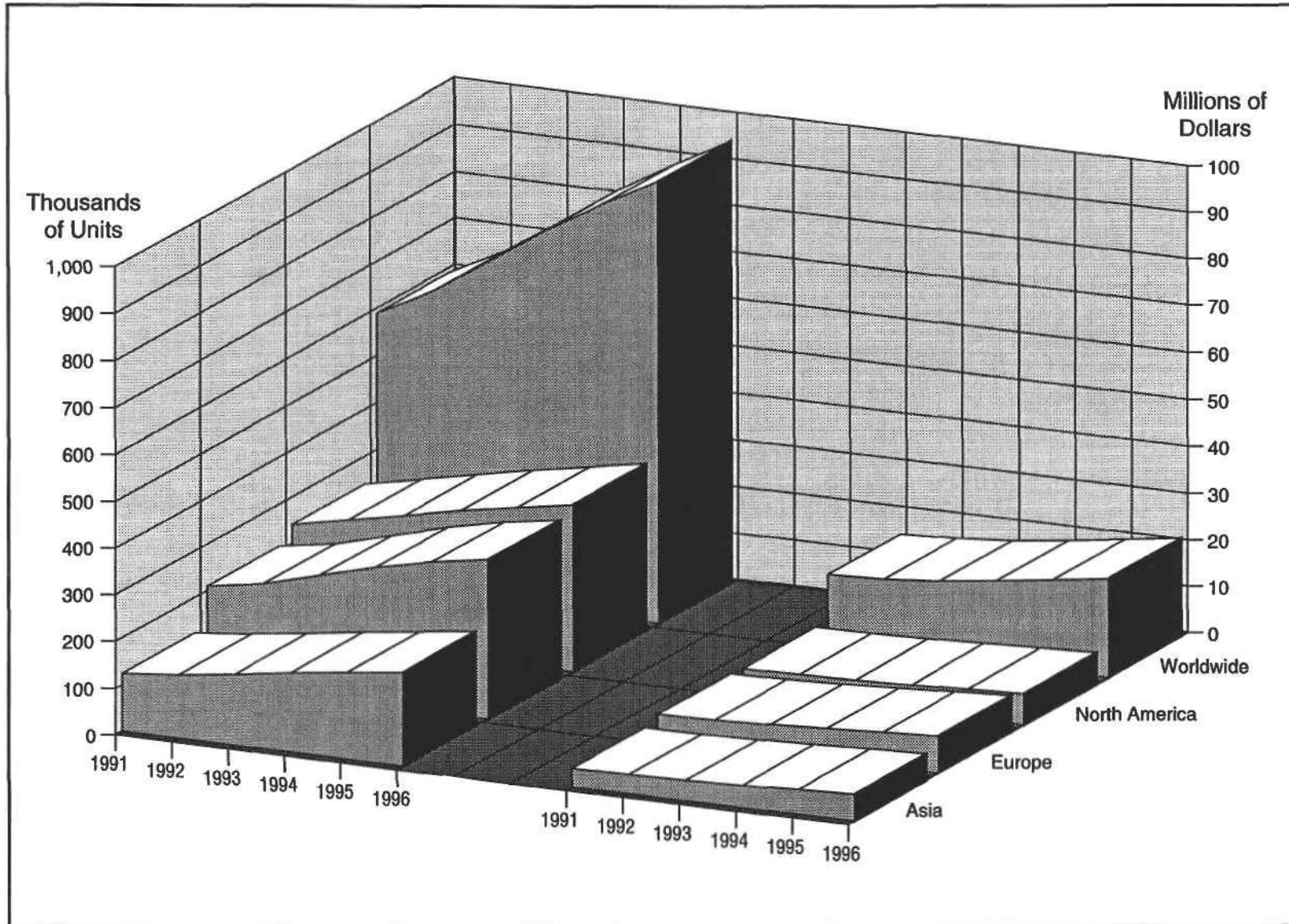
- Market growth will be limited because of lower defense spending. Spending cuts for the defense budget of 25 to 30 percent during the next five years are being proposed by the U.S. administration. In the United States, both Republicans and Democrats are seeking to balance defense spending cuts against the large forecast loss of jobs that will occur when such reductions are incurred. Most likely, the U.S. Department of Defense will encourage continued growth in R&D spending, while severely limiting the number of programs that would ultimately make the transition to production. CAD companies heavily dependent on direct or indirect government defense spending contracts increasingly will have limited growth opportunities.

European Forecast Drivers

The European market grew 4 percent in 1991 to \$5.5 billion and will reach \$7.9 billion by 1996. This market is forecast to have an 8 percent CAGR for revenue through 1996. The main issues driving the European forecast include the following:

- Growth will steadily increase in Eastern Europe. The collapse of the Soviet Union as an export market has complicated the difficult situation already facing other Central and Eastern European countries as they make the transition to market economies and establish new international trading arrangements. Poland, Hungary, and more recently Czechoslovakia have made impressive progress in shifting exports to other markets. In all these countries, prices have been set free and inflation seems to be coming under control. The initial groundwork toward adopting market economies has been laid. GDP/GNP growth is forecast to turn positive during the 1992 to 1993 period and reach strength toward 1994. As these countries' economies become market economies, CAD/CAM/CAE/GIS opportunities will increase, also.

Figure 2
CAD/CAM/CAE/GIS Market, by Region



Source: Dataquest (October 1992)

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- Growth will be relatively unaffected by the advent of the EC. The effects of 1992 will be evolutionary, not revolutionary. Growth is expected for European vendors as they expand into other European markets. To date, many European vendors have competed often only in their country of origin. During the next forecast period, European vendors increasingly will expand their operations to become more competitive across the European community. Furthermore, German companies and German subsidiaries of international companies increasingly are expanding into Eastern European countries.

Asian Forecast Drivers

The Asian market grew 4 percent in 1991 to \$4.0 billion and its forecast CAGR for revenue is 7 percent through 1996. The main issues driving the Asian forecast are as follows:

- In Japan, unexpected sluggishness has resulted from an abrupt end to the long boom of private fixed investment. This has followed a marked erosion of business confidence, partly associated with a continued unwinding of speculative activities in asset markets. CAD/CAM/CAE/GIS market growth will be limited in the short term as Japan recoups from these recent changes.
- Shifting labor costs will affect growth among countries. Labor costs in Japan, Korea, Taiwan, and Hong Kong will continue to increase, which will result in growing demand for productivity tools including CAD/CAM/CAE/GIS. Industries with blue-collar workers will transfer operations to Indonesia, Malaysia, the Philippines, Thailand, and the Republic of China; Japan, Korea, Taiwan, and Hong Kong will grow based on the work of the white-collar workers. Remote design and manufacturing sites also will encourage the growth of electronic-data sharing and thus CAD/CAM/CAE/GIS across Asia.
- Growth is less likely in some Asian countries because of the lack of stringent intellectual property rights. Most Asian countries, with the exception of Japan, have few laws governing intellectual property rights. Many companies will be hesitant to invest or set up operations in a region where they will receive no design protection.

Applications

Table 2 shows the CAD/CAM/CAE/GIS market software revenue forecast by application, as well as the forecast change in mix between bundled and unbundled software revenue. Figure 3 shows the CAD/CAM/CAE/GIS forecast by application.

Mechanical

The mechanical software market grew 7 percent in 1991, and its forecast CAGR for the 1991 to 1996 period is 5 percent. The main issues driving the mechanical forecast are as follows:

- Mechanical CAD/CAM/CAE indispensability is increasing. Market pressures to produce higher-quality, ergonomically correct designs with shorter production cycles is making mechanical CAD/CAM/CAE a necessity in all manufacturing industries. Several recent end-user surveys indicate the levels of drafting, conceptual, and detail design work done with mechanical CAD/CAM/CAE tools have surpassed 90 percent at many sites. The use of mechanical CAD/CAM/CAE tools in various departments also has high-market penetration. As the complexity of the design increases, the need to share information increases, and the benefits of automation improve dramatically. This results in an increase in the level of indispensability.
- Integration is driving significant savings. A hidden benefit when all potential users at a site have full access to mechanical CAD/CAM/CAE comes from the elimination of redundant processes or systems. Unfortunately, this is difficult to accomplish in a mechanical design and manufacturing environment because so many people need to have access to some part of the engineering database. It is difficult to even identify everyone, let alone actually set up a system that totally replaces the manual operation; but, it is happening. Slowly, a number of users are building integrated systems that effectively share engineering data between departments and supplier companies. Some vertical markets have taken this to the level of implementing standards for the sharing of data for a whole industry. The German automobile industry is a good example.

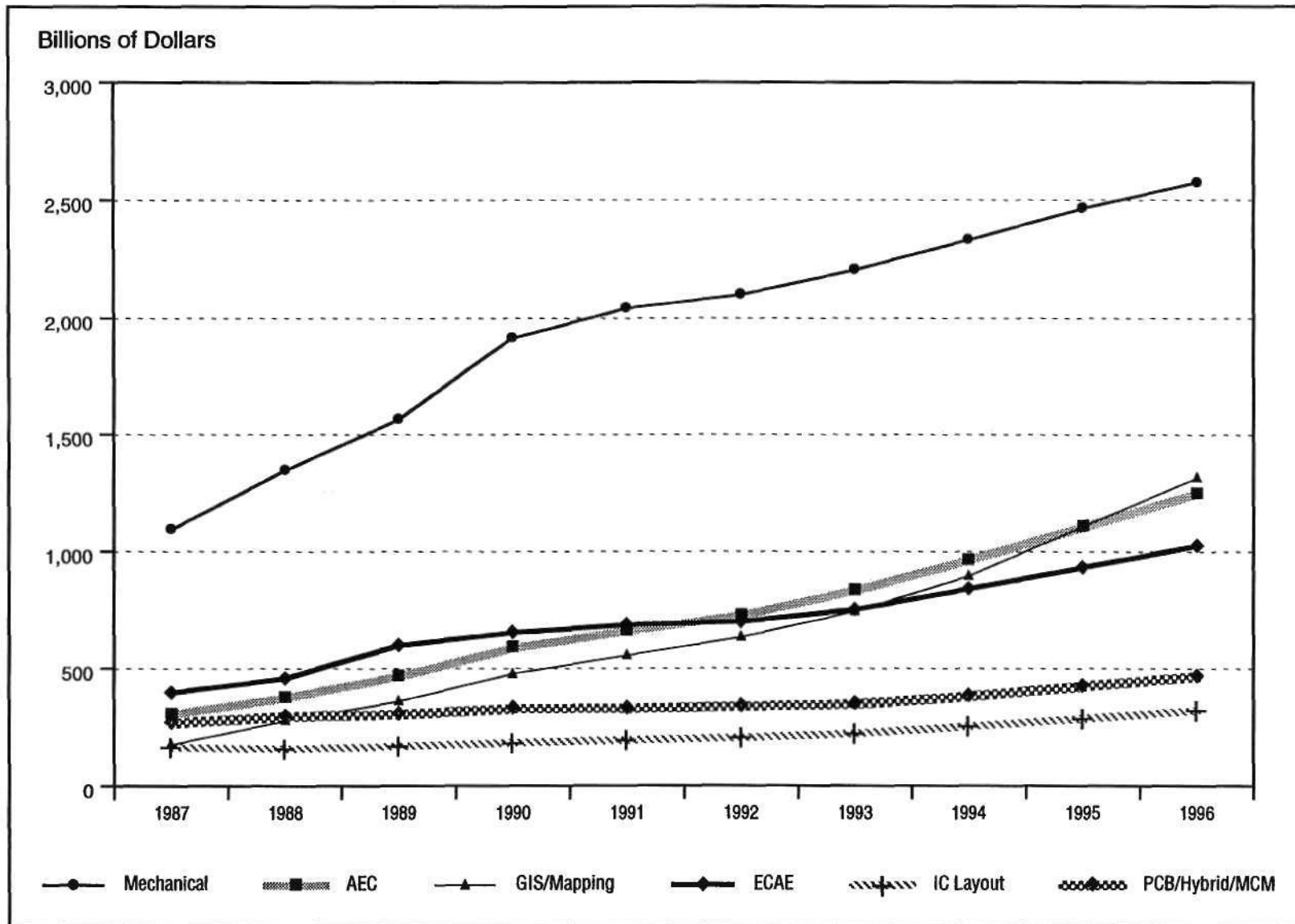
Table 2

CAD/CAM/CAE/GIS Market, by Application

	Revenue (\$M)						CAGR (%) 1991-1996	Percent Distribution (%)					
	1991	1992	1993	1994	1995	1996		1991	1992	1993	1994	1995	1996
All Applications													
Total Software	4,466	4,701	5,104	5,667	6,319	6,946	9.2	100.0	100.0	100.0	100.0	100.0	100.0
Bundled Software	2,020	2,019	2,103	2,259	2,473	2,683	5.8	45.2	42.9	41.2	39.9	39.1	38.6
Unbundled Software	2,446	2,682	3,001	3,408	3,846	4,263	11.7	54.8	57.1	58.8	60.1	60.9	61.4
Mechanical													
Total Software	2,040	2,098	2,202	2,329	2,464	2,574	4.8	100.0	100.0	100.0	100.0	100.0	100.0
Bundled Software	1,138	1,122	1,139	1,171	1,215	1,247	1.8	55.8	53.5	51.7	50.3	49.3	48.5
Unbundled Software	902	976	1,063	1,158	1,249	1,326	8.0	44.2	46.5	48.3	49.7	50.7	51.5
AEC													
Total Software	660	726	834	964	1,104	1,246	13.6	100.0	100.0	100.0	100.0	100.0	100.0
Bundled Software	307	334	380	443	511	579	13.5	46.6	46.1	45.5	46.0	46.3	46.5
Unbundled Software	352	392	454	521	593	667	13.6	53.4	53.9	54.5	54.0	53.7	53.5
GIS/Mapping													
Total Software	556	634	743	896	1,105	1,315	18.8	100.0	100.0	100.0	100.0	100.0	100.0
Bundled Software	276	311	358	426	528	639	18.3	49.6	49.1	48.2	47.5	47.8	48.6
Unbundled Software	281	323	385	470	577	676	19.2	50.4	50.9	51.8	52.5	52.2	51.4
Electronic CAE													
Total Software	686	700	752	841	933	1,024	8.3	100.0	100.0	100.0	100.0	100.0	100.0
Bundled Software	131	104	95	90	86	90	-7.2	19.1	14.8	12.6	10.7	9.2	8.8
Unbundled Software	555	597	657	751	847	934	11.0	80.9	85.2	87.4	89.3	90.8	91.2
IC Layout													
Total Software	196	206	224	255	287	322	10.4	100.0	100.0	100.0	100.0	100.0	100.0
Bundled Software	32	27	26	25	23	22	-7.4	16.3	13.3	11.5	9.7	8.2	6.8
Unbundled Software	164	178	198	230	264	300	12.9	83.7	86.7	88.5	90.3	91.8	93.2
PCB/Hybrid/MCM													
Total Software	328	338	348	382	425	466	7.3	100.0	100.0	100.0	100.0	100.0	100.0
Bundled Software	136	121	105	105	108	107	-4.8	41.5	35.7	30.2	27.4	25.4	22.9
Unbundled Software	192	217	243	277	317	360	13.3	58.5	64.3	69.8	72.6	74.6	77.1

Source: Dataquest (October 1992)

Figure 3
History and Forecast for the CAD/CAM/CAE/GIS Market, by Application



Source: Dataquest (October 1992)

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- The mechanical CAD/CAM/CAE market is evolving toward a replacement market. The next five years will see the mechanical CAD/CAM/CAE market evolve toward a replacement market where the new unit sales will be balanced by system retirements. This trend is inevitable. The only remaining question is when. We forecast 1997 or 1998 as the balance point. Considering the plethora of forces at work in emerging technologies, world economics, competitive issues, and software development, this should be considered a rough estimate.
- Significant changes are occurring for modeling technologies. Two-dimension-only systems are on a steady decline. Three-dimension capability is available for a minimal cost premium. Even if a user has few occasions for a 3-D application, the minimal expense and common availability on all platform types makes a 3-D-based product a reasonable alternative to 2-D-based products. Only a few recent 2-D-only products have added a significant amount of enhancements for parametric-user input and constraint-based modeling that may keep a significant market presence. This discussion does not intend to minimize the value or necessity of providing high-performance production drafting capabilities. The general message, however, is that the vendor revenue from this application is on the decline.
- Solid modeling has been promised for many years as the panacea for the design environment. More complete data structure with improvements in performance is rapidly building a strong following. Add-on applications that use part or assembly information are still less than optimal, but progress is being made in integration between the model and analysis applications, between the model and documentation, and further into manufacturing applications. Ease of use, performance, and the ability to accurately model any object independent of shape or manufacturing process continue to challenge all solid-modeling products.
- Knowledge-based engineering (KBE) is a productivity multiplier for any mechanical CAD/CAM/CAE system. The rules developed can drive automated applications, capture design intent, and automate sharing of data between applications and departments.

Every production operation has task and procedural structures that can be automated and optimized with KBE. The needed improvements in ease of use, cost of implementation, and availability of interface to a variety of mechanical CAD/CAM/CAE software products will improve with time. Two years ago, our first in-depth look at KBE made some wild predictions. We expected the market to grow by a factor of four in the next two years. A preliminary analysis now shows that this prediction was a bit optimistic. Doubled growth in two years would be closer to the truth. The general market softness has had an impact, but the underlying market dynamics are unchanged. In fact, the applications marked for early implementation are proving to be more successful than previously imagined.

- The promise of virtual reality (VR) and multimedia in an engineering environment is real. The practical applications are many. Training is a prime target for these technologies both as an aid to the proper use of other computer tools and in job content to make better engineers and designers. The state of the art in VR has reached the experimentation level of a new high-performance visual experience. The next phase will add the ability to do more than just fly around in your data. Dynamic editing will be required. Imagine doing cable routing by grabbing the end of a wire and flying through the engine compartment of your car.

AEC

The AEC CAD software market, which is forecast to grow at a 14 percent CAGR for 1991 to 1996, will enjoy healthy underlying demand during the forecast period because of the following factors:

- We anticipate increased demand for electronic design data from designers' clients and partners in the building process—from the U.S. government to the small commercial developer. Designers in the AEC industry are finding themselves in markets that are more regionally and globally competitive, markets that favor partnering across design disciplines. The designer with no CAD capability increasingly will be dropped from consideration as a partner or supplier.

- We anticipate increased demand from designers' clients and partners to reduce uncertainty and risk; that is, to build what the client had in mind, on time, and within budget. Meeting this challenge will require electronic design data throughout the design/construction process.

These two factors will continue to stimulate growth in the AEC CAD market during the next five years, even in a recession. Temper- ing this growth will be the following fun- damental factors that discourage purchases:

- Despite significant consolidation and partner- ing among users, the design and construc- tion process will still often be divided among several companies representing different aspects of the design process. Because automation systems are considerably harder to implement across companies than within companies, the pencil as a design tool will not be eliminated during the next five years.
- Because AEC is built primarily on a "one design/one build" model, proven economic benefits of CAD use will remain smaller than in mechanical and electronic applica- tions, where automated quantity manufacture can more readily leverage improved designs. This fact both discourages CAD use and drives users to focus on electronic drafting. Drafting software is nearly a commodity typically sold on PCs and commands a rela- tively low price.

GIS/Mapping

GIS software revenue is forecast to grow at a robust 19 percent CAGR during the next five years, primarily because of the following factors:

- Bread-and-butter prospects in government and utilities are charged with maintaining information on land and assets in per- petuity. Many of these prospective buyers are still using paper maps, which will degrade. This creates a certain inevitability to moving from paper maps to computer maps—the first step to building a GIS.
- Inexpensive spatial data—both public and private—are accumulating, and their reuse will help dissolve a traditional obstacle to growth in GIS.

- Several new technologies will drive growth in the GIS market. Currently, advances in global positioning systems (GPS) and aerial photography are making it possible to create GIS systems significantly more accurate than existing paper maps, giving experienced users some compelling reasons to reinvest. Increasingly portable computers, multimedia, and better compression of satel- lite imagery will create opportunities to develop more useful GIS.

- Opportunities for growth exist in new appli- cations, industries, and regions. During the forecast period, slow sales in one area will generally be balanced with higher sales in another.

Two factors seriously threaten the long-term expansion of the GIS market, as follows:

- The uncertain (but certainly high) cost of creating a working GIS.
- The impact of applications stuck in the pilot phase, both in terms of halted purchases at the troubled project, and the negative pub- licity these projects create.

Electronic Design Automation

The electronic design automation (EDA) indus- try produced a lackluster 1 percent growth in total factory revenue in 1991 and a 5 percent growth in software revenue. This has as much to do with fundamental changes occurring within the top suppliers as with the following economic factors:

- Product transitions of top EDA suppliers have caused a significant stagnation in the purchase of new EDA tools. Buyers are prolonging their evaluation process. This problem is further exacerbated by the global recession and political and economic infra- structure changes in North America and Europe.
 - The final vestiges of platform dependence are being removed from the EDA industry. This has had a short-term negative effect on the market, but should improve the profitability of EDA tool suppliers.
- Fueling the fires of growth in the coming years will be the ever-increasing demands to shorten the design cycles of electronic systems.

EDA tools will continue to be purchased in hopes to gain competitive advantages. Application markets that will contribute to this growth include the following:

- Advanced analysis tools for IC and PCB designs. Increasing clock frequencies will require tighter design tolerances and sophisticated analysis tools will be needed to ensure proper operation.
- Architectural-level tools to improve designer productivity. While top-down design is now being adopted by the majority of electronic designers, architectural-level tools will emerge during the next two to five years.
- Emerging higher service content. A higher service content will emerge in the EDA industry as large suppliers shift their business models toward solutions and selling integration services.

Notes on Forecast

For the 1991 publishing cycle, Dataquest's CAD/CAM/CAE/GIS group added server as a platform. The platform categories now include technical workstation, host-dependent, server, and personal computer. Revenue formerly classified in technical workstations, host-dependent, or personal computer may now be more accurately classified, where appropriate, in the server category. However, because of this reclassification, data and growth rates for the other platform areas were affected. Figure 4 depicts the revised platform distribution.

Forecast Methodology

Fundamental to the way Dataquest conducts its research is an underlying philosophy that says 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

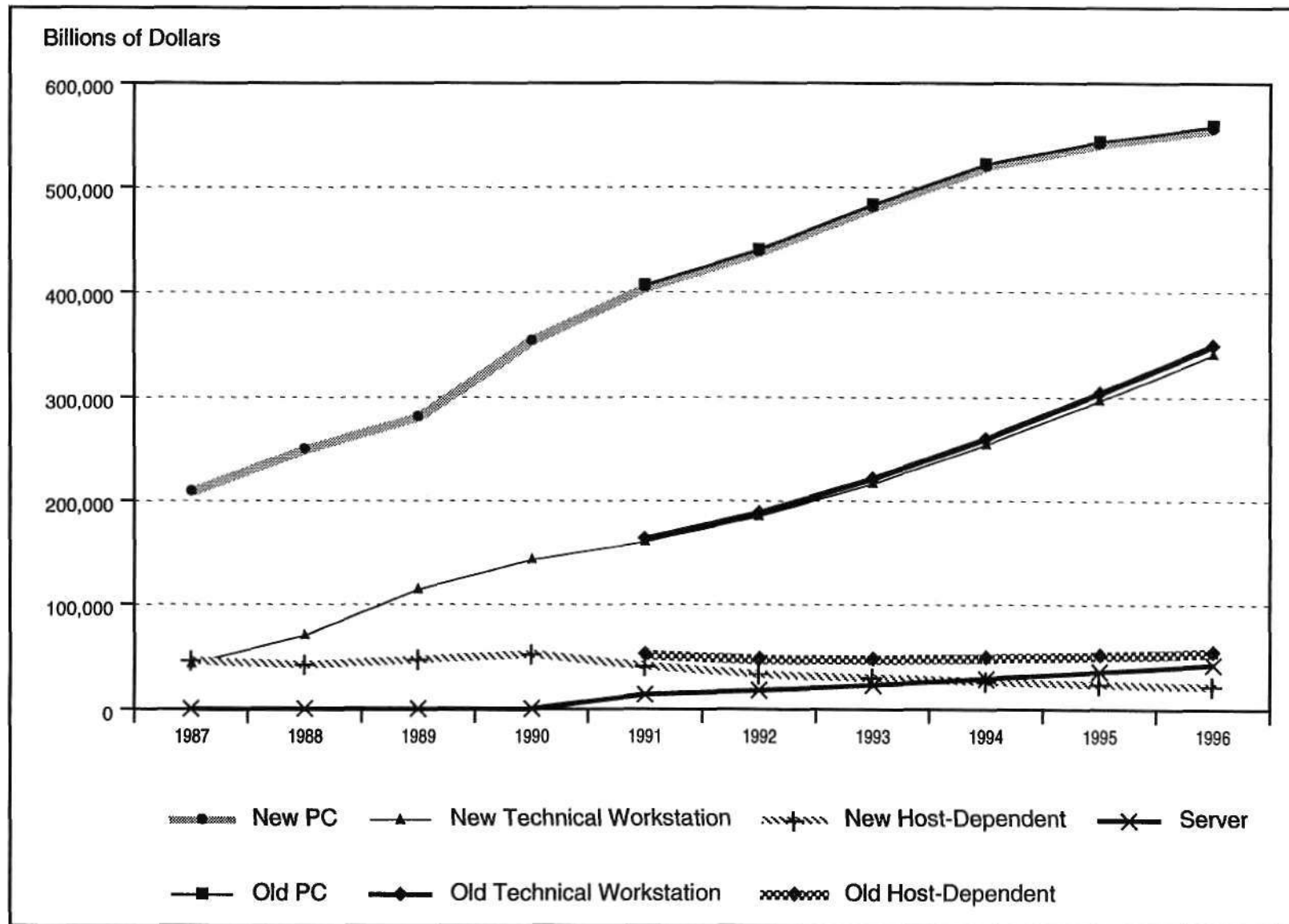
professionals and rigorous, disciplined techniques of seasoned market researchers.

Dataquest also analyzes trends in the macroenvironment, which can have major influences on both supply-side and demand-side forecasting. In addition to demographics, analysts look at GNP growth, interest rate fluctuation, currency 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 1992. Figure 5 depicts the building blocks for the CAD/CAM/CAE/GIS forecast.

Figure 6 is a diagram of the CAD/CAM/CAE/GIS forecasting model. The overall forecasting process uses a combination of forecasting techniques such as time series and technological modeling. Market estimates and forecasts are derived using the following research techniques:

- "Bottom-up" aggregation—This method involves adding all relevant vendor contributions to arrive at total market estimates for all historical data.
- Segment forecasting—For each application segment tracked by the CAD/CAM/CAE/GIS group, individual forecasts are derived following the basic information model defined previously. Specifically, each design phase covered within each application is segmented by channel, product, region, and platform. 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 (TAM) model and a satisfied available market figure to accurately assess the levels of penetration. Installed base is also evaluated. Rates of product retirement are primarily based on input from end users in our ongoing survey programs. Figure 7 shows the CAD/CAM/CAE/GIS installed base by platform. In addition, Dataquest analysts factor in the acceptance or ability for users to consume new technology.

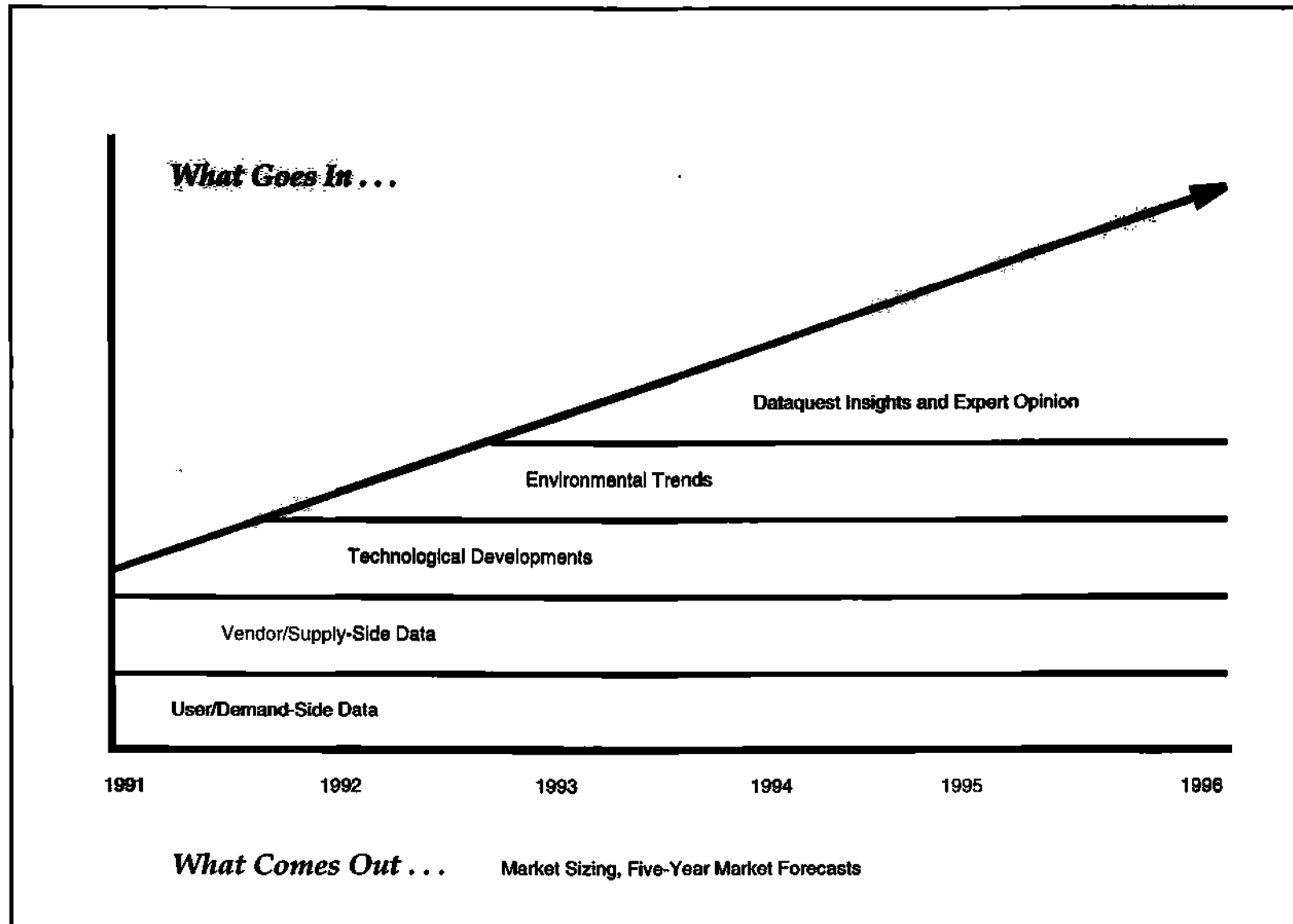
Figure 4
CAD/CAM/CAE/GIS Revised Platform Distribution



Source: Dataquest (October 1992)

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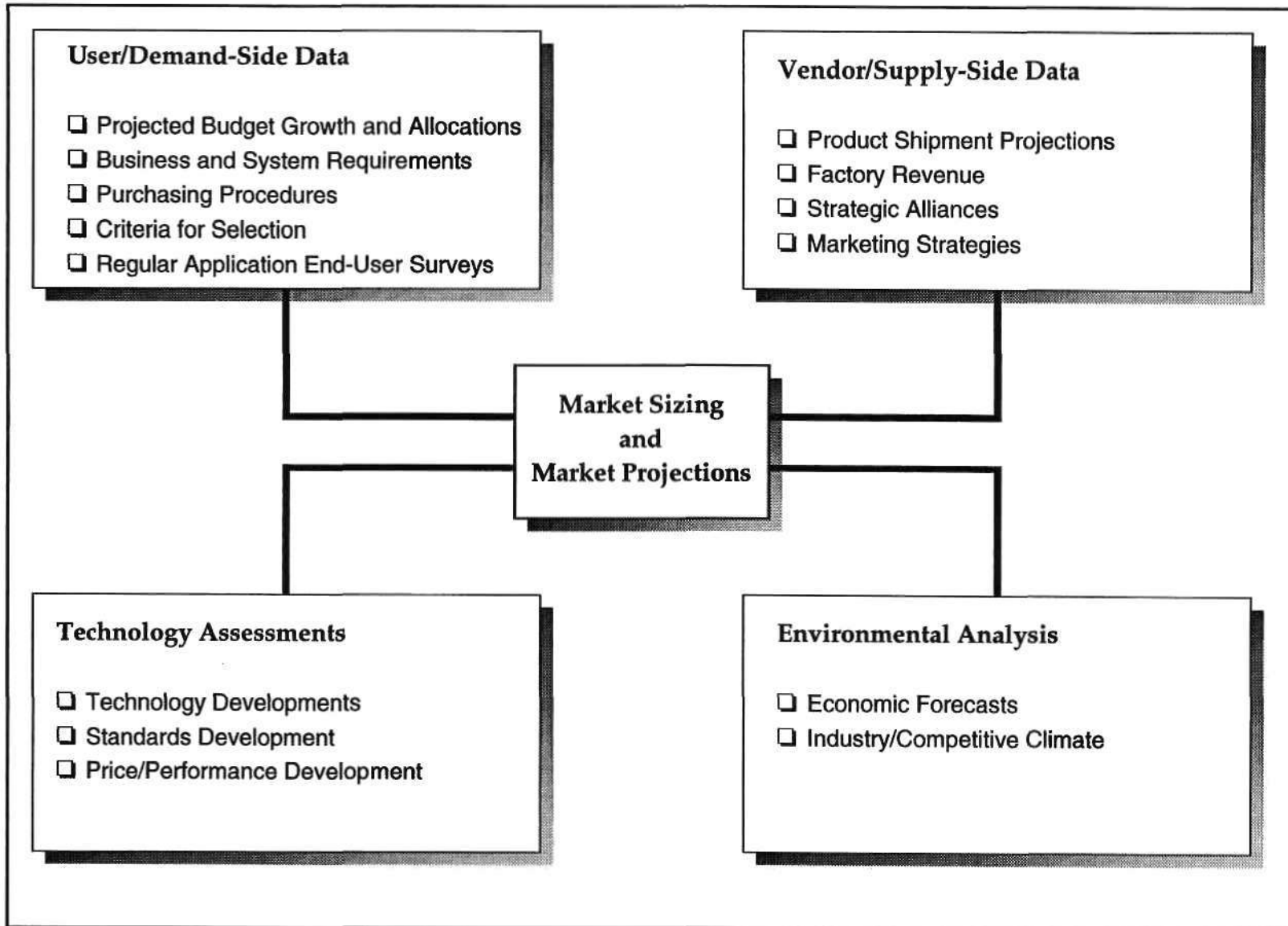
Figure 5
Dataquest's Building Blocks for CAD/CAM/CAE/GIS Market Forecasting



Source: Dataquest (October 1992)

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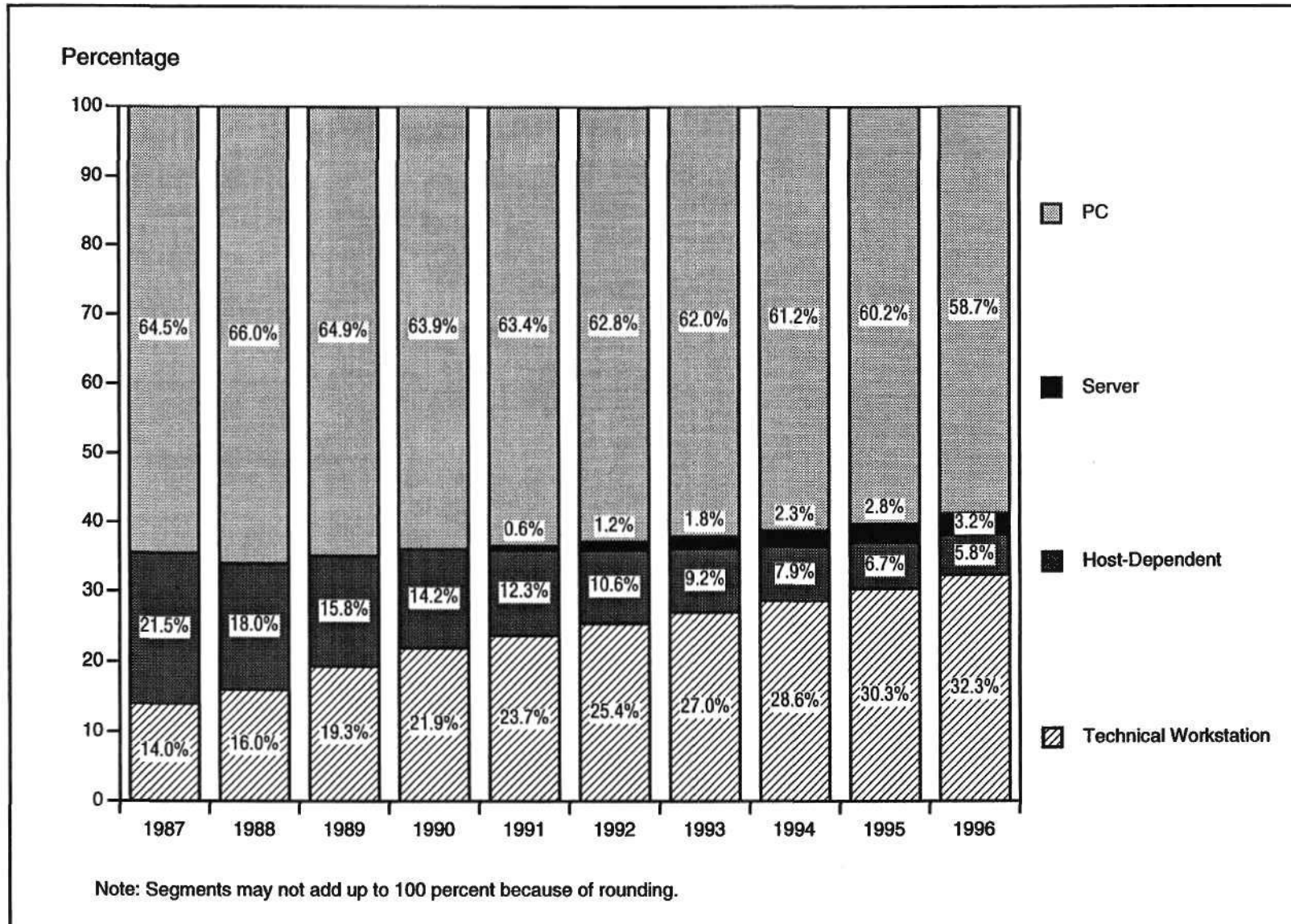
Figure 6
CAD/CAM/CAE/GIS Market Forecasting Model



Source: Dataquest (October 1992)

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Figure 7
CAD/CAM/CAE/GIS Installed Base



Source: Dataquest (October 1992)

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- 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

Dataquest defines CAD/CAM/CAE/GIS as systems used in the mechanical; architecture, engineering, and construction (AEC); GIS/mapping; and EDA application areas. The CAD/CAM/CAE/GIS market is defined according to the following segmentation scheme:

- CAD/CAM/CAE/GIS
 - Mechanical
 - AEC
 - GIS/Mapping
 - EDA
 - Electronic CAE
 - IC Layout
 - PCB/Hybrid/MCM

In addition, more detailed information by subapplication is available and usually published in *Dataquest Perspectives*.

Definitions

This section lists the definitions that are specific to this document.

Application definitions are as follows:

- Mechanical—This segment refers to computer-aided tools used to design, analyze, document, and manufacture discrete parts, components, and assemblies.
- 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.
- 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 ECAE, 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 application 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.

Regional definitions are as follows:

- North America—Includes United States and Canada
- Europe—Includes the United Kingdom, Scandinavia, Benelux, France, Germany, Italy, Spain, and Rest of Europe
- Asia—Includes Japan, Singapore, Taiwan, Korea, China, and Hong Kong
- Rest of World—All other countries including Australia, New Zealand, Oceania, Africa, Central America, South America, and the Middle East

Platform definitions are as follows:

- **Technical Workstation**—A single-user computer that is distinguished from a personal computer by its features and by the user's potential range of expansion on the platform. Features include a virtual, multitasking operating system (UNIX, VMS, Domain); the computer is designed by the manufacturer to run high-performance graphic applications in a multiuser/multitasking environment.
- **Host-Dependent**—A shared logic system in which the external workstations' functions are dependent on a host computer.
- **Server**—A computer that transparently provides its resources for use by other computer systems. It is a system on a network that provides specific functionality to other computer systems: the clients. Functions include file storage, database access, compute capability, and others. Dataquest tracks the following major categories of servers used for CAD/CAM/CAE and GIS applications:
 - **Compute Servers**—These systems provide capabilities for solving numerical problems (for example, simulations, statistical calculations, and simultaneous partial differential equations). System features usually include high-speed computational capabilities (for example, vector and parallel processing) and large memories.
 - **Print Servers**—These systems provide access to printers, specialized printing applications software, and print-spooling resources to a network.
 - **File Servers**—These systems provide mass storage capability to clients on a network. Services can range from temporary storage of working files to long-term backup and archive systems.
 - **Database Servers**—These systems manage databases as a shared resource to a network. These servers handle such functions as physical data storage, data security, and high-level queries and can access stored information at the record level.
- **Personal Computer**—A single-user computer that is distinguished from a technical workstation by its features and by the

user's potential range of expansion on the platform. Features found in technical workstations (such as a virtual operating system, networking, high-performance graphics, multiuser/multitasking capability) are optional rather than integrated by the manufacturer.

Line item definitions are as follows:

- **Average selling price (ASP)** is defined as the average price of a product, inclusive of any discounts.
- **CPU installed base** is defined as the total number of CPUs in active, day-to-day use.
- **CPU revenue** is the portion of revenue derived from a system sale that is related to the value of the CPU. (In the case of technical workstations and personal computers, CPU revenue contains the terminal revenue.)
- **CPU shipment** is defined as the number of CPUs delivered.
- **Hardware revenue** is defined as the sum of the revenue from the hardware system components: CPU revenue, terminal revenue, and peripherals revenue.
- **Installed seats** are defined as the total number of seats in active, day-to-day use.
- **Peripherals revenue** is defined as the value of all the peripherals of a turnkey sale. (Peripherals in this category typically are input and output devices.)
- **Service revenue** is defined as revenue derived from the service and support of CAD/CAM/CAE or GIS systems. Service revenue can be calculated in the tables by subtracting hardware and software revenue from total revenue.
- **Software revenue** is revenue derived from the sale of bundled (part of a turnkey system) and unbundled software.
- **Terminal revenue** is defined as revenue derived from the sale of terminals that are used to graphically create, analyze, or manipulate designs. The term is applicable only to the host-dependent platform, as terminal revenue is contained within CPU revenue for technical workstations and PCs.
- **Total factory revenue** is defined as the amount of money received by a manufacturer for its goods 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).

- Unit shipment is defined as the number of products delivered (that is, seats).

Table 3
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
Region: Worldwide
Platform: All Platforms

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	134,343	160,237	179,152	226,054	245,500	262,900	280,660	296,890	307,520	314,420	16	5
Unit Shipments or Seats	162,320	185,167	202,018	251,070	267,223	280,750	296,520	311,070	320,410	326,350	13	4
CPU Installed Base	270,012	418,518	568,305	736,572	890,820	1,028,930	1,155,290	1,270,820	1,369,820	1,450,030	35	10
Installed Seats	348,267	519,024	686,791	871,904	1,035,359	1,175,260	1,299,060	1,409,780	1,502,810	1,576,200	31	9
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	77.6	86.9	67.9	60.0	52.7	49.4	47.0	45.6	44.7	44.1	-9	-4
Hardware-Only ASP	15.2	10.2	10.9	9.5	8.9	8.0	7.5	7.1	6.9	6.8	-13	-5
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	3,544	3,612	3,799	4,111	4,003	3,838	3,785	3,777	3,783	3,772	3	-1
CPU Revenue	2,208	2,496	2,889	3,231	3,145	3,053	3,023	3,029	3,044	3,041	9	-1
Terminal Revenue	847	650	438	361	306	251	229	208	190	179	-22	-10
Peripheral Revenue (Turnkey)	489	465	471	518	552	534	533	540	549	553	3	0
Software Revenue	1,093	1,346	1,561	1,910	2,040	2,098	2,203	2,330	2,465	2,574	17	5
Bundled	610	735	930	1,114	1,138	1,122	1,140	1,172	1,216	1,248	17	2
Unbundled	483	611	631	796	902	976	1,063	1,158	1,249	1,326	17	8
Service Revenue	734	856	999	1,162	1,203	1,314	1,424	1,540	1,655	1,743	13	8
Total Factory Revenue	5,372	5,813	6,359	7,183	7,246	7,250	7,411	7,646	7,902	8,090	8	2
Increase over Prior Year (%)	24	8	9	13	1	0	2	3	3	2		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 4
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
 Region: Worldwide
 Platform: Technical Workstation

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	20,336	29,640	48,090	61,148	68,799	74,400	81,060	88,490	95,650	101,400	36	8
Unit Shipments or Seats	20,336	29,640	48,090	61,148	68,799	74,400	81,060	88,490	95,650	101,400	36	8
CPU Installed Base	36,550	64,986	109,990	164,739	221,396	275,980	327,030	375,570	419,380	459,340	57	16
Installed Seats	36,550	64,986	109,990	164,739	221,396	275,980	327,030	375,570	419,380	459,340	57	16
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	56.7	56.4	52.5	47.3	46.3	44.2	42.4	41.1	40.1	39.2	-5	-3
Hardware-Only ASP	28.7	23.4	21.4	20.7	17.8	16.5	15.3	14.4	14.0	13.7	-11	-5
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	741	1,056	1,526	1,742	1,790	1,798	1,828	1,888	1,960	2,002	25	2
CPU Revenue	617	852	1,239	1,414	1,435	1,443	1,467	1,516	1,573	1,606	24	2
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	124	204	287	328	356	355	361	373	387	396	30	2
Software Revenue	366	557	803	1,049	1,145	1,227	1,336	1,464	1,594	1,705	33	8
Bundled	220	327	528	639	666	682	710	749	795	828	32	4
Unbundled	146	230	275	410	479	545	626	715	798	877	35	13
Service Revenue	198	355	540	625	655	750	844	939	1,036	1,105	35	11
Total Factory Revenue	1,305	1,968	2,870	3,416	3,591	3,775	4,008	4,291	4,589	4,812	29	6
Increase over Prior Year (%)	91	51	46	19	5	5	6	7	7	5		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 5
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
Region: Worldwide
Platform: Host-Dependent

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	5,177	5,366	7,702	9,033	6,112	5,460	5,210	4,980	4,870	4,860	4	-4
Unit Shipments or Seats	33,154	30,296	30,568	34,049	27,835	23,180	20,940	19,050	17,660	16,700	-4	-10
CPU Installed Base	18,748	23,361	29,766	36,605	39,671	41,210	42,100	42,160	41,520	40,610	21	0
Installed Seats	97,003	123,867	148,252	171,937	184,210	187,540	185,870	181,130	174,510	166,780	17	-2
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	358.7	430.1	324.9	265.3	232.9	221.1	212.2	204.2	196.6	189.7	-10	-4
Hardware-Only ASP	1,244.3	368.2	154.7	138.8	250.3	228.8	209.0	192.3	176.5	162.5	-33	-8
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	2,236	1,884	1,579	1,523	1,134	940	845	760	698	654	-16	-10
CPU Revenue	1,087	1,067	1,019	1,046	738	613	549	492	452	423	-9	-11
Terminal Revenue	847	650	438	361	306	251	229	208	190	179	-22	-10
Peripheral Revenue (Turnkey)	301	167	122	116	90	76	67	60	56	52	-26	-10
Software Revenue	497	528	433	513	419	362	330	310	299	293	-4	-7
Bundled	291	329	313	394	317	277	255	239	231	226	2	-7
Unbundled	206	199	120	120	102	84	75	71	68	67	-16	-8
Service Revenue	496	467	403	469	378	359	340	330	321	317	-7	-3
Total Factory Revenue	3,229	2,880	2,416	2,505	1,930	1,660	1,516	1,400	1,318	1,265	-12	-8
Increase over Prior Year (%)	7	-11	-16	4	-23	-14	-9	-8	-6	-4		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 6
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
 Region: Worldwide
 Platform: Server

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	NA	NA	NA	NA	5,223	6,750	8,230	9,640	10,880	12,000	NA	18
Unit Shipments or Seats	NA	NA	NA	NA	5,223	6,750	8,230	9,640	10,880	12,000	NA	18
CPU Installed Base	NA	NA	NA	NA	5,223	11,660	19,120	26,700	34,430	40,700	NA	51
Installed Seats	NA	NA	NA	NA	5,223	11,660	19,120	26,700	34,430	40,700	NA	51
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	NA	NA	NA	NA	126.0	119.9	115.1	110.6	106.3	102.3	NA	-4
Hardware-Only ASP	NA	NA	NA	NA	33.3	30.3	27.8	26.4	25.7	25.1	NA	-5
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	NA	NA	NA	NA	267	321	366	406	437	460	NA	11
CPU Revenue	NA	NA	NA	NA	233	279	317	352	379	400	NA	11
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	NA	NA	NA	NA	35	42	49	54	58	60	NA	12
Software Revenue	NA	NA	NA	NA	88	112	136	158	176	191	NA	17
Bundled	NA	NA	NA	NA	68	87	106	122	134	144	NA	16
Unbundled	NA	NA	NA	NA	20	25	30	36	42	46	NA	18
Service Revenue	NA	NA	NA	NA	100	124	147	169	188	205	NA	15
Total Factory Revenue	NA	NA	NA	NA	456	558	650	733	802	856	NA	13
Increase over Prior Year (%)	NA	NA	NA	NA	NA	22	16	13	9	7		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 7
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
Region: Worldwide
Platform: Personal Computer

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	108,830	125,231	123,360	155,873	165,366	176,290	186,170	193,780	196,120	196,160	11	3
Unit Shipments or Seats	108,830	125,231	123,360	155,873	165,366	176,420	186,290	193,890	196,220	196,240	11	3
CPU Installed Base	214,714	330,171	428,548	535,228	624,531	700,070	767,030	826,390	874,480	909,380	31	8
Installed Seats	214,714	330,171	428,548	535,228	624,531	700,070	767,030	826,390	874,480	909,380	31	8
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	17.2	23.2	20.9	20.2	15.5	13.7	12.4	11.8	11.3	11.0	-3	-7
Hardware-Only ASP	4.2	4.4	4.8	4.6	4.2	3.9	3.6	3.4	3.2	3.1	0	-6
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	568	671	693	846	811	778	746	722	689	656	9	-4
CPU Revenue	504	577	631	771	740	717	690	670	640	611	10	-4
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	64	94	63	75	71	61	56	52	49	45	3	-9
Software Revenue	230	260	324	348	388	397	400	398	396	386	14	-0
Bundled	99	78	88	81	86	76	69	62	55	49	-3	-11
Unbundled	132	182	236	267	301	321	332	337	340	337	23	2
Service Revenue	40	33	56	68	70	81	92	102	110	115	15	10
Total Factory Revenue	838	965	1,073	1,262	1,269	1,256	1,238	1,222	1,194	1,157	11	-2
Increase over Prior Year (%)	35	15	11	18	1	-1	-1	-1	-2	-3		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 8
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
 Region: North America
 Platform: All Platforms

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	69,642	82,180	73,761	81,668	91,488	98,130	103,740	108,840	111,160	112,420	7	4
Unit Shipments or Seats	81,494	91,105	81,180	91,137	99,561	104,760	109,580	114,210	116,140	117,150	5	3
CPU Installed Base	145,332	220,605	277,947	328,113	371,669	407,660	440,890	473,930	503,400	527,290	26	7
Installed Seats	184,632	266,764	328,078	382,864	428,113	463,920	495,460	526,590	554,060	575,640	23	6
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	91.6	90.7	77.1	74.4	60.7	56.5	53.2	50.9	49.3	48.3	-10	-4
Hardware-Only ASP	12.4	8.7	10.6	9.8	8.8	7.8	7.2	6.8	6.5	6.3	-8	-6
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	1,406	1,203	1,239	1,229	1,147	1,080	1,050	1,036	1,015	995	-5	-3
CPU Revenue	888	892	963	956	898	863	846	841	828	815	0	-2
Terminal Revenue	337	223	161	161	138	111	97	89	82	77	-20	-11
Peripheral Revenue (Turnkey)	180	88	115	112	112	107	106	106	105	104	-11	-2
Software Revenue	372	424	467	571	576	593	629	660	683	693	12	4
Bundled	184	156	196	240	211	206	212	219	226	233	3	2
Unbundled	189	268	271	331	365	387	417	441	457	459	18	5
Service Revenue	312	295	335	352	327	348	370	394	413	430	1	6
Total Factory Revenue	2,090	1,922	2,040	2,152	2,051	2,022	2,048	2,090	2,111	2,118	-0	1
Increase over Prior Year (%)	11	-8	6	5	-5	-1	1	2	1	0		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 9
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
Region: North America
Platform: Technical Workstation

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	8,567	10,140	15,148	16,499	18,520	19,480	21,150	22,750	23,820	24,430	21	6
Unit Shipments or Seats	8,567	10,140	15,148	16,499	18,520	19,480	21,150	22,750	23,820	24,430	21	6
CPU Installed Base	17,346	26,804	40,391	53,935	67,446	79,540	90,570	101,210	109,940	117,620	40	12
Installed Seats	17,346	26,804	40,391	53,935	67,446	79,540	90,570	101,210	109,940	117,620	40	12
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	51.3	47.2	51.1	46.7	41.8	39.9	38.3	37.1	36.2	35.4	-5	-3
Hardware-Only ASP	28.2	27.1	21.4	19.5	17.0	15.4	14.2	13.4	12.9	12.5	-12	-6
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	283	323	458	431	415	399	400	405	406	401	10	-1
CPU Revenue	235	278	384	361	344	331	333	337	338	333	10	-1
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	48	45	74	70	71	68	68	68	68	67	11	-1
Software Revenue	119	163	228	306	321	341	374	405	429	448	28	7
Bundled	72	74	115	136	122	120	125	131	136	139	14	3
Unbundled	47	89	113	170	199	221	249	274	294	308	43	9
Service Revenue	78	121	191	183	166	182	198	212	226	234	21	7
Total Factory Revenue	480	607	876	919	902	922	972	1,023	1,061	1,083	17	4
Increase over Prior Year (%)	54	26	44	5	-2	2	5	5	4	2		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 10
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
 Region: North America
 Platform: Host-Dependent

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	1,898	1,751	2,480	2,797	1,505	1,330	1,250	1,240	1,240	1,270	-6	-3
Unit Shipments or Seats	13,750	10,676	9,899	12,266	9,577	7,950	7,090	6,600	6,230	6,000	-9	-9
CPU Installed Base	9,352	10,562	12,186	13,739	13,733	13,280	12,850	12,340	11,760	11,250	10	-4
Installed Seats	48,652	56,721	62,317	68,489	70,176	69,540	67,420	64,990	62,420	59,600	10	-3
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	344.8	360.5	483.8	349.0	297.3	284.0	272.3	261.0	250.0	240.0	-4	-4
Hardware-Only ASP	1,362.0	462.7	149.4	152.1	263.6	240.0	220.3	202.0	184.9	170.1	-34	-8
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	880	613	515	516	353	286	251	229	212	202	-20	-11
CPU Revenue	421	348	320	323	193	157	137	125	116	112	-18	-10
Terminal Revenue	337	223	161	161	138	111	97	89	82	77	-20	-11
Peripheral Revenue (Turnkey)	121	42	33	33	23	18	16	15	14	13	-34	-10
Software Revenue	187	182	135	154	108	92	83	78	78	79	-13	-6
Bundled	100	79	78	101	67	59	54	52	52	53	-9	-4
Unbundled	87	103	57	53	41	33	28	27	26	26	-17	-9
Service Revenue	223	166	128	151	106	98	93	92	91	94	-17	-3
Total Factory Revenue	1,290	962	778	822	567	476	426	400	381	375	-19	-8
Increase over Prior Year (%)	-3	-25	-19	6	-31	-16	-11	-6	-5	-2		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 11
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
Region: North America
Platform: Server

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	NA	NA	NA	NA	2,252	2,900	3,520	4,040	4,410	4,800	NA	16
Unit Shipments or Seats	NA	NA	NA	NA	2,252	2,900	3,520	4,040	4,410	4,800	NA	16
CPU Installed Base	NA	NA	NA	NA	2,252	5,020	8,210	11,370	14,430	16,800	NA	49
Installed Seats	NA	NA	NA	NA	2,252	5,020	8,210	11,370	14,430	16,800	NA	49
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	NA	NA	NA	NA	105.5	100.8	96.6	92.6	88.7	85.2	NA	-4
Hardware-Only ASP	NA	NA	NA	NA	32.5	29.6	27.2	25.8	25.0	24.5	NA	-5
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	NA	NA	NA	NA	95	113	127	138	143	148	NA	9
CPU Revenue	NA	NA	NA	NA	84	100	112	121	126	131	NA	9
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	NA	NA	NA	NA	11	13	15	16	17	17	NA	9
Software Revenue	NA	NA	NA	NA	28	36	44	50	54	58	NA	15
Bundled	NA	NA	NA	NA	20	25	31	35	37	39	NA	15
Unbundled	NA	NA	NA	NA	9	11	13	15	17	19	NA	16
Service Revenue	NA	NA	NA	NA	38	47	54	61	65	70	NA	13
Total Factory Revenue	NA	NA	NA	NA	161	196	225	248	263	276	NA	11
Increase over Prior Year (%)	NA	NA	NA	NA	NA	21	15	10	6	5		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 12
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
 Region: North America
 Platform: Personal Computer

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	59,177	70,289	56,133	62,372	69,211	74,420	77,820	80,820	81,680	81,910	4	3
Unit Shipments or Seats	59,177	70,289	56,133	62,372	69,211	74,420	77,820	80,820	81,680	81,910	4	3
CPU Installed Base	118,634	183,239	225,370	260,440	288,239	309,810	329,260	349,010	367,270	381,630	25	6
Installed Seats	118,634	183,239	225,370	260,440	288,239	309,810	329,260	349,010	367,270	381,630	25	6
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	15.4	13.8	10.8	19.6	12.3	11.1	10.0	9.4	8.9	8.5	-5	-7
Hardware-Only ASP	3.8	3.7	4.7	4.5	4.1	3.8	3.5	3.3	3.1	3.0	2	-6
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	242	267	267	282	284	282	271	265	254	245	4	-3
CPU Revenue	232	266	259	273	277	275	265	258	248	239	5	-3
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	11	1	8	9	7	7	7	6	6	6	-10	-4
Software Revenue	67	78	104	111	119	124	128	126	121	107	15	-2
Bundled	12	2	3	3	2	2	2	2	1	1	-38	-7
Unbundled	55	76	101	108	117	123	126	125	120	106	21	-2
Service Revenue	11	8	16	18	17	21	25	28	31	32	13	14
Total Factory Revenue	320	353	386	410	420	428	424	419	406	385	7	-2
Increase over Prior Year (%)	34	10	10	6	2	2	-1	-1	-3	-5		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 13
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
Region: Europe
Platform: All Platforms

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	37,263	47,214	62,409	77,516	88,616	94,690	100,370	105,370	109,710	111,660	24	5
Unit Shipments or Seats	44,951	56,271	72,030	86,470	96,521	101,410	106,580	110,940	114,820	116,410	21	4
CPU Installed Base	71,432	115,935	170,909	233,237	296,647	354,810	406,500	451,020	487,960	516,920	43	12
Installed Seats	91,564	145,082	209,134	278,867	346,995	406,750	458,840	502,390	537,580	564,540	40	10
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	56.1	72.8	75.2	68.1	62.2	57.9	54.7	52.6	50.9	49.6	3	-4
Hardware-Only ASP	14.4	12.5	11.6	9.5	8.4	7.7	7.3	6.9	6.7	6.5	-13	-5
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	955	1,310	1,491	1,516	1,517	1,483	1,477	1,467	1,480	1,467	12	-1
CPU Revenue	595	929	1,124	1,200	1,198	1,181	1,177	1,174	1,188	1,180	19	-0
Terminal Revenue	222	214	186	122	104	92	90	82	75	71	-17	-7
Peripheral Revenue (Turnkey)	138	167	180	195	215	210	210	212	217	216	12	0
Software Revenue	419	498	614	769	830	869	916	973	1,035	1,076	19	5
Bundled	188	273	380	466	488	497	511	528	557	571	27	3
Unbundled	231	225	234	302	342	372	405	445	478	505	10	8
Service Revenue	270	347	439	540	585	637	690	748	812	853	21	8
Total Factory Revenue	1,644	2,154	2,544	2,825	2,932	2,989	3,083	3,188	3,327	3,396	16	3
Increase over Prior Year (%)	36	31	18	11	4	2	3	3	4	2		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 14
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
Region: Europe
Platform: Technical Workstation

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	7,224	12,344	19,246	23,368	27,597	29,960	32,150	34,180	36,690	38,290	40	7
Unit Shipments or Seats	7,224	12,344	19,246	23,368	27,597	29,960	32,150	34,180	36,690	38,290	40	7
CPU Installed Base	11,953	23,972	42,271	63,477	86,702	109,190	129,770	148,120	164,260	178,480	64	16
Installed Seats	11,953	23,972	42,271	63,477	86,702	109,190	129,770	148,120	164,260	178,480	64	16
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	47.0	53.0	53.5	52.2	48.6	46.4	44.6	43.2	42.1	41.2	1	-3
Hardware-Only ASP	29.1	26.4	20.4	19.9	16.3	14.8	13.6	12.8	12.4	12.0	-13	-6
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	237	452	636	716	744	752	757	764	788	790	33	1
CPU Revenue	194	366	525	594	608	614	618	623	643	644	33	1
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	43	86	110	122	136	138	139	140	145	146	33	1
Software Revenue	157	237	350	472	505	542	579	624	674	708	34	7
Bundled	75	137	234	303	319	332	346	360	384	395	43	4
Unbundled	81	100	116	168	187	210	233	263	290	313	23	11
Service Revenue	84	156	257	329	359	407	454	502	554	586	44	10
Total Factory Revenue	478	844	1,244	1,517	1,608	1,700	1,789	1,889	2,015	2,084	35	5
Increase over Prior Year (%)	96	77	47	22	6	6	5	6	7	3		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 15
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
Region: Europe
Platform: Host-Dependent

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	2,215	2,148	2,500	2,949	1,975	1,850	1,850	1,800	1,790	1,810	-3	-2
Unit Shipments or Seats	9,903	11,205	12,122	11,903	9,880	8,570	8,060	7,370	6,900	6,560	-0	-8
CPU Installed Base	4,801	6,874	9,192	11,706	12,946	13,740	14,150	14,280	14,260	14,170	28	2
Installed Seats	24,933	36,021	47,418	57,336	63,293	65,690	66,490	65,650	63,870	61,790	26	-0
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	237.2	358.0	459.2	286.0	274.6	258.5	248.0	237.7	227.4	218.2	4	-4
Hardware-Only ASP	929.0	419.7	164.2	142.5	221.8	207.1	190.8	175.8	161.9	149.3	-30	-8
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	574	679	612	517	384	335	316	287	267	253	-10	-8
CPU Revenue	277	403	387	356	248	215	201	183	171	161	-3	-8
Terminal Revenue	222	214	186	122	104	92	90	82	75	71	-17	-7
Peripheral Revenue (Turnkey)	75	63	39	39	31	27	25	23	22	20	-20	-8
Software Revenue	190	173	157	185	158	140	130	123	120	118	-5	-6
Bundled	94	118	128	151	128	116	107	102	101	99	8	-5
Unbundled	97	55	29	35	30	24	22	21	20	19	-26	-8
Service Revenue	173	178	162	185	157	148	139	134	132	131	-2	-4
Total Factory Revenue	938	1,031	931	888	699	623	585	545	520	502	-7	-6
Increase over Prior Year (%)	15	10	-10	-5	-21	-11	-6	-7	-5	-3		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 16
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
Region: Europe
Platform: Server

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	NA	NA	NA	NA	1,622	2,050	2,510	3,010	3,490	3,860	NA	19
Unit Shipments or Seats	NA	NA	NA	NA	1,622	2,050	2,510	3,010	3,490	3,860	NA	19
CPU Installed Base	NA	NA	NA	NA	1,622	3,570	5,850	8,220	10,750	12,840	NA	51
Installed Seats	NA	NA	NA	NA	1,622	3,570	5,850	8,220	10,750	12,840	NA	51
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	NA	NA	NA	NA	147.5	140.6	134.8	129.2	123.7	118.8	NA	-4
Hardware-Only ASP	NA	NA	NA	NA	40.9	36.9	33.9	32.1	31.2	30.5	NA	-6
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	NA	NA	NA	NA	104	123	141	160	177	187	NA	12
CPU Revenue	NA	NA	NA	NA	90	105	121	137	151	160	NA	12
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	NA	NA	NA	NA	15	18	21	23	25	27	NA	13
Software Revenue	NA	NA	NA	NA	37	46	56	66	75	81	NA	17
Bundled	NA	NA	NA	NA	30	38	46	54	61	66	NA	17
Unbundled	NA	NA	NA	NA	7	8	10	12	14	16	NA	18
Service Revenue	NA	NA	NA	NA	41	50	60	71	80	88	NA	16
Total Factory Revenue	NA	NA	NA	NA	182	219	258	297	332	356	NA	14
Increase over Prior Year (%)	NA	NA	NA	NA	NA	20	18	15	12	7		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 17
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
Region: Europe
Platform: Personal Computer

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	27,824	32,722	40,662	51,199	57,422	60,830	63,850	66,380	67,730	67,690	20	3
Unit Shipments or Seats	27,824	32,722	40,662	51,199	57,422	60,830	63,850	66,380	67,730	67,690	20	3
CPU Installed Base	54,678	85,088	119,445	158,055	195,377	228,300	256,730	280,400	298,690	311,420	37	10
Installed Seats	54,678	85,088	119,445	158,055	195,377	228,300	256,730	280,400	298,690	311,420	37	10
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	10.3	14.3	28.6	25.4	23.1	20.5	18.5	17.5	16.6	16.0	22	-7
Hardware-Only ASP	4.4	4.5	4.9	4.8	4.3	4.0	3.7	3.4	3.3	3.1	-1	-6
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	143	178	242	284	285	274	263	256	248	238	19	-4
CPU Revenue	124	160	212	250	252	246	237	231	224	214	20	-3
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	19	18	30	34	33	28	26	25	25	23	14	-7
Software Revenue	72	88	107	111	130	141	151	160	166	169	16	5
Bundled	19	18	18	12	11	12	12	12	12	11	-13	1
Unbundled	53	70	89	99	119	129	140	148	154	157	22	6
Service Revenue	13	13	20	25	27	32	37	41	46	49	21	12
Total Factory Revenue	228	279	369	420	442	447	451	457	460	455	18	1
Increase over Prior Year (%)	55	22	32	14	5	1	1	1	1	-1		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 18
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
Region: Asia
Platform: All Platforms

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	24,549	28,248	39,674	62,305	59,293	62,450	67,530	72,210	74,770	77,110	25	5
Unit Shipments or Seats	32,230	34,395	44,984	68,288	64,472	66,450	70,860	74,990	77,150	79,190	19	4
CPU Installed Base	47,940	74,354	109,059	161,324	204,170	242,870	278,350	309,710	335,390	355,870	44	12
Installed Seats	64,922	97,265	136,663	193,428	238,844	277,850	312,070	341,580	365,110	383,170	38	10
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	97.8	107.3	57.3	49.1	43.8	41.1	39.2	38.5	38.2	38.3	-18	-3
Hardware-Only ASP	25.1	11.2	9.8	8.9	10.5	9.7	9.0	8.7	8.8	8.9	-20	-3
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	1,080	1,028	1,006	1,301	1,271	1,202	1,181	1,190	1,201	1,219	4	-1
CPU Revenue	658	629	757	1,027	999	953	939	947	957	971	11	-1
Terminal Revenue	260	193	79	68	53	39	33	29	26	24	-33	-15
Peripheral Revenue (Turnkey)	161	205	170	206	219	210	209	214	218	224	8	0
Software Revenue	289	409	462	551	605	600	614	645	687	734	20	4
Bundled	230	298	343	397	427	404	401	406	413	423	17	-0
Unbundled	60	112	118	154	178	195	213	239	274	311	32	12
Service Revenue	139	198	210	254	273	310	341	371	400	425	19	9
Total Factory Revenue	1,508	1,635	1,677	2,106	2,150	2,112	2,136	2,206	2,287	2,378	9	2
Increase over Prior Year (%)	34	8	3	26	2	-2	1	3	4	4		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 19

CAD/CAM/CAE/CIS History and Forecast Update

Application: Mechanical
 Region: Asia
 Platform: Technical Workstation

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	3,975	6,617	12,956	20,358	21,628	23,670	26,200	29,690	32,990	36,300	53	11
Unit Shipments or Seats	3,975	6,617	12,956	20,358	21,628	23,670	26,200	29,690	32,990	36,300	53	11
CPU Installed Base	6,102	12,565	25,042	44,307	63,474	82,620	101,080	119,430	137,070	153,810	80	19
Installed Seats	6,102	12,565	25,042	44,307	63,474	82,620	101,080	119,430	137,070	153,810	80	19
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	94.1	78.3	52.6	42.6	46.5	44.3	42.6	41.3	40.3	39.4	-16	-3
Hardware-Only ASP	29.4	13.2	23.8	23.7	21.0	20.0	18.4	17.4	16.8	16.3	-8	-5
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	205	265	413	574	611	624	644	689	732	775	31	5
CPU Revenue	175	195	315	442	467	480	496	531	566	600	28	5
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	31	71	99	132	144	144	148	158	166	175	47	4
Software Revenue	86	151	217	262	305	326	361	408	460	515	37	11
Bundled	70	112	173	193	218	219	228	245	260	277	33	5
Unbundled	16	39	44	69	87	107	133	164	200	238	53	22
Service Revenue	33	73	84	104	121	151	180	209	239	265	38	17
Total Factory Revenue	324	490	714	940	1,037	1,101	1,184	1,306	1,431	1,556	34	8
Increase over Prior Year (%)	195	51	46	32	10	6	8	10	10	9		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 20
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
Region: Asia
Platform: Host-Dependent

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	971	1,365	2,588	3,165	2,557	2,210	2,030	1,870	1,770	1,700	27	-8
Unit Shipments or Seats	8,652	7,512	7,899	9,147	7,737	6,080	5,240	4,540	4,050	3,690	-3	-14
CPU Installed Base	4,054	5,367	7,760	10,498	12,351	13,620	14,570	15,040	15,030	14,730	32	4
Installed Seats	21,037	28,279	35,365	42,602	47,024	48,590	48,290	46,920	44,740	42,030	22	-2
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	689.1	638.9	211.2	217.2	189.0	178.8	171.5	164.4	157.5	151.2	-28	-4
Hardware-Only ASP	1,367.4	155.2	131.1	84.1	265.5	239.4	219.9	202.4	185.4	171.1	-34	-8
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	703	545	421	462	375	300	261	227	204	186	-15	-13
CPU Revenue	345	292	295	352	287	232	202	176	158	144	-5	-13
Terminal Revenue	260	193	79	68	53	39	33	29	26	24	-33	-15
Peripheral Revenue (Turnkey)	97	60	47	43	36	29	25	22	20	18	-22	-13
Software Revenue	115	166	136	169	148	126	114	104	98	93	7	-9
Bundled	94	127	104	138	119	100	91	82	77	72	6	-9
Unbundled	21	38	32	31	30	26	23	22	21	21	9	-7
Service Revenue	89	113	106	125	109	108	104	99	94	90	5	-4
Total Factory Revenue	907	824	663	756	632	534	479	430	395	369	-9	-10
Increase over Prior Year (%)	15	-9	-20	14	-16	-16	-10	-10	-8	-7		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 21
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
Region: Asia
Platform: Server

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	NA	NA	NA	NA	1,235	1,650	2,010	2,360	2,690	3,010	NA	20
Unit Shipments or Seats	NA	NA	NA	NA	1,235	1,650	2,010	2,360	2,690	3,010	NA	20
CPU Installed Base	NA	NA	NA	NA	1,235	2,810	4,630	6,500	8,420	10,040	NA	52
Installed Seats	NA	NA	NA	NA	1,235	2,810	4,630	6,500	8,420	10,040	NA	52
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	NA	NA	NA	NA	124.6	118.3	113.5	108.8	104.2	100.0	NA	-4
Hardware-Only ASP	NA	NA	NA	NA	24.9	23.6	21.7	20.6	20.0	19.7	NA	-5
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	NA	NA	NA	NA	63	80	91	101	109	116	NA	13
CPU Revenue	NA	NA	NA	NA	54	69	78	87	94	100	NA	13
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	NA	NA	NA	NA	9	11	13	14	15	16	NA	12
Software Revenue	NA	NA	NA	NA	22	29	34	39	44	48	NA	17
Bundled	NA	NA	NA	NA	18	23	28	31	34	37	NA	16
Unbundled	NA	NA	NA	NA	4	5	7	8	9	11	NA	21
Service Revenue	NA	NA	NA	NA	19	25	30	34	38	42	NA	17
Total Factory Revenue	NA	NA	NA	NA	104	134	155	174	191	206	NA	15
Increase over Prior Year (%)	NA	NA	NA	NA	NA	28	16	13	10	8		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 22
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
Region: Asia
Platform: Personal Computer

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	19,603	20,266	24,129	38,783	33,873	34,920	37,300	38,300	37,330	36,110	15	1
Unit Shipments or Seats	19,603	20,266	24,129	38,783	33,873	35,040	37,420	38,410	37,420	36,200	15	1
CPU Installed Base	37,783	56,421	76,257	106,519	127,111	143,820	158,060	168,740	174,880	177,290	35	7
Installed Seats	37,783	56,421	76,257	106,519	127,111	143,820	158,060	168,740	174,880	177,290	35	7
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	25.7	33.2	19.7	19.2	14.5	12.8	11.5	10.8	10.3	9.8	-13	-8
Hardware-Only ASP	5.7	7.0	4.7	4.4	4.2	3.9	3.6	3.4	3.2	3.1	-7	-6
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	172	217	172	264	222	198	186	173	156	141	7	-9
CPU Revenue	139	143	148	233	191	172	163	153	139	126	8	-8
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	33	74	25	31	30	26	23	20	17	15	-2	-13
Software Revenue	89	93	109	120	130	119	105	93	85	78	10	-10
Bundled	66	58	66	66	73	62	55	48	42	36	2	-13
Unbundled	23	35	42	54	57	57	50	45	43	42	26	-6
Service Revenue	16	12	20	25	25	26	28	29	29	28	12	3
Total Factory Revenue	277	322	300	409	377	344	318	295	270	248	8	-8
Increase over Prior Year (%)	21	16	-7	36	-8	-9	-7	-7	-8	-8		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 23

CAD/CAM/CAR/CIS History and Forecast Update

Application: Mechanical
 Region: Rest of World
 Platform: All Platforms

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	2,889	2,596	3,309	4,565	6,103	7,630	9,020	10,470	11,890	13,220	21	17
Unit Shipments or Seats	3,646	3,396	3,824	5,175	6,669	8,140	9,500	10,940	12,300	13,610	16	15
CPU Installed Base	5,309	7,624	10,389	13,898	18,334	23,590	29,560	36,170	43,060	49,950	36	22
Installed Seats	7,148	9,912	12,916	16,744	21,408	26,740	32,690	39,230	46,050	52,840	32	20
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	62.2	70.0	60.5	45.4	33.9	32.6	31.8	31.0	30.3	29.7	-14	-3
Hardware-Only ASP	32.4	18.1	12.9	10.4	8.5	7.0	6.2	5.7	5.2	5.0	-28	-10
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	104	71	63	65	67	72	77	83	87	91	-10	6
CPU Revenue	66	46	45	48	50	56	61	67	71	75	-7	8
Terminal Revenue	27	20	12	11	11	9	9	8	7	7	-21	-9
Peripheral Revenue (Turnkey)	10	6	6	6	6	7	8	9	9	10	-12	9
Software Revenue	13	15	18	19	29	36	44	52	61	72	22	20
Bundled	8	9	11	10	12	14	16	19	20	21	10	11
Unbundled	4	6	8	9	16	21	28	33	40	51	39	26
Service Revenue	14	15	16	16	17	20	23	27	30	34	5	15
Total Factory Revenue	131	102	97	101	113	127	144	162	178	197	-4	12
Increase over Prior Year (%)	7	-22	-5	4	11	13	13	12	10	11		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 24
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
Region: Rest of World
Platform: Technical Workstation

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	570	539	739	923	1,054	1,290	1,570	1,870	2,150	2,380	17	18
Unit Shipments or Seats	570	539	739	923	1,054	1,290	1,570	1,870	2,150	2,380	17	18
CPU Installed Base	1,148	1,644	2,286	3,021	3,774	4,620	5,610	6,800	8,100	9,440	35	20
Installed Seats	1,148	1,644	2,286	3,021	3,774	4,620	5,610	6,800	8,100	9,440	35	20
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	32.6	38.6	46.4	36.5	33.9	32.3	31.1	30.1	29.4	28.7	1	-3
Hardware-Only ASP	31.0	24.4	11.5	16.0	12.5	11.4	10.4	9.8	9.5	9.2	-20	-6
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	15	16	19	21	20	24	27	31	34	36	8	12
CPU Revenue	12	13	15	17	16	19	21	24	27	28	7	12
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	3	3	4	4	4	5	6	7	7	8	11	12
Software Revenue	5	6	9	9	14	18	22	27	31	34	33	19
Bundled	3	3	6	7	8	10	12	14	15	17	25	16
Unbundled	1	2	2	3	6	8	11	13	15	18	48	22
Service Revenue	3	5	8	9	9	11	13	15	18	20	26	18
Total Factory Revenue	23	27	36	39	43	52	62	73	82	90	17	16
Increase over Prior Year (%)	25	18	34	8	11	20	19	17	13	9		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 25
CAD/CAM/CAE/GIS History and Forecast Update

Application: Mechanical
Region: Rest of World
Platform: Host-Dependent

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	93	103	134	123	75	70	70	70	70	70	-5	-1
Unit Shipments or Seats	849	903	649	733	642	580	550	540	480	450	-7	-7
CPU Installed Base	541	558	627	662	642	570	530	500	470	470	4	-6
Installed Seats	2,381	2,845	3,153	3,509	3,716	3,720	3,670	3,570	3,470	3,360	12	-2
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	496.3	482.0	601.0	365.8	367.4	350.9	336.6	322.5	308.9	296.6	-7	-4
Hardware-Only ASP	1,342.8	522.2	182.5	217.9	313.0	285.0	261.6	239.8	219.6	202.0	-31	-8
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	79	46	32	28	22	19	18	17	15	13	-27	-10
CPU Revenue	44	24	18	16	10	9	8	8	7	6	-30	-11
Terminal Revenue	27	20	12	11	11	9	9	8	7	7	-21	-9
Peripheral Revenue (Turnkey)	7	3	2	1	1	1	1	1	1	0	-39	-13
Software Revenue	6	7	5	5	4	4	4	4	3	3	-8	-6
Bundled	4	5	4	4	3	3	3	3	2	2	-10	-7
Unbundled	1	2	2	1	1	1	1	1	1	1	-5	-4
Service Revenue	10	10	7	7	5	5	5	5	4	4	-15	-7
Total Factory Revenue	94	64	44	40	31	28	26	25	22	20	-24	-9
Increase over Prior Year (%)	-4	-33	-31	-9	-22	-10	-6	-4	-13	-10		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 26

CAD/CAM/CAE/CAS History and Forecast Update

Application: Mechanical
 Region: Rest of World
 Platform: Server

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	NA	NA	NA	NA	115	150	190	240	280	330	NA	24
Unit Shipments or Seats	NA	NA	NA	NA	115	150	190	240	280	330	NA	24
CPU Installed Base	NA	NA	NA	NA	115	260	430	620	830	1,020	NA	55
Installed Seats	NA	NA	NA	NA	115	260	430	620	830	1,020	NA	55
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	NA	NA	NA	NA	87.7	83.8	80.3	77.0	73.7	70.8	NA	-4
Hardware-Only ASP	NA	NA	NA	NA	32.1	29.2	26.8	25.5	24.7	24.2	NA	-5
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	NA	NA	NA	NA	5	6	7	8	9	10	NA	16
CPU Revenue	NA	NA	NA	NA	4	5	6	7	8	9	NA	16
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	NA	NA	NA	NA	1	1	1	1	1	1	NA	15
Software Revenue	NA	NA	NA	NA	1	2	2	3	3	3	NA	19
Bundled	NA	NA	NA	NA	1	1	2	2	2	2	NA	17
Unbundled	NA	NA	NA	NA	0	0	1	1	1	1	NA	25
Service Revenue	NA	NA	NA	NA	2	2	3	4	4	5	NA	19
Total Factory Revenue	NA	NA	NA	NA	8	10	12	14	16	18	NA	18
Increase over Prior Year (%)	NA	NA	NA	NA	NA	22	22	18	15	11		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

Table 27

CAD/CAM/CAE/GIS History and Forecast Update

Application: GIS/Mapping
 Region: Rest of World
 Platform: Personal Computer

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	398	269	822	1,126	1,628	1,950	2,430	3,030	3,780	4,520	42	23
Unit Shipments or Seats	398	269	822	1,126	1,628	1,950	2,430	3,030	3,780	4,520	42	23
CPU Installed Base	464	729	1,521	2,557	3,988	5,580	7,410	9,530	12,030	14,880	71	30
Installed Seats	464	729	1,521	2,557	3,988	5,580	7,410	9,530	12,030	14,880	71	30
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	6.0	35.1	64.1	24.1	22.3	20.1	18.1	17.0	16.1	15.5	39	-7
Hardware-Only ASP	4.8	5.9	4.9	4.6	4.3	4.0	3.6	3.4	3.3	3.1	-3	-6
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	2	2	5	6	7	8	9	11	13	14	42	14
CPU Revenue	2	2	4	5	7	8	9	11	12	14	43	14
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	0	0	0	0	0	0	0	0	0	0	0	-6
Software Revenue	1	1	3	4	5	6	8	9	11	13	58	20
Bundled	0	0	0	0	0	0	0	0	0	0	-7	-6
Unbundled	1	1	3	4	5	6	8	9	11	13	66	21
Service Revenue	0	0	1	1	1	1	2	2	3	4	84	32
Total Factory Revenue	3	3	8	10	14	16	19	22	26	31	49	18
Increase over Prior Year (%)	120	15	166	22	32	16	19	19	20	18		

Note: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (October 1992)

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Internal Distribution

**Mechanical Applications
Preliminary Forecast**

May 18, 1992

**Source:
Dataquest**

Market Statistics

**CAD/CAM/CAE
Mechanical Applications**

CCAM-MEC-MS-9201

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Preliminary Forecast
May 18, 1992**

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Market Statistics

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File behind the *Market Statistics* tab inside the
binder labeled CAD/CAM/CAE--*Mechanical
Applications*

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May 1992

Mechanical Applications Preliminary Forecast

May 18, 1992

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Note: All tables show estimated data.

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Mechanical Applications Preliminary Forecast

Introduction

The slowing of world economies was a major factor affecting CAD/CAM/CAE growth in 1991 and will continue to affect growth over the next few years. Many of the major world economies faltered in 1991 to 1992. On a list of the 33 largest countries compiled earlier this year by the Economic Analysis Department of The Dun & Bradstreet Corporation, 18 were in or near recession. Although the gross domestic product/gross national product (GDP/GNP) forecast for 1992 to 1993 has been adjusted upward for the United States, the GDP/GNP forecast for 1992 to 1993 for 7 of the 14 European economies tracked has been adjusted downward. The Japanese economy, which has traditionally exhibited steady growth when other major economies slowed, began to falter in the latter half of 1991. Forecasts call for R&D spending in Japan to slow to less than 10 percent (for the first time in 10 years) and for Japanese domestic spending to decline in the second half of 1992.

In spite of these poor economic conditions, the CAD/CAM/CAE market posted solid growth of 9.5 percent to \$15.8 billion in 1991, somewhat slower than the growth rates of previous years. The market is forecast to grow at a compound annual growth rate (CAGR) of 9 percent through 1996 (see Figure 1). (This forecast is based on the CAD/CAM/CAE group's preliminary market information and will be updated in October).

This document contains Dataquest's detailed forecast information on the CAD/CAM/CAE industry. Included in this document are the following:

- Five-year historical data
- Five-year forecast data

More detailed data on this market may be requested through our client inquiry service.

Forecast Accuracy and Comparison

Overall, last year's CAD/CAM/CAE market forecast appears to have been slightly optimistic in many cases, with some variance among regions (see Table 1).

European growth in 1991 was slightly less than expected because of slower growth in all countries except Benelux. Overall, the European economy slowed considerably during 1991. The North American results for 1991 were somewhat better than expected. Asia was right on target. By application, AEC results were slightly better than expected for 1991; while actual results were somewhat lower than expected in the other application areas. Figure 2 shows the CAD/CAM/CAE forecast by application.

Forecast Assumptions

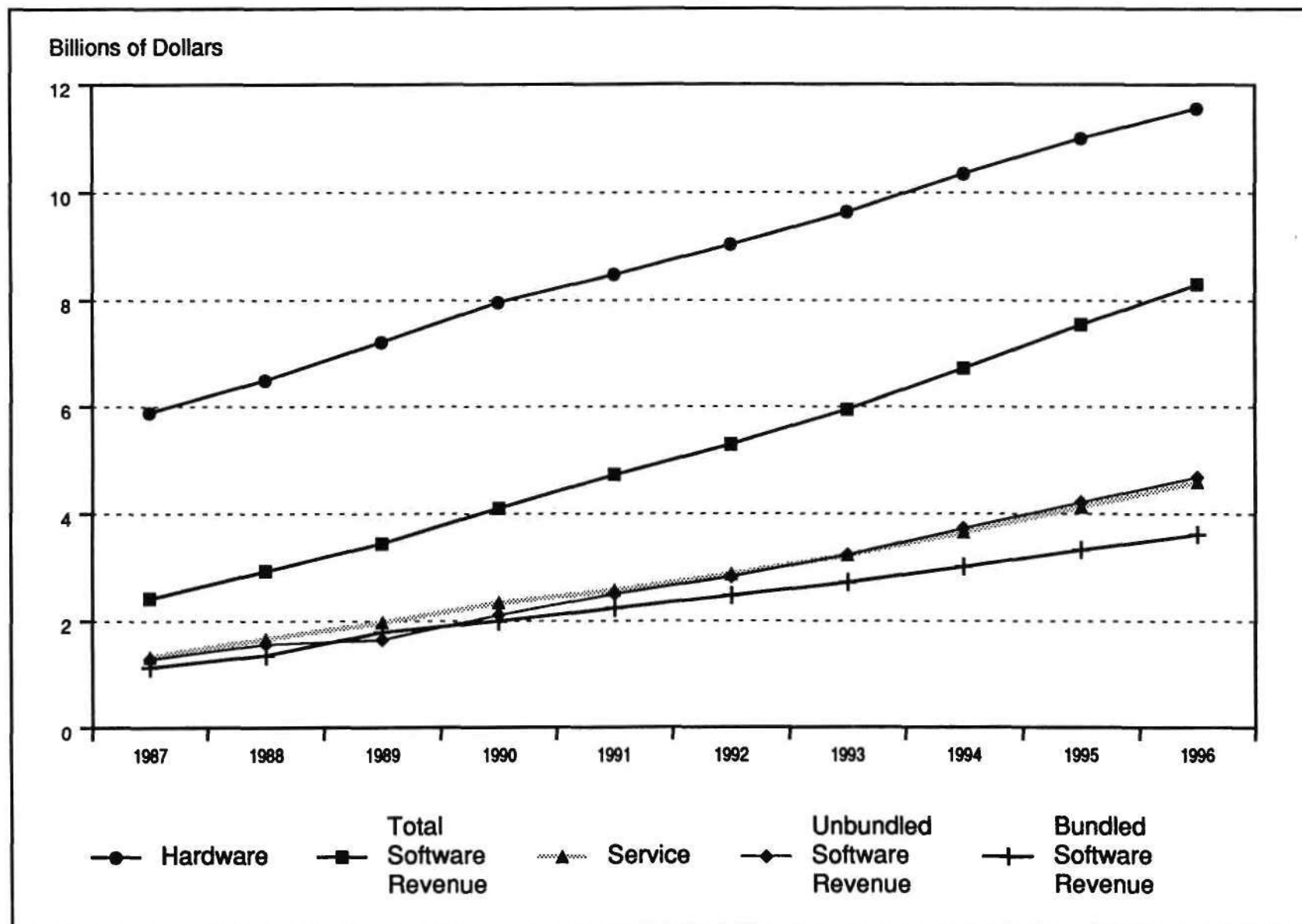
Below are the main forces by region, driving the CAD/CAM/CAE forecast.

Worldwide Forecast Drivers

The following are the main forces driving the CAD/CAM/CAE worldwide forecast:

- CAD/CAM/CAE systems will continue to give buyers a competitive edge. As time-to-market requirements shrink, demand for design automation tools will continue to increase.
- Limited system budget growth in the near term will constrain growth. Budgets for hardware, software, and services are forecast to grow by 5 to 10 percent in North America in 1992, 10 to 15 percent in Europe, and approximately 15 percent in Asia. Dataquest's research indicates that users do not plan to buy one core software

Figure 1
History and Forecast for the CAD/CAM/CAE Market: Hardware, Software, and Service



Source: Dataquest (May 1992)

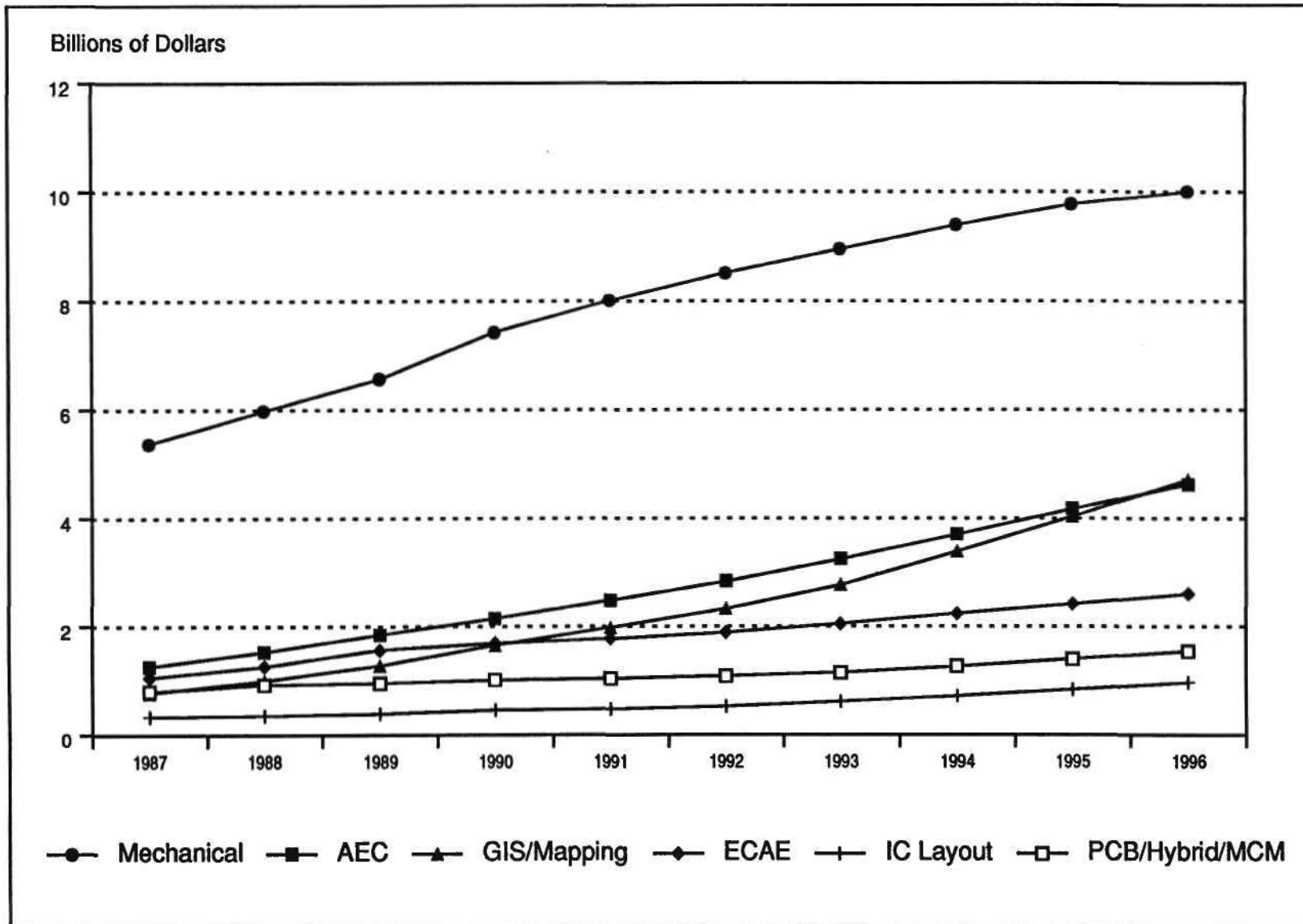
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Table 1
CAD/CAM/CAE Forecast Comparison (Billions of Dollars)

	1991	1992	CAGR (%) 1991-1996
Worldwide			
Last Year's Forecast	16.0	17.9	12
Actual Results and Current Forecast	15.8	17.2	9
Difference (%)	-1.5	-4.2	
North America			
Last Year's Forecast	5.2	5.7	9
Actual Results and Current Forecast	5.3	5.7	7
Difference (%)	2.4	0.5	
Europe			
Last Year's Forecast	6.0	6.8	13
Actual Results and Current Forecast	5.7	6.2	10
Difference (%)	-4.9	-7.9	
Asia			
Last Year's Forecast	4.5	5.1	12
Actual Results and Current Forecast	4.4	4.9	9
Difference (%)	-0.8	-3.6	
Rest of World			
Last Year's Forecast	0.4	0.5	21
Actual Results and Current Forecast	0.3	0.4	16
Difference (%)	-9.6	-14.3	

Source: Dataquest (May 1992)

Figure 2
History and Forecast for the CAD/CAM/CAE Market by Application



Source: Dataquest (May 1992)

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package for each person; the sharing of seats will continue. Networked users will continue to buy systems for a limited number of concurrent users, waiting until the system overloads before buying more.

- Market demand will be limited by the vendors' inability to fully meet demand for highly integrated software systems. Dataquest believes that the industry business model is evolving to a structure where large software vendors will function increasingly as application software integrators. Much of the innovation in new niche products can be expected to come from the small software vendors, which will be dependent on their OEM relationships with "major" software vendors. These alliances will ultimately reduce the total cost of software development, thus strengthening industry profitability. However, design problems will become increasingly complex, and meaningful success in integrating software will lag behind market demand.
- We anticipate incremental progress in delivering open systems and standards to market, which will constrain market demand. When and how open systems successfully arrive on the market will affect the value of CAD tools.
- The "late majority" buyers for CAD/CAM/CAE will be coming to market over the next five years, driving additional growth. However, conservative buyers will favor market leaders. These conservative buyers are the "late majority" buyers who do not buy until the weight of the majority seems to legitimize the product. Therefore, for vendors, the value of having high market share as well as financial clout will increase.
- Market growth will be limited until the second half of 1992 for the EDA market. The major EDA vendors have just introduced their new products. Currently, many EDA buyers are evaluating product options and refraining from purchasing until a thorough evaluation is completed.

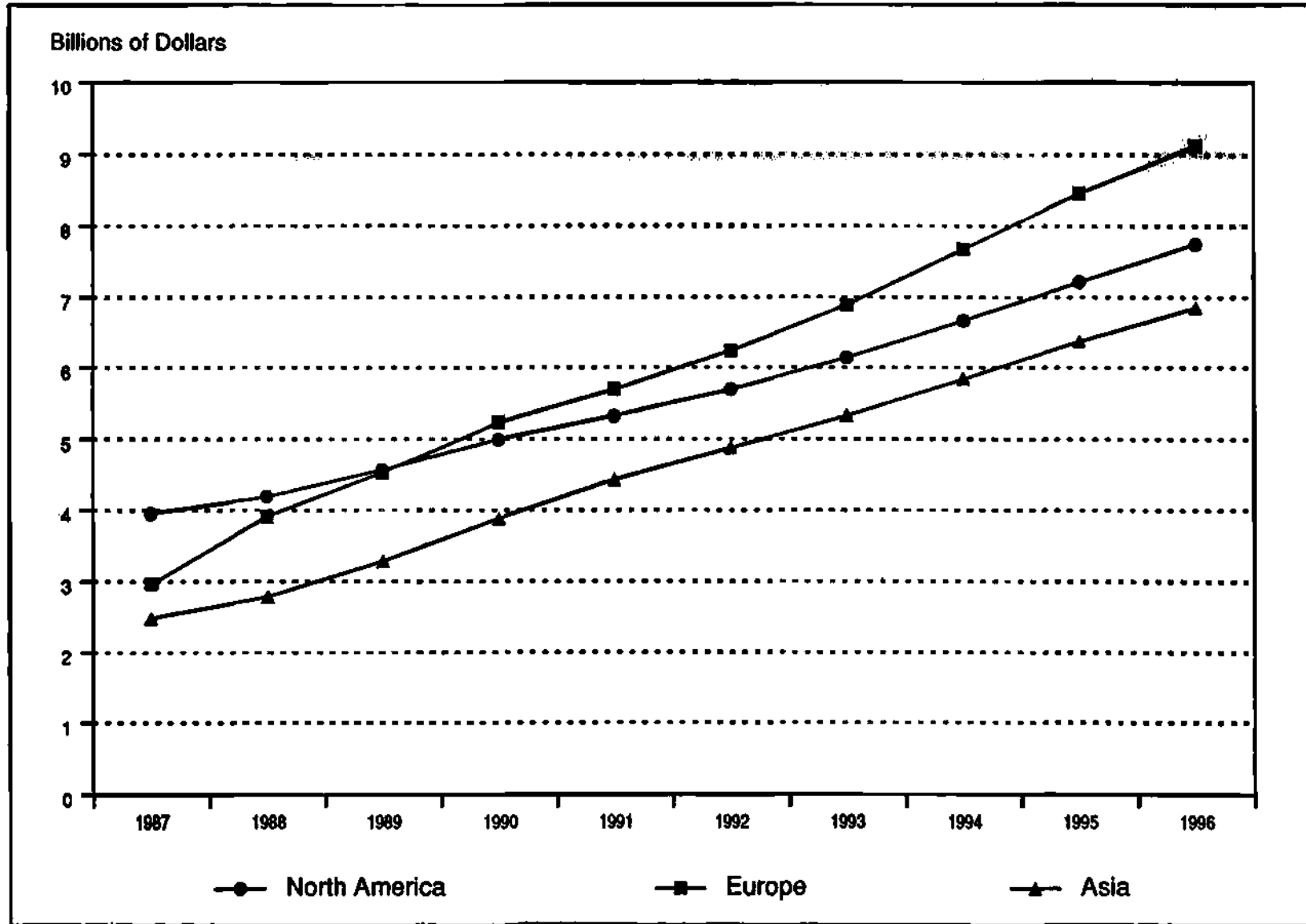
North American Forecast Drivers

The North American market grew 6 percent in 1991 to \$5.3 billion and is forecast to grow at an 8 percent CAGR through 1996 (see Figure 3 for the forecast by region).

Some of the main factors driving the North American forecast are the following:

- Market growth will increase in the second half of 1992. In an across-the-board resurgence of optimism, U.S. business executives have said they expect higher sales and profits in the second quarter, according to The Dun & Bradstreet Corporation's latest nationwide quarterly survey of business executives. "Rebounding sharply from nearly a nine-year low last quarter, the mood of business executives around the nation has grown much more optimistic," said Joseph W. Duncan, vice president and chief economist for The Dun & Bradstreet Corporation. "The turnaround was unequivocal, with virtually all industries and nearly every region of the country expecting stronger sales and profits next quarter."
- Market growth will be reduced because of decreasing average selling prices (ASPs). The United States is a large market with more developed distribution channels and larger order sizes than other markets. Streamlined distribution channels leave fewer places for profit to hide; and, therefore, ASPs have declined more sharply. In contrast, the European market is the sum of many markets of smaller countries, each with its own customs and requirements. Because of these special requirements, ASPs have not been as pressured to decline in European markets as they have been in the U.S. market. Therefore, North American unit shipments will continue to grow significantly, while revenue will grow at a slower rate because of strong price competition.
- Market growth will be limited because of lower defense spending. Spending cuts in the defense budget of 25 to 30 percent over the next five years are currently being proposed by the U.S. administration. In the United States, both republicans and democrats are seeking to balance defense spending cuts against the large loss of jobs that is expected to occur when such reductions are made. Most likely, the defense department will encourage continued growth in R&D spending, while severely limiting the number of programs that would lead to actual production. CAD companies that are heavily dependent on direct or indirect government defense spending contracts will have increasingly limited growth opportunities.

Figure 3
History and Forecast for the CAD/CAM/CAE Market by Region



Source: Dataquest (May 1992)

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European Forecast Drivers

The European market will reach \$9.1 billion by 1996 and grew 9 percent in 1991 to \$5.7 billion. This market is forecast to have a revenue CAGR of 10 percent through 1996. Some of the main issues driving the European forecast include the following:

- Growth will steadily increase in Eastern Europe. The collapse of the Soviet Union as an export market has complicated the difficult situation already facing other central and eastern European countries as they make the transition to market economies and establish new international trading arrangements. Poland, Hungary, and, more recently, Czechoslovakia have made impressive progress in shifting exports to other markets. In all these countries, prices have been set free and inflation seems to be coming under control. The initial groundwork has been laid. GDP/GNP growth is forecast to turn positive during 1992 to 1993 and reach strength toward 1994. As these countries' economies become market economies, CAD/CAM/CAE opportunities will increase.
- Growth will be relatively unaffected by the advent of the European Community (EC). The effects of 1992 will be evolutionary, not revolutionary. Currently, the new EC regulations on environment (such as request for environmental impact studies for town planning) are driving considerable growth in the GIS application area.
- Growth is expected for European vendors as they expand into other European markets. To date, many European vendors have competed only in their country of origin. Over the next forecast period, European vendors will increasingly expand their overseas operations to become more competitive across the European community. German companies and German subsidiaries of international companies are increasingly expanding into Eastern European countries.

Asian Forecast Drivers

The Asian market grew 14 percent in 1991 to \$4.4 billion, and its forecast CAGR for revenue is 9 percent through 1996. Some of

the main issues driving the Asian forecast are as follows:

- Shifting labor costs will affect growth among countries. Labor costs in Japan, Korea, Taiwan, and Hong Kong will continue to increase, which will result in a growing demand for productivity tools including CAD/CAM/CAE. Industries with blue-collar workers will transfer operations to Indonesia, Malaysia, the Philippines, Thailand, and the Republic of China; Japan, Korea, Taiwan, and Hong Kong will grow based on the industry of the white-collar workers. Remote design and manufacturing sites also will encourage the growth of electronic data sharing and thus CAD/CAM across Asia.
- Growth will be strong as companies continue transitioning from the mainframe to network-based desktop environments. CAD/CAM/CAE in Japan is still predominantly a mainframe environment. As companies increase their interest in desktop systems, healthy unit growth will occur, and ASPs should decline sharply.
- Growth will be strong in EDA. Demands for merchant EDA tools supporting the design of ASICs, MCMs, and application-specific standard products (ASSPs) will expand; the development of in-house electronic products will continue to decline. The EDA industry will continue moving toward an oligopoly of vendors providing a full line of tools encapsulated within an open framework, with niche vendors providing point-solution tools.
- Growth is less likely in some Asian countries because of the lack of stringent intellectual property rights. Most Asian countries, with the exception of Japan, have few laws governing intellectual property rights. Many companies will be hesitant to invest or set up operations in a region where they will receive no design protection.
- Mechanical CAD/CAM/CAE growth will continue to be strong in Asia because of growing requirements to support concurrent engineering. Point-solution tools associated with parametric and variational design, manufacturability, and testability will be required. Major vendors will add these tools through OEMs, merger and acquisitions, or

in-house development in order to defend their installed base.

Notes on Forecast

For the 1991 publishing cycle, Dataquest's CAD/CAM/CAE group added server as a platform. The platform categories now include technical workstation, host-dependent, server, and personal computer. Revenue formerly classified in technical workstations, host-dependent, or personal computer may now be more accurately classified, where appropriate, in the server category. However, because of this reclassification, data and growth rates for the other platform areas were affected. Figure 4 depicts the revised platform distribution.

Forecast Methodology

Fundamental to the way Dataquest conducts its research is an underlying philosophy that says the best data and analyses come from a well-balanced program. This program includes 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 GNP growth, interest rate fluctuation, currency 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 1992.

Figure 5 is a pictorial summary of the information compendium offered by the Dataquest CAD/CAM/CAE group.

The CAD/CAM/CAE industry market estimates and forecasts are derived using the following research techniques:

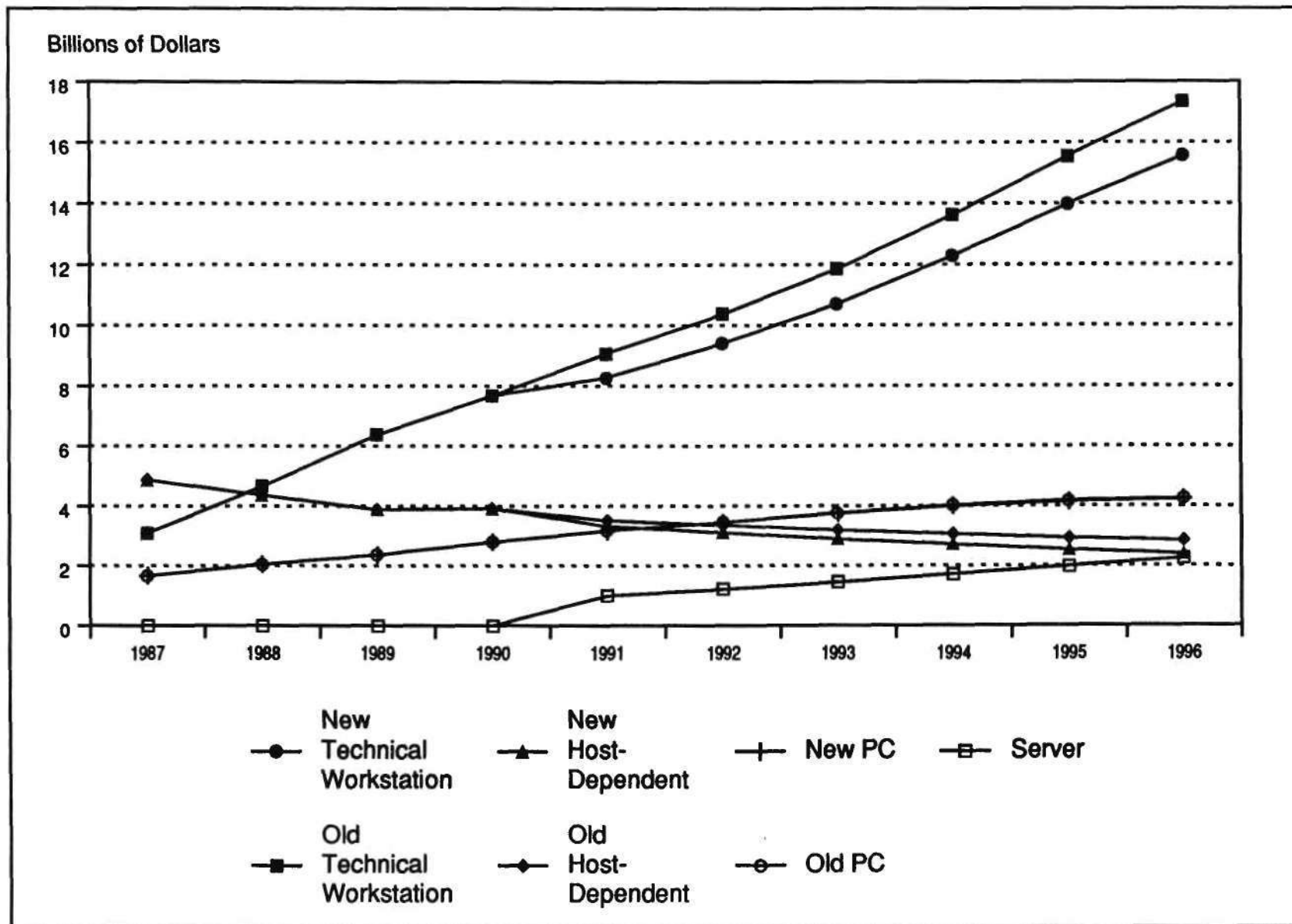
- "Bottom-up" aggregation—This method involves adding all relevant vendor contributions to arrive at total market estimates for all historical data.
- Segment forecasting—For each application segment tracked by the CAD/CAM/CAE group, individual forecasts are derived following the basic information model defined previously. Specifically, each design phase covered within each application is segmented by channel, product, region, and platform. 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 (TAM) model and a satisfied available market figure to accurately assess the levels of penetration. Installed base is also evaluated. Rates of product retirement are primarily based on input from end users in our ongoing survey programs. Figure 6 shows the CAD/CAM/CAE installed base by platform. In addition, Dataquest analysts 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

For complete information on Dataquest's high-technology market segmentation scheme, please refer to the *Dataquest High-Technology Guide: Segmentation and Glossary*.

Dataquest defines CAD/CAM/CAE as systems used in the mechanical; architecture, engineering, and construction (AEC); GIS/mapping; and electronic design automation (EDA) application

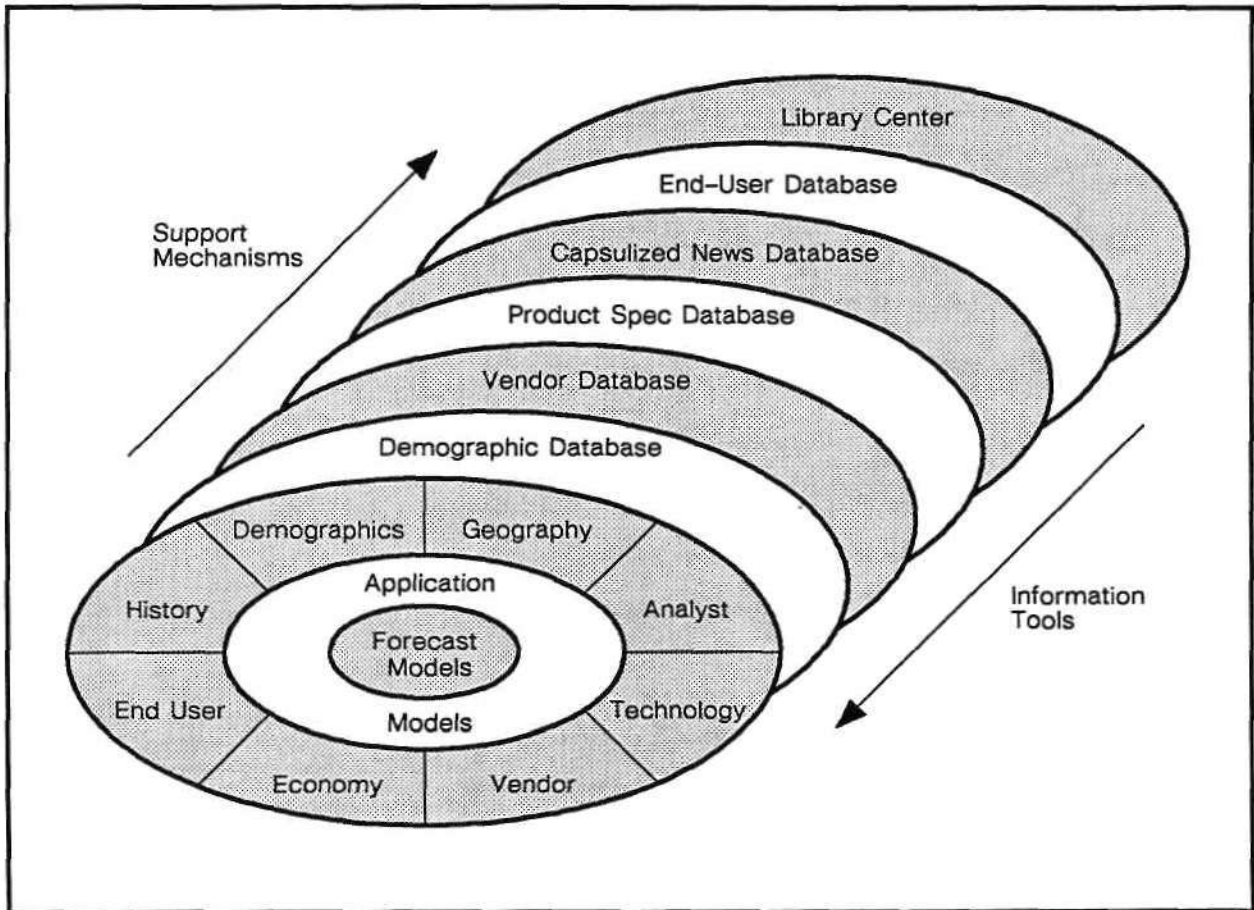
Figure 4
CAD/CAM/CAE Revised Platform Distribution



Source: Dataquest (May 1992)

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Figure 5
Information Compendium



Source: Dataquest (May 1992)

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areas. The CAD/CAM/CAE market is defined according to the following segmentation scheme:

- CAD/CAM/CAE
 - Mechanical
 - AEC (Architecture, Engineering, and Construction)
 - GIS/Mapping (Geographic Information Systems)
 - EDA (Electronic Design Automation)
 - Electronic CAE
 - IC Layout
 - PCB/Hybrid/MCM

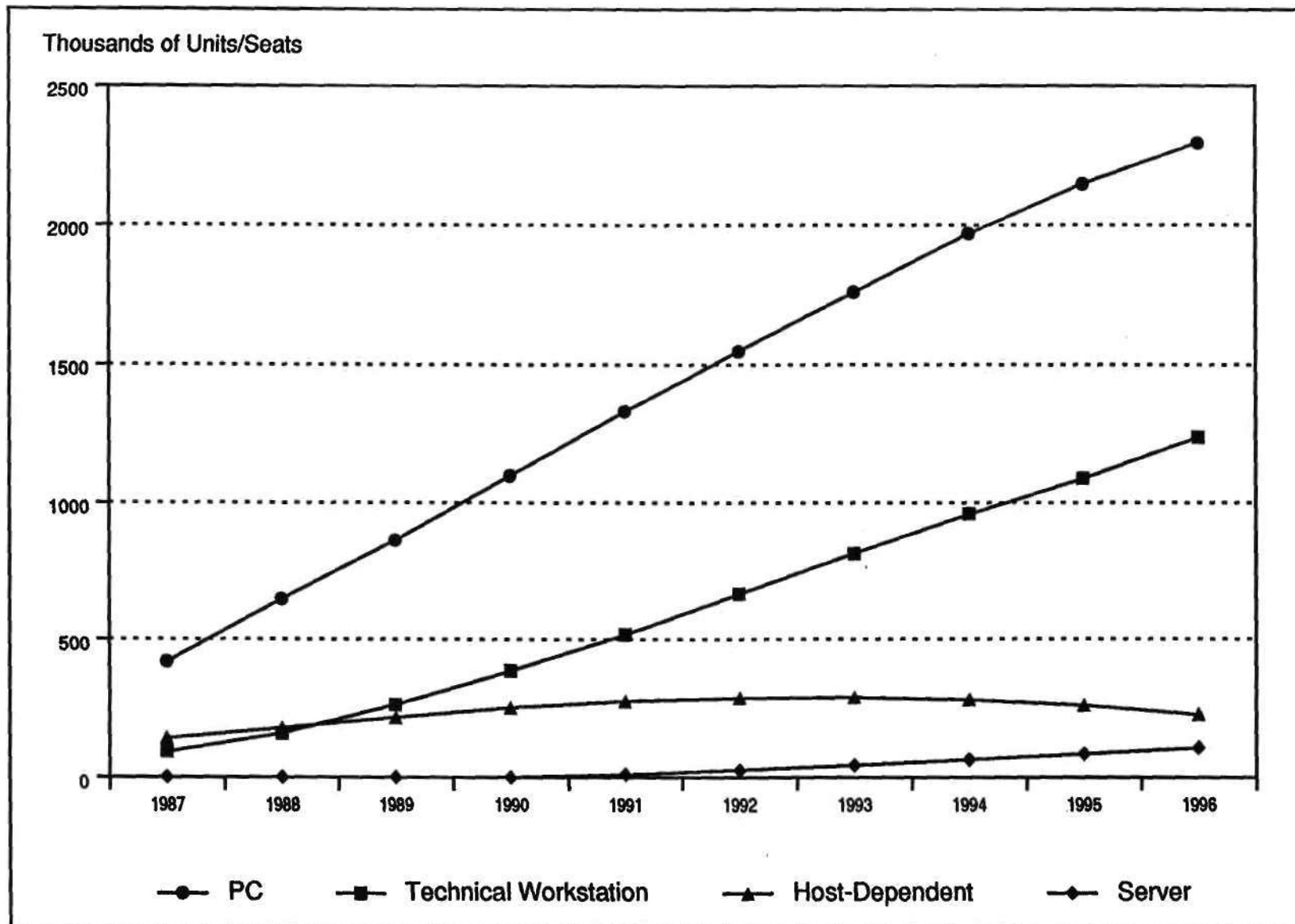
In addition, more detailed information by subapplication is available and usually published in *Dataquest Perspectives*.

For a listing of possible subapplication categories, see the *Dataquest High-Technology Guide: Segmentation and Glossary*.

Definitions

This section lists the definitions that are specific to this document. Complete definitions for all terms can be found in the *Dataquest High-Technology Guide: Segmentation and Glossary*.

Figure 6
CAD/CAM/CAE Installed Base



Source: Dataquest (May 1992)

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Application definitions are as follows:

- **Mechanical**—Mechanical CAD/CAM refers to computer-aided tools used to design, analyze, document, and manufacture discrete parts, components, and assemblies.
- **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.
- **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 ECAE, 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 application 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.

Regional definitions are as follows:

- **North America**—Includes United States and Canada
- **Europe**—Includes the United Kingdom, Scandinavia, Benelux, France, Germany, Italy, Spain, and Rest of Europe
- **Asia**—Includes Japan, Singapore, Taiwan, Korea, China, and Hong Kong
- **Rest of World**—All other countries including Australia, New Zealand, Oceania, Africa, Central America, South America, and the Middle East

Platform definitions are as follows:

- **Technical Workstation**—This is a single-user computer that is distinguished from a personal computer by its features and by the user's potential range of expansion on the platform. Features include a virtual, multitasking operating system (UNIX, VMS, DOMAIN); the computer is designed by manufacturer to run high-performance graphic applications in a multiuser/multitasking environment.
- **Host-Dependent**—This is a shared logic system in which the external workstations' functions are dependent on a host computer.
- **Server**—A server is a computer that transparently provides its resources for use by other computer systems. It is a system on a network that provides specific functionality to other computer systems: the clients. Functions include file storage, database access, compute capability, and others. Dataquest tracks the following major categories of servers used for CAD/CAM/CAE and GIS applications:
 - **Compute Servers**—These systems provide capabilities for solving numerical problems (for example, simulations, statistical calculations, and simultaneous partial differential equations). System features usually include high-speed computational capabilities (for example, vector and parallel processing) and large memories.
 - **Print Servers**—These systems provide access to printers, specialized printing applications software, and print-spooling resources to a network.

- File Servers—These systems provide mass storage capability to clients on a network. Services can range from temporary storage of working files to long-term backup and archive systems.
 - Database Servers—These systems manage databases as a shared resource to a network. These servers handle such functions as physical data storage, data security, and high-level queries and can access stored information at the record level.
 - Personal Computer—This is defined as a single-user computer that is distinguished from a technical workstation by its features and by the user's potential range of expansion on the platform. Features found in technical workstations (such as a virtual operating system, networking, high-performance graphics, multiuser/multitasking capability) are optional rather than integrated by the manufacturer.
- Line item definitions are as follows:
- Average selling price (ASP) is defined as the average price of a product, inclusive of any discounts.
 - CPU installed base is defined as the total number of CPUs in active, day-to-day use.
 - CPU revenue is the portion of revenue derived from a system sale that is related to the value of the CPU. (In the case of technical workstations and personal computers, CPU revenue contains the terminal revenue.)
 - CPU shipment is defined as the number of CPUs delivered.
 - Hardware revenue is defined as the sum of the revenue from the hardware system components: CPU revenue, terminal revenue, and peripherals revenue.
 - Installed seats are defined as the total number of seats in active, day-to-day use.
 - Peripherals revenue is defined as the value of all the peripherals of a turnkey sale. (Peripherals in this category typically are input and output devices.)
 - Service revenue is defined as revenue derived from the service and support of CAD/CAM/CAE or GIS systems. Service revenue can be calculated in the tables by subtracting hardware and software revenue from total revenue.
 - Software revenue is revenue derived from the sale of bundled (part of a turnkey system) and unbundled software.
 - Terminal revenue is defined as revenue derived from the sale of terminals that are used to graphically create, analyze, or manipulate designs. The term is applicable only to the host-dependent platform, as terminal revenue is contained within CPU revenue for technical workstations and PCs.
 - Total factory revenue is defined as the amount of money received by a manufacturer for its goods 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).
 - Unit shipment is defined as the number of products delivered (that is, seats).

Table 2
Preliminary History and Forecast

Application: Mechanical
Region: Worldwide
Platform: All Platforms

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	134,443	165,576	180,794	225,743	249,425	275,120	299,030	319,560	333,860	342,540	17	7
Unit Shipments or Seats	162,425	188,061	203,506	250,064	275,842	298,610	320,130	339,020	351,610	359,120	14	5
CPU Installed Base	270,425	424,786	576,900	745,310	903,484	1,053,200	1,190,410	1,311,710	1,402,430	1,478,220	35	10
Installed Seats	349,024	523,460	693,584	877,895	1,048,984	1,203,720	1,340,060	1,455,310	1,535,300	1,593,950	32	9
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	77.4	86.7	66.0	58.0	52.8	50.0	47.6	45.9	44.6	43.6	-9	-4
Hardware-Only ASP	15.2	10.8	12.0	10.4	10.0	9.5	9.0	8.8	8.6	8.5	-10	-3
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	3,546	3,747	3,947	4,312	4,518	4,698	4,827	4,944	5,023	5,028	6	2
CPU Revenue	2,209	2,617	3,035	3,409	3,581	3,750	3,873	3,980	4,058	4,068	13	3
Terminal Revenue	847	652	438	373	333	302	275	259	238	228	-21	-7
Peripheral Revenue (Turnkey)	490	479	474	530	604	647	679	704	726	732	5	4
Software Revenue	1,095	1,348	1,558	1,877	2,146	2,360	2,556	2,749	2,932	3,055	18	7
Bundled	610	733	933	1,090	1,235	1,344	1,439	1,527	1,617	1,672	19	6
Unbundled	485	615	624	787	911	1,017	1,116	1,222	1,315	1,384	17	9
Service Revenue	735	888	1,062	1,230	1,346	1,466	1,582	1,706	1,827	1,920	16	7
Total Factory Revenue	5,376	5,984	6,568	7,419	8,010	8,525	8,965	9,399	9,782	10,004	10	5
Increase over Prior Year (%)	24	11	10	13	8	6	5	5	4	2		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 3
Preliminary History and Forecast

Application: Mechanical
Region: Worldwide
Platform: Technical Workstation

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	20,398	32,591	54,137	67,491	78,145	91,780	104,770	116,570	127,440	134,950	40	12
Unit Shipments or Seats	20,398	32,591	54,137	67,491	78,145	91,780	104,770	116,570	127,440	134,950	40	12
CPU Installed Base	36,838	68,657	120,383	181,975	248,120	318,800	384,650	442,490	482,590	522,180	61	16
Installed Seats	36,838	68,657	120,383	181,975	248,120	318,800	384,650	442,490	482,590	522,180	61	16
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	56.5	56.3	51.4	46.2	43.9	41.7	40.0	38.7	37.8	36.9	-6	-3
Hardware-Only ASP	28.7	22.9	19.7	19.9	17.7	16.2	15.0	14.1	13.7	13.3	-11	-6
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	742	1,118	1,602	1,864	1,970	2,159	2,314	2,450	2,583	2,642	28	6
CPU Revenue	617	905	1,318	1,525	1,595	1,743	1,866	1,973	2,080	2,126	27	6
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	124	213	284	339	376	415	448	477	503	516	32	7
Software Revenue	367	558	811	1,053	1,198	1,387	1,572	1,757	1,930	2,055	34	11
Bundled	221	327	532	640	707	807	899	986	1,075	1,132	34	10
Unbundled	146	231	279	413	491	580	673	771	856	923	35	13
Service Revenue	199	364	574	669	717	819	920	1,021	1,124	1,197	38	11
Total Factory Revenue	1,308	2,040	2,987	3,585	3,886	4,365	4,806	5,227	5,637	5,895	31	9
Increase over Prior Year (%)	91	56	46	20	8	12	10	9	8	5		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 4
Preliminary History and Forecast

Application: Mechanical
Region: Worldwide
Platform: Host-Dependent

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	5,181	8,027	9,054	10,569	7,724	7,690	7,500	7,430	7,330	7,370	10	-1
Unit Shipments or Seats	33,163	30,512	31,766	34,890	34,140	31,150	28,580	26,860	25,060	23,940	1	-7
CPU Installed Base	18,839	26,198	33,967	42,287	46,502	49,500	51,130	50,640	48,050	43,420	25	-1
Installed Seats	97,438	124,872	150,651	174,871	192,002	200,020	200,780	194,230	180,930	159,150	18	-4
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	358.4	431.8	321.8	268.7	215.9	203.1	194.5	187.0	179.9	173.5	-12	-4
Hardware-Only ASP	1,244.3	151.3	133.7	113.2	243.8	224.1	206.2	189.9	174.1	160.6	-33	-8
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	2,236	1,959	1,678	1,637	1,358	1,251	1,145	1,069	990	939	-12	-7
CPU Revenue	1,087	1,137	1,112	1,145	915	846	775	721	669	633	-4	-7
Terminal Revenue	847	652	438	373	333	302	275	259	238	228	-21	-7
Peripheral Revenue (Turnkey)	301	171	128	119	110	103	95	88	82	78	-22	-7
Software Revenue	497	529	442	495	473	453	429	416	408	403	-1	-3
Bundled	291	328	313	369	360	349	335	325	319	315	5	-3
Unbundled	206	201	129	125	113	104	93	90	89	89	-14	-5
Service Revenue	496	491	437	499	444	424	402	390	379	375	-3	-3
Total Factory Revenue	3,229	2,979	2,557	2,631	2,275	2,127	1,976	1,875	1,777	1,717	-8	-5
Increase over Prior Year (%)	7	-8	-14	3	-14	-7	-7	-5	-5	-3		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 5
Preliminary History and Forecast

Application: Mechanical
Region: Worldwide
Platform: Server

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	NA	NA	NA	NA	5,493	7,110	8,660	10,160	11,490	12,680	NA	18
Unit Shipments or Seats	NA	NA	NA	NA	5,493	7,110	8,660	10,160	11,490	12,680	NA	18
CPU Installed Base	NA	NA	NA	NA	5,493	12,490	20,340	28,380	35,520	42,830	NA	51
Installed Seats	NA	NA	NA	NA	5,493	12,490	20,340	28,380	35,520	42,830	NA	51
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	NA	NA	NA	NA	125.9	119.3	114.6	109.9	105.4	101.2	NA	-4
Hardware-Only ASP	NA	NA	NA	NA	45.0	40.9	37.5	35.6	34.5	33.7	NA	-6
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	NA	NA	NA	NA	331	395	449	497	535	566	NA	11
CPU Revenue	NA	NA	NA	NA	293	349	395	438	472	500	NA	11
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	NA	NA	NA	NA	38	46	53	59	63	66	NA	12
Software Revenue	NA	NA	NA	NA	84	107	130	152	171	185	NA	17
Bundled	NA	NA	NA	NA	65	83	101	118	131	141	NA	17
Unbundled	NA	NA	NA	NA	19	24	29	34	40	44	NA	18
Service Revenue	NA	NA	NA	NA	113	140	165	189	211	230	NA	15
Total Factory Revenue	NA	NA	NA	NA	527	642	744	839	917	981	NA	13
Increase over Prior Year (%)	NA	NA	NA	NA	NA	22	16	13	9	7		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 6
Preliminary History and Forecast

Application: Mechanical
Region: Worldwide
Platform: Personal Computer

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	108,864	124,958	117,603	147,683	158,063	168,550	178,100	185,410	187,600	187,530	10	3
Unit Shipments or Seats	108,864	124,958	117,603	147,683	158,063	168,570	178,120	185,430	187,620	187,550	10	3
CPU Installed Base	214,748	329,931	422,550	521,048	603,369	672,400	734,290	790,210	836,270	869,800	29	8
Installed Seats	214,748	329,931	422,550	521,048	603,369	672,400	734,290	790,210	836,270	869,800	29	8
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	17.2	23.1	20.0	19.1	18.1	18.3	18.1	17.9	17.8	17.5	1	-1
Hardware-Only ASP	4.2	4.4	4.8	4.6	4.5	4.4	4.3	4.3	4.2	4.1	2	-2
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	568	670	667	811	859	894	919	928	915	881	11	1
CPU Revenue	504	576	605	740	778	812	836	847	837	808	11	1
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	64	94	62	72	80	82	82	80	78	72	6	-2
Software Revenue	231	261	304	329	392	414	425	425	423	412	14	1
Bundled	99	78	88	81	103	105	104	99	93	84	1	-4
Unbundled	132	183	216	248	289	309	321	327	331	328	22	3
Service Revenue	40	34	51	62	72	84	95	105	113	119	16	11
Total Factory Revenue	839	965	1,023	1,202	1,322	1,391	1,439	1,458	1,451	1,411	12	1
Increase over Prior Year (%)	35	15	6	18	10	5	3	1	-0	-3		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 7
Preliminary History and Forecast

Application: Mechanical
Region: North America
Platform: All Platforms

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	69,642	85,759	76,194	82,511	89,781	97,810	104,130	109,710	112,430	113,950	7	5
Unit Shipments or Seats	81,494	93,394	83,507	91,230	99,063	106,010	111,620	116,930	119,160	120,550	5	4
CPU Installed Base	145,543	224,639	284,618	335,540	376,746	411,310	441,740	470,280	492,510	511,690	27	6
Installed Seats	185,148	269,970	333,700	387,864	431,137	465,500	494,400	520,560	539,360	553,240	24	5
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	91.6	90.7	78.3	77.1	65.6	61.2	57.8	55.7	54.1	53.2	-8	-4
Hardware-Only ASP	12.4	9.2	11.3	10.7	10.1	9.4	9.0	8.7	8.4	8.3	-5	-4
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	1,406	1,270	1,305	1,297	1,296	1,297	1,303	1,319	1,307	1,298	-2	0
CPU Revenue	888	951	1,026	1,022	1,024	1,043	1,058	1,076	1,074	1,068	4	1
Terminal Revenue	337	224	163	160	146	127	116	112	102	100	-19	-7
Peripheral Revenue (Turnkey)	180	95	116	115	126	128	129	131	131	130	-9	1
Software Revenue	372	424	471	541	603	649	688	722	751	759	13	5
Bundled	184	156	202	216	226	236	248	262	274	286	5	5
Unbundled	189	268	268	324	377	414	440	460	477	473	19	5
Service Revenue	312	310	368	391	396	419	444	472	494	514	6	5
Total Factory Revenue	2,090	2,004	2,144	2,229	2,296	2,366	2,434	2,513	2,552	2,571	2	2
Increase over Prior Year (%)	11	-4	7	4	3	3	3	3	2	1		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 8
Preliminary History and Forecast

Application:	Mechanical											
Region:	North America											
Platform:	Technical Workstation											
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	8,567	12,176	18,170	18,831	22,178	24,890	27,540	29,820	31,380	32,210	27	8
Unit Shipments or Seats	8,567	12,176	18,170	18,831	22,178	24,890	27,540	29,820	31,380	32,210	27	8
CPU Installed Base	17,481	29,190	46,044	61,942	78,759	95,250	109,370	120,830	127,010	132,940	46	11
Installed Seats	17,481	29,190	46,044	61,942	78,759	95,250	109,370	120,830	127,010	132,940	46	11
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	51.3	47.2	50.9	48.6	43.1	41.1	39.5	38.3	37.3	36.5	-4	-3
Hardware-Only ASP	28.2	23.5	19.4	18.3	15.6	14.2	13.0	12.3	11.8	11.5	-14	-6
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	283	357	491	473	473	485	496	505	509	503	14	1
CPU Revenue	235	306	417	400	395	405	414	422	425	420	14	1
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	48	50	73	73	79	80	81	83	83	82	13	1
Software Revenue	119	163	233	296	331	370	404	435	462	476	29	8
Bundled	72	74	119	125	125	133	142	150	158	162	15	5
Unbundled	47	89	114	171	206	237	263	285	305	314	45	9
Service Revenue	78	125	212	213	207	226	245	263	278	288	28	7
Total Factory Revenue	480	645	936	982	1,012	1,081	1,145	1,202	1,249	1,266	20	5
Increase over Prior Year (%)	54	34	45	5	3	7	6	5	4	1		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 9
Preliminary History and Forecast

Application: Mechanical
Region: North America
Platform: Host-Dependent

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	1,898	3,204	3,050	3,524	1,846	1,760	1,730	1,790	1,810	1,930	-1	1
Unit Shipments or Seats	13,750	10,838	10,362	12,242	11,127	9,960	9,230	9,010	8,530	8,530	-5	-5
CPU Installed Base	9,428	12,119	14,272	16,446	16,446	15,990	15,260	14,150	12,670	11,040	15	-8
Installed Seats	49,034	57,450	63,354	68,770	70,838	70,180	67,910	64,430	59,520	52,590	10	-6
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	344.8	360.5	489.5	368.8	279.7	267.2	256.2	245.5	235.2	225.8	-5	-4
Hardware-Only ASP	1,362.0	152.3	128.1	118.6	259.8	236.5	217.1	199.0	182.2	167.7	-34	-8
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	880	648	553	549	418	366	335	322	300	297	-17	-7
CPU Revenue	421	380	355	355	245	216	197	190	178	177	-13	-6
Terminal Revenue	337	224	163	160	146	127	116	112	102	100	-19	-7
Peripheral Revenue (Turnkey)	121	44	35	33	27	24	22	21	20	20	-31	-6
Software Revenue	187	182	140	142	126	120	112	111	112	116	-9	-2
Bundled	100	79	80	88	80	76	74	75	77	82	-5	0
Unbundled	87	103	60	54	46	44	38	36	35	35	-15	-5
Service Revenue	223	177	141	162	129	119	113	112	110	114	-13	-2
Total Factory Revenue	1,290	1,006	835	852	673	605	559	545	523	527	-15	-5
Increase over Prior Year (%)	-3	-22	-17	2	-21	-10	-8	-2	-4	1		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 10
Preliminary History and Forecast

Application: Mechanical
Region: North America
Platform: Server

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	NA	NA	NA	NA	2,093	2,700	3,270	3,760	4,110	4,470	NA	16
Unit Shipments or Seats	NA	NA	NA	NA	2,093	2,700	3,270	3,760	4,110	4,470	NA	16
CPU Installed Base	NA	NA	NA	NA	2,093	4,750	7,720	10,670	13,130	15,580	NA	49
Installed Seats	NA	NA	NA	NA	2,093	4,750	7,720	10,670	13,130	15,580	NA	49
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	NA	NA	NA	NA	122.3	116.8	112.0	107.4	102.8	98.7	NA	-4
Hardware-Only ASP	NA	NA	NA	NA	50.1	45.6	41.9	39.8	38.6	37.8	NA	-5
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	NA	NA	NA	NA	123	146	163	177	184	191	NA	9
CPU Revenue	NA	NA	NA	NA	111	131	147	158	165	173	NA	9
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	NA	NA	NA	NA	12	15	17	18	19	19	NA	9
Software Revenue	NA	NA	NA	NA	27	35	43	50	55	59	NA	17
Bundled	NA	NA	NA	NA	19	24	30	35	37	40	NA	17
Unbundled	NA	NA	NA	NA	9	11	13	15	17	19	NA	16
Service Revenue	NA	NA	NA	NA	43	53	61	69	74	80	NA	13
Total Factory Revenue	NA	NA	NA	NA	193	234	268	295	313	330	NA	11
Increase over Prior Year (%)	NA	NA	NA	NA	NA	21	15	10	6	6		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 11
Preliminary History and Forecast

Application: Mechanical
Region: North America
Platform: Personal Computer

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	59,177	70,379	54,975	60,156	63,664	68,460	71,590	74,340	75,130	75,340	2	3
Unit Shipments or Seats	59,177	70,379	54,975	60,156	63,664	68,460	71,590	74,340	75,130	75,340	2	3
CPU Installed Base	118,634	183,329	224,302	257,151	279,447	295,320	309,400	324,630	339,700	352,130	24	5
Installed Seats	118,634	183,329	224,302	257,151	279,447	295,320	309,400	324,630	339,700	352,130	24	5
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	15.4	13.8	10.8	20.3	13.3	13.2	13.0	12.8	12.6	12.3	-4	-2
Hardware-Only ASP	3.8	3.7	4.7	4.6	4.4	4.4	4.3	4.2	4.2	4.1	4	-2
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	242	266	261	276	282	300	309	316	314	307	4	2
CPU Revenue	232	265	254	267	274	291	299	306	305	298	4	2
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	11	1	7	9	9	9	9	9	9	9	-6	1
Software Revenue	67	78	97	103	119	125	128	127	121	108	15	-2
Bundled	12	2	3	3	2	2	2	2	2	2	-38	-1
Unbundled	55	76	94	100	117	123	126	125	120	106	21	-2
Service Revenue	11	8	14	16	17	21	25	28	31	33	13	14
Total Factory Revenue	320	352	373	395	418	446	462	471	467	448	7	1
Increase over Prior Year (%)	34	10	6	6	6	7	4	2	-1	-4		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 12
Preliminary History and Forecast

Application:	Mechanical											
Region:	Europe											
Platform:	All Platforms											
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	37,362	48,831	61,506	77,034	88,446	96,320	103,780	110,770	116,850	119,770	24	6
Unit Shipments or Seats	45,054	56,812	70,947	85,783	97,890	104,600	111,150	117,510	123,110	125,600	21	5
CPU Installed Base	71,591	117,885	172,246	234,432	298,058	358,050	410,900	455,390	488,070	514,720	43	12
Installed Seats	91,725	145,980	209,526	279,232	349,046	411,890	465,150	507,700	536,380	556,690	40	10
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	55.8	72.5	68.4	62.6	59.6	56.2	53.3	51.2	49.5	48.2	2	-4
Hardware-Only ASP	14.4	13.4	13.0	10.7	9.7	9.4	9.0	8.7	8.6	8.5	-9	-3
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	956	1,360	1,489	1,584	1,646	1,708	1,751	1,804	1,866	1,873	15	3
CPU Revenue	596	975	1,140	1,267	1,322	1,377	1,419	1,468	1,523	1,531	22	3
Terminal Revenue	222	214	175	121	108	102	93	86	81	77	-16	-6
Peripheral Revenue (Turnkey)	138	170	175	196	215	229	239	250	262	264	12	4
Software Revenue	421	500	585	749	854	945	1,037	1,131	1,221	1,281	19	8
Bundled	189	271	353	443	504	549	589	632	683	711	28	7
Unbundled	232	228	232	306	349	396	449	499	538	570	11	10
Service Revenue	271	360	441	546	614	669	724	785	851	895	23	8
Total Factory Revenue	1,647	2,220	2,516	2,879	3,114	3,323	3,513	3,720	3,939	4,049	17	5
Increase over Prior Year (%)	36	35	13	14	8	7	6	6	6	3		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 13
Preliminary History and Forecast

Application: Mechanical
Region: Europe
Platform: Technical Workstation

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	7,287	13,202	20,975	25,562	28,458	32,620	36,740	40,770	44,950	47,500	41	11
Unit Shipments or Seats	7,287	13,202	20,975	25,562	28,458	32,620	36,740	40,770	44,950	47,500	41	11
CPU Installed Base	12,070	25,087	45,384	69,079	93,379	118,180	140,190	158,840	171,590	184,520	67	15
Installed Seats	12,070	25,087	45,384	69,079	93,379	118,180	140,190	158,840	171,590	184,520	67	15
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	46.7	52.8	52.9	51.6	49.7	47.3	45.4	44.1	43.0	42.0	2	-3
Hardware-Only ASP	29.1	25.8	19.6	20.3	18.6	16.9	15.5	14.6	14.1	13.7	-11	-6
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	238	472	667	780	799	855	905	955	1,014	1,032	35	5
CPU Revenue	195	384	561	654	666	712	753	794	843	858	36	5
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	43	88	107	126	132	142	152	160	171	174	32	6
Software Revenue	158	238	341	469	530	606	685	763	839	890	35	11
Bundled	76	137	223	301	337	374	411	448	493	516	45	9
Unbundled	82	101	117	168	193	232	274	315	346	374	24	14
Service Revenue	84	159	265	335	374	422	471	521	574	609	45	10
Total Factory Revenue	480	869	1,272	1,584	1,703	1,882	2,060	2,239	2,428	2,531	37	8
Increase over Prior Year (%)	97	81	46	24	8	11	9	9	8	4		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 14
Preliminary History and Forecast

Application:	Mechanical												
Region:	Europe												
Platform:	Host-Dependent												
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996	
HARDWARE SHIPMENT DATA													
CPU Shipments	2,219	3,272	2,832	3,480	2,525	2,490	2,410	2,400	2,420	2,470	3	-0	
Unit Shipments or Seats	9,912	11,253	12,273	12,230	11,968	10,770	9,770	9,140	8,680	8,290	5	-7	
CPU Installed Base	4,809	8,042	10,713	13,790	15,559	16,800	17,290	16,950	16,040	14,540	34	-1	
Installed Seats	24,944	36,137	47,993	58,590	66,547	70,630	71,540	69,250	64,350	56,510	28	-3	
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)													
Turnkey ASP	236.8	360.9	400.2	265.7	227.0	214.0	205.2	196.5	188.1	180.5	-1	-4	
Hardware-Only ASP	929.0	139.6	149.9	119.0	215.6	204.1	188.4	173.8	160.1	148.0	-31	-7	
REVENUE DATA (Millions of U.S. Dollars)													
Hardware Revenue	574	710	593	536	437	404	366	341	323	308	-7	-7	
CPU Revenue	277	431	381	377	294	269	244	228	216	206	2	-7	
Terminal Revenue	222	214	175	121	108	102	93	86	81	77	-16	-6	
Peripheral Revenue (Turnkey)	75	64	38	38	34	32	29	27	26	25	-18	-6	
Software Revenue	191	174	142	167	161	151	143	139	139	139	-4	-3	
Bundled	94	116	112	130	128	122	116	113	113	113	8	-3	
Unbundled	97	57	30	36	32	29	27	26	26	26	-24	-4	
Service Revenue	173	188	158	188	171	162	153	148	145	144	-0	-3	
Total Factory Revenue	938	1,071	894	892	768	717	662	629	607	591	-5	-5	
Increase over Prior Year (%)	15	14	-17	-0	-14	-7	-8	-5	-3	-3			

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 15
Preliminary History and Forecast

Application: Mechanical
Region: Europe
Platform: Server

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	NA	NA	NA	NA	1,782	2,250	2,750	3,300	3,830	4,240	NA	19
Unit Shipments or Seats	NA	NA	NA	NA	1,782	2,250	2,750	3,300	3,830	4,240	NA	19
CPU Installed Base	NA	NA	NA	NA	1,782	3,990	6,490	9,100	11,540	14,050	NA	51
Installed Seats	NA	NA	NA	NA	1,782	3,990	6,490	9,100	11,540	14,050	NA	51
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	NA	NA	NA	NA	141.4	134.3	128.8	123.3	118.1	113.3	NA	-4
Hardware-Only ASP	NA	NA	NA	NA	50.4	45.8	42.1	39.9	38.7	38.0	NA	-5
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	NA	NA	NA	NA	119	139	160	181	200	213	NA	12
CPU Revenue	NA	NA	NA	NA	105	122	140	158	175	186	NA	12
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	NA	NA	NA	NA	14	17	20	23	25	26	NA	13
Software Revenue	NA	NA	NA	NA	32	40	49	58	66	72	NA	18
Bundled	NA	NA	NA	NA	25	32	39	46	52	57	NA	18
Unbundled	NA	NA	NA	NA	7	8	10	12	14	15	NA	18
Service Revenue	NA	NA	NA	NA	44	53	64	74	85	93	NA	16
Total Factory Revenue	NA	NA	NA	NA	195	232	272	313	351	378	NA	14
Increase over Prior Year (%)	NA	NA	NA	NA	NA	19	17	15	12	8		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 16
Preliminary History and Forecast

Application: Mechanical
Region: Europe
Platform: Personal Computer

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	27,856	32,357	37,699	47,991	55,681	58,960	61,880	64,310	65,640	65,570	19	3
Unit Shipments or Seats	27,856	32,357	37,699	47,991	55,681	58,960	61,880	64,310	65,640	65,570	19	3
CPU Installed Base	54,711	84,756	116,149	151,563	187,339	219,080	246,930	270,500	288,900	301,610	36	10
Installed Seats	54,711	84,756	116,149	151,563	187,339	219,080	246,930	270,500	288,900	301,610	36	10
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	10.3	14.2	23.3	19.2	18.2	21.4	21.2	21.1	20.9	20.4	15	2
Hardware-Only ASP	4.4	4.6	4.9	4.8	4.5	4.5	4.4	4.3	4.3	4.2	1	-1
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	143	178	229	268	290	311	321	328	329	320	19	2
CPU Revenue	124	160	199	236	257	274	282	288	289	281	20	2
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	19	19	30	32	34	37	39	39	40	38	15	3
Software Revenue	73	88	102	114	131	149	161	170	177	180	16	7
Bundled	19	18	18	12	14	22	23	24	25	25	-7	12
Unbundled	53	70	85	102	117	127	138	146	152	155	22	6
Service Revenue	13	14	18	22	26	32	37	42	46	50	18	13
Total Factory Revenue	229	280	349	404	448	492	518	539	553	549	18	4
Increase over Prior Year (%)	56	22	25	15	11	10	5	4	2	-1		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 17
Preliminary History and Forecast

Application: Mechanical
Region: Asia
Platform: All Platforms

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	24,549	28,250	40,151	62,051	65,605	74,020	82,880	89,550	93,790	96,860	28	8
Unit Shipments or Seats	32,230	34,401	45,405	68,098	72,416	80,230	88,400	94,360	97,980	100,520	22	7
CPU Installed Base	47,971	74,471	109,856	162,068	211,530	262,060	310,780	353,320	383,340	407,490	45	14
Installed Seats	64,967	97,503	137,638	194,536	248,167	300,770	349,610	390,490	417,510	436,760	40	12
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	97.8	107.2	57.6	48.3	44.4	42.8	41.0	39.7	38.7	37.8	-18	-3
Hardware-Only ASP	25.1	12.1	11.6	9.1	10.5	10.1	9.5	9.2	9.2	9.3	-20	-2
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	1,080	1,044	1,076	1,350	1,490	1,601	1,674	1,713	1,739	1,744	8	3
CPU Revenue	658	644	814	1,061	1,170	1,259	1,318	1,351	1,371	1,375	15	3
Terminal Revenue	260	193	85	78	66	61	56	51	47	43	-29	-8
Peripheral Revenue (Turnkey)	161	207	176	211	254	281	299	311	321	325	12	5
Software Revenue	289	410	480	562	657	726	783	843	898	943	23	8
Bundled	230	298	363	415	486	538	580	608	633	648	21	6
Unbundled	60	112	117	148	171	188	204	234	266	295	30	11
Service Revenue	139	202	233	269	311	350	383	414	444	470	22	9
Total Factory Revenue	1,508	1,655	1,788	2,182	2,458	2,677	2,841	2,970	3,081	3,157	13	5
Increase over Prior Year (%)	34	10	8	22	13	9	6	5	4	2		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 18
Preliminary History and Forecast

Application: Mechanical
Region: Asia
Platform: Technical Workstation

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	3,975	6,619	14,392	22,288	26,617	33,160	39,140	44,380	49,280	53,260	61	15
Unit Shipments or Seats	3,975	6,619	14,392	22,288	26,617	33,160	39,140	44,380	49,280	53,260	61	15
CPU Installed Base	6,131	12,655	26,710	48,087	72,555	101,310	130,320	157,240	177,670	197,580	85	22
Installed Seats	6,131	12,655	26,710	48,087	72,555	101,310	130,320	157,240	177,670	197,580	85	22
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	94.1	78.3	50.1	39.6	39.0	37.2	35.8	34.7	33.9	33.1	-20	-3
Hardware-Only ASP	29.4	16.8	20.6	22.4	20.7	19.0	17.6	16.5	16.0	15.5	-8	-6
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	205	273	425	589	678	795	885	959	1,026	1,071	35	10
CPU Revenue	175	201	325	454	518	607	677	733	785	820	31	10
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	31	72	100	135	160	187	209	226	241	251	51	9
Software Revenue	86	151	230	279	324	397	464	536	604	661	39	15
Bundled	70	112	184	206	237	290	334	373	408	436	36	13
Unbundled	16	39	46	72	88	107	130	163	195	224	53	21
Service Revenue	33	74	89	110	126	158	189	220	251	279	40	17
Total Factory Revenue	324	498	744	978	1,128	1,350	1,539	1,715	1,880	2,010	37	12
Increase over Prior Year (%)	195	54	49	31	15	20	14	11	10	7		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 19
Preliminary History and Forecast

Application: Mechanical
Region: Asia
Platform: Host-Dependent

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	971	1,365	2,997	3,383	3,214	3,310	3,240	3,110	2,980	2,870	35	-2
Unit Shipments or Seats	8,652	7,516	8,250	9,430	10,025	9,500	8,730	7,900	7,150	6,510	4	-8
CPU Installed Base	4,057	5,395	8,256	11,233	13,664	15,910	17,820	18,820	18,710	17,320	35	5
Installed Seats	21,054	28,426	36,038	43,701	50,300	54,620	56,640	55,990	52,880	46,590	24	-2
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	689.1	639.0	227.2	231.1	186.7	176.1	168.9	161.9	155.1	149.0	-28	-4
Hardware-Only ASP	1,367.4	176.2	105.7	73.4	254.9	228.5	210.1	193.0	177.1	163.2	-34	-9
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	703	554	485	508	467	449	415	378	343	314	-10	-8
CPU Revenue	345	300	347	385	355	342	317	288	262	239	1	-8
Terminal Revenue	260	193	85	78	66	61	56	51	47	43	-29	-8
Peripheral Revenue (Turnkey)	97	60	52	45	47	45	42	38	35	32	-17	-7
Software Revenue	115	166	149	176	177	173	165	157	150	143	11	-4
Bundled	94	127	113	142	144	143	138	130	123	116	11	-4
Unbundled	21	39	36	34	33	30	27	27	27	27	12	-4
Service Revenue	89	116	126	137	134	133	128	122	116	110	11	-4
Total Factory Revenue	907	835	760	821	778	754	709	657	609	568	-4	-6
Increase over Prior Year (%)	15	-8	-9	8	-5	-3	-6	-7	-7	-7		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 20
Preliminary History and Forecast

Application: Mechanical
Region: Asia
Platform: Server

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	NA	NA	NA	NA	1,493	2,000	2,430	2,850	3,250	3,630	NA	19
Unit Shipments or Seats	NA	NA	NA	NA	1,493	2,000	2,430	2,850	3,250	3,630	NA	19
CPU Installed Base	NA	NA	NA	NA	1,493	3,460	5,660	7,930	9,960	12,090	NA	52
Installed Seats	NA	NA	NA	NA	1,493	3,460	5,660	7,930	9,960	12,090	NA	52
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	NA	NA	NA	NA	114.3	107.9	103.5	99.2	95.1	91.3	NA	-4
Hardware-Only ASP	NA	NA	NA	NA	27.3	25.1	23.0	21.9	21.3	20.9	NA	-5
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	NA	NA	NA	NA	80	100	113	125	135	144	NA	13
CPU Revenue	NA	NA	NA	NA	69	87	98	109	118	126	NA	13
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	NA	NA	NA	NA	10	13	15	16	17	18	NA	12
Software Revenue	NA	NA	NA	NA	22	29	35	40	45	49	NA	17
Bundled	NA	NA	NA	NA	19	25	29	33	37	40	NA	16
Unbundled	NA	NA	NA	NA	3	4	5	7	8	9	NA	21
Service Revenue	NA	NA	NA	NA	23	30	35	41	46	50	NA	17
Total Factory Revenue	NA	NA	NA	NA	125	159	183	206	226	243	NA	14
Increase over Prior Year (%)	NA	NA	NA	NA	NA	27	15	13	9	8		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 21
Preliminary History and Forecast

Application: Mechanical
Region: Asia
Platform: Personal Computer

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	19,603	20,266	22,763	36,379	34,281	35,550	38,070	39,210	38,280	37,110	15	2
Unit Shipments or Seats	19,603	20,266	22,763	36,379	34,281	35,570	38,100	39,230	38,300	37,120	15	2
CPU Installed Base	37,783	56,421	74,890	102,749	123,818	141,380	156,980	169,340	177,000	180,500	35	8
Installed Seats	37,783	56,421	74,890	102,749	123,818	141,380	156,980	169,340	177,000	180,500	35	8
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	25.7	33.2	19.8	19.2	18.4	17.8	17.6	17.3	17.0	16.6	-8	-2
Hardware-Only ASP	5.7	7.0	4.7	4.4	4.4	4.4	4.3	4.3	4.2	4.1	-6	-1
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	172	217	166	253	266	258	260	252	234	214	11	-4
CPU Revenue	139	143	141	223	229	223	226	221	207	190	13	-4
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	33	74	25	31	38	35	34	31	28	24	3	-8
Software Revenue	89	93	100	107	133	128	119	109	100	91	11	-7
Bundled	66	58	66	66	86	81	78	72	65	57	7	-8
Unbundled	23	35	34	41	47	47	41	37	35	34	20	-6
Service Revenue	16	12	18	22	27	29	31	32	32	31	14	3
Total Factory Revenue	277	322	284	383	426	414	410	392	366	336	11	-5
Increase over Prior Year (%)	21	16	-12	35	11	-3	-1	-4	-7	-8		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 22
Preliminary History and Forecast

Application:	Mechanical										CAGR (%)	CAGR (%)
Region:	Rest of World										1987-1991	1991-1996
Platform:	All Platforms											
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996		
HARDWARE SHIPMENT DATA												
CPU Shipments	2,891	2,735	2,943	4,148	5,593	6,980	8,240	9,540	10,790	11,960	18	16
Unit Shipments or Seats	3,647	3,454	3,648	4,954	6,473	7,760	8,960	10,210	11,360	12,450	15	14
CPU Installed Base	5,322	7,790	10,181	13,271	17,150	21,770	26,990	32,720	38,510	44,320	34	21
Installed Seats	7,183	10,008	12,719	16,263	20,634	25,560	30,910	36,570	42,050	47,260	30	18
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	62.1	69.8	86.3	66.1	50.9	46.9	44.1	41.6	39.3	37.1	-5	-6
Hardware-Only ASP	32.4	18.0	15.5	11.8	9.9	8.4	7.8	7.3	6.9	6.6	-26	-8
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	104	74	77	81	86	92	99	106	111	114	-5	6
CPU Revenue	66	48	55	59	64	71	77	85	90	94	-1	8
Terminal Revenue	27	20	15	15	13	12	11	10	9	8	-17	-10
Peripheral Revenue (Turnkey)	10	6	7	8	8	9	10	11	12	12	-5	8
Software Revenue	13	15	22	25	33	39	47	54	62	72	27	17
Bundled	8	9	15	16	19	21	23	25	27	27	22	7
Unbundled	4	6	7	9	14	19	24	29	35	45	34	26
Service Revenue	14	16	20	23	25	28	31	35	39	41	16	11
Total Factory Revenue	131	105	120	129	143	159	177	196	211	227	2	10
Increase over Prior Year (%)	7	-20	14	8	11	11	11	11	8	8		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.
Source: Dataquest (May 1992)

Table 23
Preliminary History and Forecast

Application: Mechanical
Region: Rest of World
Platform: Technical Workstation

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	571	594	600	810	891	1,100	1,340	1,600	1,820	1,990	12	17
Unit Shipments or Seats	571	594	600	810	891	1,100	1,340	1,600	1,820	1,990	12	17
CPU Installed Base	1,156	1,724	2,244	2,867	3,427	4,060	4,770	5,580	6,320	7,130	31	16
Installed Seats	1,156	1,724	2,244	2,867	3,427	4,060	4,770	5,580	6,320	7,130	31	16
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	32.5	38.5	45.7	38.3	34.8	33.2	31.9	30.9	30.1	29.5	2	-3
Hardware-Only ASP	31.0	20.4	25.4	23.9	21.1	19.2	17.6	16.6	16.0	15.5	-9	-6
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	15	17	19	22	21	24	28	32	35	37	8	12
CPU Revenue	12	13	15	17	16	18	21	24	26	28	7	12
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	3	3	4	5	5	6	7	8	8	9	15	12
Software Revenue	5	6	8	10	12	15	19	22	25	28	28	18
Bundled	3	3	6	7	8	10	12	14	16	17	26	16
Unbundled	1	2	2	2	4	5	7	8	9	11	31	22
Service Revenue	3	6	8	10	10	12	15	18	20	22	32	17
Total Factory Revenue	23	28	35	42	43	52	61	72	80	87	17	15
Increase over Prior Year (%)	25	21	26	19	3	20	18	17	12	8		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 24
Preliminary History and Forecast

Application: Mechanical
Region: Rest of World
Platform: Host-Dependent

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	93	185	176	182	139	130	130	130	120	110	11	-5
Unit Shipments or Seats	849	905	880	988	1,019	920	850	810	700	600	5	-10
CPU Installed Base	545	642	727	819	833	800	770	720	640	520	11	-9
Installed Seats	2,407	2,859	3,266	3,811	4,317	4,590	4,690	4,570	4,180	3,460	16	-4
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	496.3	482.0	699.9	461.3	337.6	322.5	309.3	296.4	283.9	272.5	-9	-4
Hardware-Only ASP	1,342.8	202.3	170.9	188.6	295.2	268.8	246.7	226.2	207.1	190.5	-32	-8
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	79	48	47	44	36	32	30	28	23	20	-18	-12
CPU Revenue	44	26	29	27	21	19	17	16	13	11	-17	-13
Terminal Revenue	27	20	15	15	13	12	11	10	9	8	-17	-10
Peripheral Revenue (Turnkey)	7	3	3	2	2	2	2	1	1	1	-27	-14
Software Revenue	6	7	10	10	9	9	8	8	7	6	13	-10
Bundled	4	5	8	8	8	8	7	7	6	5	18	-11
Unbundled	1	2	2	1	1	1	1	1	1	1	-5	-4
Service Revenue	10	10	11	12	10	10	9	9	8	6	1	-9
Total Factory Revenue	94	66	68	66	56	51	47	44	38	31	-12	-11
Increase over Prior Year (%)	-4	-30	4	-3	-15	-10	-7	-6	-14	-17		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 25

Preliminary History and Forecast

Application: Mechanical
 Region: Rest of World
 Platform: Server

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	NA	NA	NA	NA	125	160	210	260	300	350	NA	23
Unit Shipments or Seats	NA	NA	NA	NA	125	160	210	260	300	350	NA	23
CPU Installed Base	NA	NA	NA	NA	125	280	470	680	880	1,100	NA	54
Installed Seats	NA	NA	NA	NA	125	280	470	680	880	1,100	NA	54
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	NA	NA	NA	NA	130.5	124.7	119.5	114.6	109.7	105.3	NA	-4
Hardware-Only ASP	NA	NA	NA	NA	49.8	45.3	41.6	39.5	38.4	37.6	NA	-5
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	NA	NA	NA	NA	9	10	12	14	16	18	NA	16
CPU Revenue	NA	NA	NA	NA	7	9	11	12	14	15	NA	16
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	NA	NA	NA	NA	1	1	2	2	2	2	NA	15
Software Revenue	NA	NA	NA	NA	2	3	4	4	5	5	NA	19
Bundled	NA	NA	NA	NA	2	3	3	4	4	5	NA	18
Unbundled	NA	NA	NA	NA	0	0	1	1	1	1	NA	25
Service Revenue	NA	NA	NA	NA	3	4	5	6	7	7	NA	19
Total Factory Revenue	NA	NA	NA	NA	14	17	21	24	28	31	NA	17
Increase over Prior Year (%)	NA	NA	NA	NA	NA	23	22	17	14	10		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

Table 26

Preliminary History and Forecast

Application: Mechanical
 Region: Rest of World
 Platform: Personal Computer

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	CAGR (%) 1987-1991	CAGR (%) 1991-1996
HARDWARE SHIPMENT DATA												
CPU Shipments	2,228	1,956	2,167	3,156	4,438	5,580	6,560	7,550	8,550	9,510	19	16
Unit Shipments or Seats	2,228	1,956	2,167	3,156	4,438	5,580	6,560	7,550	8,550	9,510	19	16
CPU Installed Base	3,620	5,424	7,209	9,585	12,765	16,620	20,980	25,740	30,670	35,560	37	23
Installed Seats	3,620	5,424	7,209	9,585	12,765	16,620	20,980	25,740	30,670	35,560	37	23
CALCULATED AVERAGE SELLING PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	13.5	10.0	9.6	6.2	5.1	5.0	5.0	4.9	4.8	4.7	-22	-2
Hardware-Only ASP	4.3	4.5	5.1	4.6	4.6	4.6	4.5	4.4	4.4	4.2	2	-2
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	10	9	11	15	20	25	29	33	37	40	17	15
CPU Revenue	10	9	11	14	19	24	28	32	36	39	19	15
Terminal Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	1	0	0	0	0	0	1	1	1	1	-9	6
Software Revenue	3	2	5	6	9	13	17	20	25	33	37	29
Bundled	1	0	1	0	1	1	1	1	1	0	-11	-8
Unbundled	2	2	4	6	8	12	16	19	24	33	54	31
Service Revenue	0	0	1	1	1	2	2	3	4	5	21	39
Total Factory Revenue	13	11	16	21	30	39	48	56	65	78	22	21
Increase over Prior Year (%)	136	-15	42	30	42	31	22	16	18	20		

NOTE: In 1991, server was added as a platform. This reclassification reduced 1991 growth rates for the other platforms.

Source: Dataquest (May 1992)

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**Mechanical Applications
Preliminary Market Share
February 1992**

**Source:
Dataquest**

Market Statistics

**Mechanical Applications
Preliminary Market Share
February 1992**

**Source:
Dataquest**

Market Statistics

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File behind the *Market Statistics* tab inside the
binder labeled **CAD/CAM/CAE—Mechanical
Applications**

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Mechanical Applications Preliminary Market Share

February 1992

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Note: All tables show estimated data.

Mechanical Applications Preliminary Market Share

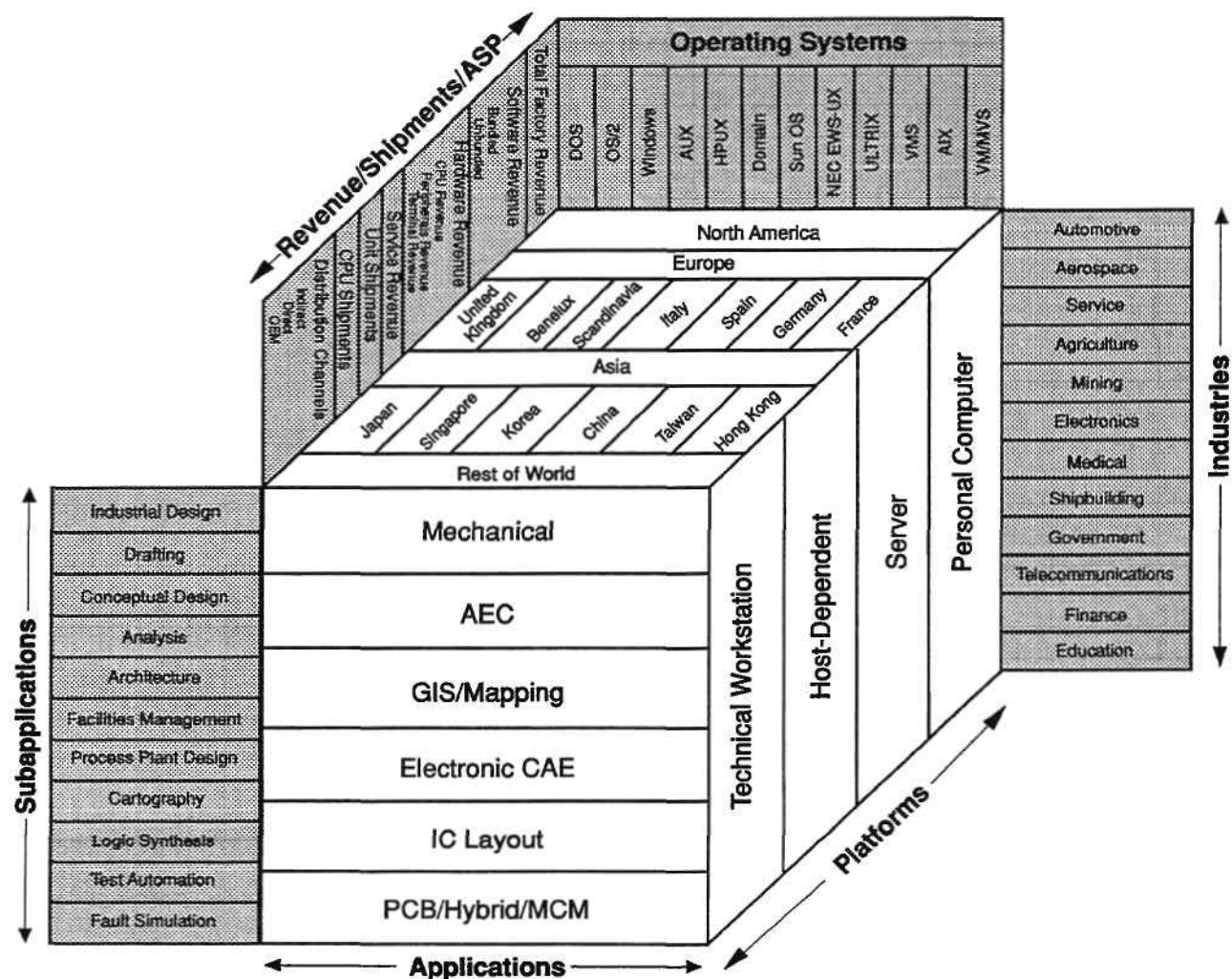
Introduction

CAD/CAM/CAE 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 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 industry, Dataquest's CAD/CAM/CAE group maintains a large database of industry information. The type of information contained in the database is depicted in Figure 1.

Figure 1
CAD/CAM/CAE Market Database



Source: Dataquest (February 1992)

This document contains Dataquest's detailed market share information on the CAD/CAM/CAE industry. Following is a description of the information reported in the *Market Share* book for each segment:

- Source—All companies in database; overview of industry
- Mechanical Applications—All companies in database with mechanical revenue
- AEC and GIS Applications—All companies in database with AEC or GIS revenue
- Electronic Design Automation Applications—All companies in database with EDA (electronic CAE, IC layout, PCB/hybrid/MCM) revenue
- Europe—All Europe-based companies and all other companies with more than \$1 million in European revenue
- Asia—All Asia-based companies and all other companies with more than \$1 million in Asian revenue
- Personal CAD and Distribution Channels—All companies in database with personal computer revenue

More detailed data on this market may be requested through our client inquiry service.

Segmentation

For complete information on Dataquest's high-technology market segmentation scheme, please refer to the *Dataquest High-Technology Guide—Segmentation and Glossary*.

Dataquest defines CAD/CAM/CAE as systems used in the mechanical; architecture, engineering, and construction (AEC); GIS/mapping; and electronic design automation (EDA) application areas. The CAD/CAM/CAE market is defined according to the following segmentation scheme:

- CAD/CAM/CAE
 - Mechanical
 - AEC (Architecture, Engineering, and Construction)
 - GIS/Mapping (Geographic Information Systems)

– EDA (Electronic Design Automation)

- Electronic CAE
- IC Layout
- PCB/Hybrid/MCM

In addition, more detailed information by subapplication is available and usually published in *Dataquest Perspectives*.

For a listing of possible subapplication categories, see the *Dataquest High-Technology Guide—Segmentation and Glossary*.

Definitions

This section lists the definitions that are specific to this document. Complete definitions for all terms can be found in the *Dataquest High-Technology Guide—Segmentation and Glossary*.

Application definitions are as follows:

- Mechanical—Mechanical CAD/CAM refers to computer-aided tools used to design, analyze, document, and manufacture discrete parts, components, and assemblies.
- 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.
- 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 ECAE, 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 application 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.

Regional definitions are as follows:

- North America—Includes United States and Canada
- Europe—Includes the United Kingdom, Scandinavia, Benelux, France, Germany, Italy, Spain, and Rest of Europe
- Asia—Includes Japan, Singapore, Taiwan, Korea, China, and Hong Kong
- Rest of World—All other countries including Australia, New Zealand, Oceania, Africa, Central America, South America, and the Middle East

Platform definitions are as follows:

- Technical Workstation—This is a single-user computer that is distinguished from a personal computer by its features and by the user's potential range of expansion on the platform. Features include a virtual, multitasking operating system (UNIX, VMS, DOMAIN); the computer is designed by manufacturer to run high-performance graphic applications in a multiuser/multitasking environment.
- Host-Dependent—This is a shared logic system in which the external workstations' functions are dependent on a host computer.

- Server—A server is a computer that transparently provides its resources for use by other computer systems. It is a system on a network that provides specific functionality to other computer systems: the clients. Functions include file storage, database access, compute capability, and others. Dataquest tracks the following major categories of servers used for CAD/CAM/CAE and GIS applications:

- Compute Servers—These systems provide capabilities for solving numerical problems (for example, simulations, statistical calculations, and simultaneous partial differential equations). System features usually include high-speed computational capabilities (for example, vector and parallel processing) and large memories.
- Print Servers—These systems provide access to printers, specialized printing applications software, and print spooling resources to a network.
- File Servers—These systems provide mass storage capability to clients on a network. Services can range from temporary storage of working files to long-term backup and archive systems.
- Database Servers—These systems manage databases as a shared resource to a network. These servers handle such functions as physical data storage, data security, and high-level queries and can access stored information at the record level.

- Personal Computer—This is defined as a single-user computer that is distinguished from a technical workstation by its features and by the user's potential range of expansion on the platform. Features found in technical workstations (such as a virtual operating system, networking, high-performance graphics, multiuser/multitasking capability) are optional rather than integrated by the manufacturer.

Revenue/shipments/ASP definitions are as follows:

- Total factory revenue is defined as the amount of money received by a manufacturer for its goods 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).

- Unit shipment is defined as the number of products delivered (that is, seats).
- Software revenue is revenue derived from the sale of bundled (part of a turnkey system) and unbundled software.
- Service revenue is defined as revenue derived from the service and support of CAD/CAM/CAE or GIS systems. Service revenue can be calculated in the tables by subtracting hardware and software revenue from total revenue.

Market Share Methodology

Dataquest uses both primary and secondary sources to produce our market share data. In the fourth quarter of each year, we survey all major 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 Marketing Programs
- Market Research Analyst

We resurvey select companies during the second quarter of the following year to verify final annual results and then publish final market share information based on this updated information. Our annual delivery schedule is as follows:

- First Quarter (January 31)—Preliminary market data are available. All tables will be published and distributed to clients. Historical database is opened for changes for a six-month period.

- Second Quarter (March 31)—We provide complete preliminary forecast tables, including a new five-year forecast period.
- Third Quarter (July 1)—We send complete, final updated market share tables based on additional data collection and analysis over the previous six months, as well as company history tables. 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 these final market data.
- Fourth Quarter (October 1)—We provide complete final forecast tables, taking into consideration changes in the market during the previous six months.

The Audit Process

Data supplied by vendors are 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

In addition, Dataquest 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 above tools 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 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 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.

Notes on Market Share

For the 1991 market share cycle, Dataquest's CAD/CAM/CAE group added server as a platform. The platform categories now include

technical workstation, host-dependent, server, and personal computer. Revenue formerly classified in technical workstations, host-dependent, or personal computer may now be more accurately classified, where appropriate, in the server category. However, because of this reclassification, data and growth rates for the other platform areas were affected.

Finally, please note that despite the care taken in gathering and analyzing the available data and in attempting to categorize those 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 these data and those provided by others.

Table 1
1991 Preliminary CAD/CAM/CAE Market Share

Application: Platform: Region: Units:	Mechanical All Platforms Worldwide Millions of U.S. Dollars/Actual Units	Market Share									
		Total		Hardware		Software		Hardware		Total	
		Revenue	Units	Revenue	Shipped	Revenue	Revenue	Revenue	Revenue	Revenue	Units
Company		Revenue	Units	Revenue	Shipped	Revenue	Revenue	Revenue	Revenue	Revenue	Units
IBM		1,408.5		824.7	313.4	37,185		17.5%	18.2%	14.6%	13.5%
Computervision		787.2		296.0	217.3	9,371		9.8%	6.5%	10.1%	3.4%
Hewlett-Packard		582.6		409.3	72.7	30,393		7.3%	9.0%	3.4%	11.1%
Digital		487.4		350.9	.0	3,384		6.1%	7.7%	.0%	1.2%
EDS Unigraphics		294.5		150.9	102.8	4,409		3.7%	3.3%	4.8%	1.6%
NEC		268.0		186.4	60.2	11,806		3.3%	4.1%	2.8%	4.3%
Sun		259.8		223.7	.0	13,819		3.2%	4.9%	.0%	5.0%
Nihon Unisys		206.5		138.3	26.8	1,919		2.6%	3.1%	1.2%	.7%
Fujitsu		204.6		126.8	57.3	4,581		2.5%	2.8%	2.7%	1.7%
Intergraph		169.8		87.8	36.8	1,764		2.1%	1.9%	1.7%	.6%
Hitachi		157.5		75.6	66.2	4,875		2.0%	1.7%	3.1%	1.8%
Schlumberger		155.7		52.3	60.3	1,634		1.9%	1.2%	2.8%	.6%
Silicon Graphics		155.4		141.3	.0	4,238		1.9%	3.1%	.0%	1.5%
Compaq		155.0		155.0	.0	26,531		1.9%	3.4%	.0%	9.7%
Control Data		151.2		77.9	26.5	1,939		1.9%	1.7%	1.2%	.7%
Autodesk		105.5		.0	105.5	0		1.3%	.0%	4.9%	.0%
Apple Computer		94.9		83.5	.0	19,887		1.2%	1.8%	.0%	7.2%
SDRC		93.5		.0	93.5	0		1.2%	.0%	4.4%	.0%
Toshiba—NO OEM		93.3		49.3	34.7	2,415		1.2%	1.1%	1.6%	.9%
Matra Datavision		85.2		31.4	37.6	784		1.1%	.7%	1.7%	.3%
CADAM		73.9		31.3	36.4	4,473		.9%	.7%	1.7%	1.6%
Siemens Nixdorf Info systems		60.3		30.1	21.1	824		.8%	.7%	1.0%	.3%
Hitachi Zosen Info Systems		58.8		46.9	.6	595		.7%	1.0%	.0%	.2%
Mutoh Industries—NO OEM		56.6		30.6	20.7	1,345		.7%	.7%	1.0%	.5%

(Continued)

(Continued)

Table 1 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Hakuto	55.0	33.0	22.0	1,350	.7%	.7%	1.0%	.5%
MacNeal-Schwendler	54.8	.0	52.7	0	.7%	.0%	2.5%	.0%
Mitsubishi Electric	49.0	39.1	6.4	971	.6%	.9%	.3%	.4%
Parametric Technology	47.2	.0	43.4	0	.6%	.0%	2.0%	.0%
Norsk Data	44.3	22.3	7.7	433	.6%	.5%	.4%	.2%
Cisigraph	42.0	14.7	14.7	366	.5%	.3%	.7%	.1%
Unisys	38.5	19.6	13.5	574	.5%	.4%	.6%	.2%
STI-Straessele	38.0	8.7	20.9	357	.5%	.2%	1.0%	.1%
Sumitomo Denko Workstation	31.2	31.2	.0	1,739	.4%	.7%	.0%	.6%
Sharp System Products—NO OEM	31.2	16.2	15.0	205	.4%	.4%	.7%	.1%
PDA Engineering	30.1	.0	24.9	0	.4%	.0%	1.2%	.0%
Alias Research	29.7	.0	27.0	0	.4%	.0%	1.3%	.0%
Gerber Systems	29.5	14.5	9.8	400	.4%	.3%	.5%	.1%
Cimlinc	29.5	5.9	17.7	563	.4%	.1%	.8%	.2%
Swanson Analysis	28.8	.0	28.8	0	.4%	.0%	1.3%	.0%
Investronica SA	28.1	22.5	2.8	1,125	.4%	.5%	.1%	.4%
Ferranti	27.9	10.3	12.8	243	.3%	.2%	.6%	.1%
Wiechers Datentechnik	27.0	15.4	8.1	667	.3%	.3%	.4%	.2%
Tokyo Electron—NO OEM	26.8	8.8	12.9	94	.3%	.2%	.6%	.0%
Auto-Trol	26.3	10.5	9.2	310	.3%	.2%	.4%	.1%
Mitsui Engineering	26.1	18.3	5.2	171	.3%	.4%	.2%	.1%
Cimatron	24.4	11.0	11.0	607	.3%	.2%	.5%	.2%
Vero International Software	22.1	.0	20.1	0	.3%	.0%	.9%	.0%
ADRA Systems	20.9	7.2	11.6	371	.3%	.2%	.5%	.1%

(Continued)

Mechanical Applications Preliminary Market Share

Table 1 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Company	Application: Platform: Region: Units:	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Market Share			
							Hardware Revenue	Software Revenue	Hardware Units Shipped	Hardware Units Shipped
ISICAD	Mechanical All Platforms Worldwide Millions of U.S. Dollars/Actual Units	20.7	9.1	8.2	148	.3%	.2%	.4%	.1%	.1%
Deltam International		20.4	7.1	10.2	343	.3%	.2%	.5%	.1%	.1%
Toyo Information Systems-NO OEM		19.8	12.1	5.8	211	.2%	.3%	.3%	.1%	.1%
MCS		19.5	.0	17.2	0	.2%	.0%	.8%	.0%	.0%
ICAD		18.0	.0	14.4	0	.2%	.0%	.7%	.0%	.0%
ISYKON Software		17.8	8.9	6.2	254	.2%	.2%	.3%	.1%	.1%
Digital Klensle		17.3	8.8	4.9	244	.2%	.2%	.2%	.1%	.1%
Hahn & Kolb		16.1	9.7	4.8	230	.2%	.2%	.2%	.1%	.1%
Kewill Systems		15.5	4.7	8.5	310	.2%	.1%	.4%	.1%	.1%
CADKEY		15.2	1.0	14.2	150	.2%	.0%	.7%	.1%	.1%
Aries Technology		15.0	.0	13.5	0	.2%	.0%	.6%	.0%	.0%
Graphtec Engineering		14.8	7.4	6.6	319	.2%	.2%	.3%	.1%	.1%
Fransoft		14.2	.0	8.6	0	.2%	.0%	.4%	.0%	.0%
CAD Lab		14.0	.0	11.3	0	.2%	.0%	.5%	.0%	.0%
Omron		13.9	12.6	1.4	402	.2%	.3%	.1%	.1%	.1%
Fides Industrielle Automation		13.4	1.9	9.9	107	.2%	.0%	.5%	.0%	.0%
PAPEC		13.3	.0	13.3	0	.2%	.0%	.6%	.0%	.0%
Exapt		12.7	6.2	4.3	216	.2%	.1%	.2%	.1%	.1%
Albert Neuhäuser		11.0	5.0	6.1	300	.1%	.1%	.3%	.1%	.1%
ItalCad		10.8	5.1	2.6	101	.1%	.1%	.1%	.0%	.0%
Dell Computer		10.7	10.7	.0	2,790	.1%	.2%	.0%	1.0%	1.0%
Design Automation		10.2	.0	10.2	0	.1%	.0%	.5%	.0%	.0%
ICL		10.2	6.0	3.5	279	.1%	.1%	.2%	.1%	.1%
MARC		10.0	.0	10.0	0	.1%	.0%	.5%	.0%	.0%

(Continued)

Table 1 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Caditron	9.8	4.9	3.9	151	.1%	.1%	.2%	.1%
Wacom	9.7	2.0	6.8	155	.1%	.0%	.3%	.1%
Tebis	9.3	1.4	6.5	46	.1%	.0%	.3%	.0%
CNC Software	9.2	.0	9.2	0	.1%	.0%	.4%	.0%
Ziegler	8.7	.0	8.7	0	.1%	.0%	.4%	.0%
Andor	8.5	2.1	6.1	77	.1%	.0%	.3%	.0%
Sony	8.5	7.4	.0	493	.1%	.2%	.0%	.2%
Radan Computational	7.9	2.8	4.0	271	.1%	.1%	.2%	.1%
Mechanical Dynamics	7.6	.0	6.8	0	.1%	.0%	.3%	.0%
Engineering Mechanics	7.6	.4	6.5	604	.1%	.0%	.3%	.2%
Research Machines	7.2	7.2	.0	1,162	.1%	.2%	.0%	.4%
DAT Standard info ssytemes	6.5	.0	6.1	0	.1%	.0%	.3%	.0%
Technische Computer Systeme	5.8	1.2	4.7	153	.1%	.0%	.2%	.1%
Vallsys	5.6	.0	5.6	0	.1%	.0%	.3%	.0%
Spatial Technology	5.0	.0	5.0	0	.1%	.0%	.2%	.0%
Marcus Computer Systeme	4.9	2.6	1.6	152	.1%	.1%	.1%	.1%
Algor Interactive Systems	4.7	.0	4.1	0	.1%	.0%	.2%	.0%
Anilam Electronics	4.7	1.4	2.8	58	.1%	.0%	.1%	.0%
Serbi	4.6	.0	4.6	0	.1%	.0%	.2%	.0%
Everex Systems	4.5	4.5	.0	1,323	.1%	.1%	.0%	.5%
Moda CAD	4.2	1.0	2.9	35	.1%	.0%	.1%	.0%
Pathtrace	4.1	1.1	2.7	60	.1%	.0%	.1%	.0%
Whessoe Computing Systems	4.1	.0	4.1	0	.1%	.0%	.2%	.0%
Mentor Graphics	4.1	1.2	1.7	40	.1%	.0%	.1%	.0%

(Continued)

Mechanical Applications Preliminary Market Share

Table 1 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
Platform: All Platforms
Region: Worldwide
Units: Millions of U.S. Dollars/Actual Units

Company	Total			Market Share			Hardware Units Shipped
	Factory Revenue	Hardware Revenue	Software Revenue	Factory Revenue	Hardware Revenue	Software Revenue	
Ontos	3.8	.0	3.8	.0%	.0%	.2%	.0%
Micro Engineering Solutions	3.7	1.0	2.4	.0%	.0%	.1%	.0%
XAO Industrie	3.7	1.3	2.2	.0%	.0%	.1%	.0%
Wisdom Systems	3.4	.0	2.6	.0%	.0%	.1%	.0%
CADIX	3.2	1.3	1.6	.0%	.0%	.1%	.0%
Clarix	3.1	.0	3.1	.0%	.0%	.1%	.0%
Superdraft	3.1	1.4	1.5	.0%	.0%	.1%	.1%
Century Research Center	3.1	1.6	1.1	.0%	.0%	.1%	.0%
Caroline Informatique	3.0	.6	2.1	.0%	.0%	.1%	.0%
Micrographx	3.0	.0	3.0	.0%	.0%	.1%	.0%
FEA	2.9	.7	.7	.0%	.0%	.0%	.0%
Olivetti	2.9	2.4	.0	.0%	.1%	.0%	.2%
CAMTEK	2.8	.0	2.3	.0%	.0%	.1%	.0%
Kubota Computer	2.8	1.8	.9	.0%	.0%	.0%	.2%
Catalpa	2.6	.9	1.3	.0%	.0%	.1%	.0%
X-TRA	2.5	.5	1.1	.0%	.0%	.1%	.0%
debs Systemhaus	2.4	.6	1.4	.0%	.0%	.1%	.0%
American Small Business Comp.	2.4	.0	2.4	.0%	.0%	.1%	.0%
Computational Mechanics	2.3	.0	2.3	.0%	.0%	.1%	.0%
ISKA	2.1	1.0	.9	.0%	.0%	.0%	.0%
Ricoh—NO OEM	1.9	.0	1.6	.0%	.0%	.1%	.0%
Forestlight Resources	1.9	.0	1.7	.0%	.0%	.1%	.0%
Rasna Corporation	1.8	.0	1.8	.0%	.0%	.1%	.0%
FEGS	1.7	.0	1.4	.0%	.0%	.1%	.0%

(Continued)

Table 1 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Robocom	1.7	.0	1.7	0	.0%	.0%	.1%	.0%
Point Control	1.4	.0	1.4	0	.0%	.0%	.1%	.0%
Evolution Computing	1.2	.0	1.2	0	.0%	.0%	.1%	.0%
Accugraph	1.1	.5	.5	37	.0%	.0%	.0%	.0%
CAD Centre	1.0	.0	.8	0	.0%	.0%	.0%	.0%
Object Design	1.0	.0	1.0	0	.0%	.0%	.0%	.0%
S.T.L.D. s.r.l.	1.0	.0	1.0	0	.0%	.0%	.0%	.0%
Objectivity	.9	.0	.9	0	.0%	.0%	.0%	.0%
Vision 3D	.9	.5	.2	6	.0%	.0%	.0%	.0%
Zuken	.8	.3	.5	5	.0%	.0%	.0%	.0%
Cadtronic	.8	.5	.4	24	.0%	.0%	.0%	.0%
Innovative Data Design	.8	.0	.8	0	.0%	.0%	.0%	.0%
Aura CAD/CAM Systems	.7	.0	.6	0	.0%	.0%	.0%	.0%
Ithaca Software	.7	.0	.7	0	.0%	.0%	.0%	.0%
A.I. Systems	.7	.0	.7	0	.0%	.0%	.0%	.0%
GRAPHISOFT	.6	.0	.6	0	.0%	.0%	.0%	.0%
Machinery Sales	.6	.0	.6	0	.0%	.0%	.0%	.0%
ACERI SA	.6	.1	.3	3	.0%	.0%	.0%	.0%
Solbourne	.5	.5	.0	58	.0%	.0%	.0%	.0%
Uniras	.4	.0	.4	0	.0%	.0%	.0%	.0%
Cascade Graphics	.4	.0	.4	0	.0%	.0%	.0%	.0%
Engineering Systems Corp.	.4	.0	.3	0	.0%	.0%	.0%	.0%
Spectrum Graphics	.3	.1	.2	3	.0%	.0%	.0%	.0%
Ashlar	.3	.0	.3	0	.0%	.0%	.0%	.0%

(Continued)

Table 1 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Georgia Tech Research Corp.	.3	.0	.3	0	.0%	.0%	.0%	.0%
Mc2 Engineering Software	.3	.0	.3	0	.0%	.0%	.0%	.0%
Synthesis	.3	.0	.3	0	.0%	.0%	.0%	.0%
A/E Microsystems	.3	.2	.0	25	.0%	.0%	.0%	.0%
Mega CADD	.2	.0	.2	0	.0%	.0%	.0%	.0%
CAD-Capture	.2	.0	.0	0	.0%	.0%	.0%	.0%
ESDU International	.2	.0	.2	0	.0%	.0%	.0%	.0%
DAPCO	.2	.0	.1	0	.0%	.0%	.0%	.0%
Comshoppe	.1	.0	.1	0	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.1	1	.0%	.0%	.0%	.0%
IGC Technology	.1	.0	.1	0	.0%	.0%	.0%	.0%
Lamp Software	.1	.0	.1	4	.0%	.0%	.0%	.0%
Number One Systems	.1	.0	.0	1	.0%	.0%	.0%	.0%
Other Companies	461.5	448.5	.1	63,295	5.7%	9.9%	.0%	23.0%
All Companies	8,033.5	4,532.7	2,148.2	274,884	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	5,969.5	3,420.9	1,455.2	229,796	74.3%	75.5%	67.7%	83.6%
All Asian-Based Companies	1,361.6	849.1	370.3	34,188	16.9%	18.7%	17.2%	12.4%
All European-Based Companies	702.4	262.7	322.7	10,900	8.7%	5.8%	15.0%	4.0%
All Hardware Companies	2,025.9	1,751.0	5.5	180,998	25.2%	38.6%	.3%	65.8%
All Turnkey & SW Companies	6,007.6	2,781.7	2,142.7	93,886	74.8%	61.4%	99.7%	34.2%

Source: Dataquest (February 1992)

Table 2
1991 Preliminary CAD/CAM/CAE Market Share

Application: Platform: Region: Units:	Mechanical Technical Workstation Worldwide	Millions of U.S. Dollars/Actual Units	Market Share							
Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Hardware Units Shipped	
Computervision	678.6	258.4	181.7	6,834	17.5%	13.1%	15.2%	8.7%		
Hewlett-Packard	501.2	343.9	72.7	17,105	12.9%	17.5%	6.1%	21.9%		
EDS Unigraphics	241.7	124.1	84.1	3,157	6.2%	6.3%	7.0%	4.0%		
Sun	181.9	159.3	.0	11,836	4.7%	8.1%	.0%	15.1%		
Silicon Graphics	150.3	137.1	.0	4,120	3.9%	7.0%	.0%	5.3%		
NEC	120.6	67.5	43.4	6,244	3.1%	3.4%	3.6%	8.0%		
Intergraph	113.8	62.3	21.9	1,269	2.9%	3.2%	1.8%	1.6%		
Schlumberger	109.0	37.4	41.1	1,010	2.8%	1.9%	3.4%	1.3%		
IBM	96.0	55.7	21.1	2,942	2.5%	2.8%	1.8%	3.8%		
Digital	90.6	65.2	.0	3,384	2.3%	3.3%	.0%	4.3%		
Fujitsu	85.5	53.0	23.9	2,013	2.2%	2.7%	2.0%	2.6%		
Matra Datavision	85.2	31.4	37.6	784	2.2%	1.6%	3.1%	1.0%		
SDRC	81.3	.0	81.3	0	2.1%	.0%	6.8%	.0%		
Hitachi	78.8	37.8	33.1	1,640	2.0%	1.9%	2.8%	2.1%		
Nihon Unisys	76.3	51.2	9.9	899	2.0%	2.6%	.8%	1.1%		
Siemens Nixdorf Info systems	60.3	30.1	21.1	824	1.6%	1.5%	1.8%	1.1%		
Control Data	60.2	38.5	12.6	1,437	1.6%	2.0%	1.1%	1.8%		
Hitachi Zosen Info Systems	55.2	46.9	.6	595	1.4%	2.4%	.0%	.8%		
Toshiba—NO OEM	54.1	27.1	21.6	490	1.4%	1.4%	1.8%	.6%		
Parametric Technology	47.2	.0	43.4	0	1.2%	.0%	3.6%	.0%		
STI-Straessele	38.0	8.7	20.9	357	1.0%	.4%	1.7%	.5%		
Cisgraph	37.8	13.2	13.2	292	1.0%	.7%	1.1%	.4%		
Mitsubishi Electric	36.8	32.2	2.5	366	.9%	1.6%	.2%	.5%		
Unisys	29.7	15.2	10.4	454	.8%	.8%	.9%	.6%		

(Continued)

(Continued)

Table 2 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Platform: Region: Units:	Mechanical Technical Workstation Worldwide	Millions of U.S. Dollars/Actual Units	Market Share									
Company			Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Hardware Units Shipped	
Alias Research			29.7	.0	27.0	0	.8%	.0%	2.3%	.0%	.0%	
Gerber Systems			29.5	14.5	9.8	400	.8%	.7%	.8%	.5%	.5%	
Cimlinec			29.5	5.9	17.7	563	.8%	.3%	1.5%	.7%	.7%	
Sumitomo Denko Workstation			29.1	29.1	.0	1,577	.7%	1.5%	.0%	2.0%	.0%	
Ferranti			27.9	10.3	12.8	243	.7%	.5%	1.1%	.3%	.3%	
Sharp System Products—NO OEM			27.1	14.1	13.0	168	.7%	.7%	1.1%	.2%	.2%	
Tokyo Electron—NO OEM			26.8	8.8	12.9	94	.7%	.4%	1.1%	.1%	.1%	
Auto-Trol			26.3	10.5	9.2	310	.7%	.5%	.8%	.4%	.4%	
Mitsui Engineering			23.9	16.8	4.8	157	.6%	.9%	.4%	.2%	.2%	
PDA Engineering			22.5	.0	18.7	0	.6%	.0%	1.6%	.0%	.0%	
Delcam International			20.4	7.1	10.2	343	.5%	.4%	.9%	.4%	.4%	
Norsk Data			20.3	11.8	4.1	253	.5%	.6%	.3%	.3%	.3%	
Muroh Industries—NO OEM			19.8	9.5	6.7	225	.5%	.5%	.6%	.3%	.3%	
ISICAD			18.8	9.1	6.3	148	.5%	.5%	.5%	.2%	.2%	
ICAD			18.0	.0	14.4	0	.5%	.0%	1.2%	.0%	.0%	
ISYKON Software			17.8	8.9	6.2	254	.5%	.5%	.5%	.3%	.3%	
Digital Kienzle			17.3	8.8	4.9	244	.4%	.4%	.4%	.3%	.3%	
Cimatron			16.3	7.3	7.3	283	.4%	.4%	.6%	.4%	.4%	
ADRA Systems			16.1	7.2	7.2	371	.4%	.4%	.6%	.5%	.5%	
Toyo Information Systems—NO OEM			15.8	9.9	4.5	187	.4%	.5%	.4%	.2%	.2%	
Graphtec Engineering			14.8	7.4	6.6	319	.4%	.4%	.6%	.4%	.4%	
Hahn & Kolb			14.5	8.7	4.4	199	.4%	.4%	.4%	.3%	.3%	
Kewill Systems			14.0	4.2	7.7	294	.4%	.2%	.6%	.4%	.4%	
Omron			13.9	12.6	1.4	402	.4%	.6%	.1%	.5%	.5%	

(Continued)

(Continued)

Table 2 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Platform: Region: Units:	Mechanical Technical Workstation Worldwide Millions of U.S. Dollars/Actual Units	Market Share							
Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	
Swanson Analysis	13.8	.0	13.8	0	.4%	.0%	1.1%	.0%	
CAD Lab	13.6	.0	10.9	0	.4%	.0%	.9%	.0%	
Fransoft	12.8	.0	7.7	0	.3%	.0%	.6%	.0%	
Autodesk	12.7	.0	12.7	0	.3%	.0%	1.1%	.0%	
CADAM	12.2	.0	10.3	0	.3%	.0%	.9%	.0%	
Aries Technology	12.0	.0	10.8	0	.3%	.0%	.9%	.0%	
PAFEC	11.3	.0	11.3	0	.3%	.0%	.9%	.0%	
Albert Nestler	11.0	5.0	6.1	300	.3%	.3%	.5%	.4%	
ItaiCad	10.8	5.1	2.6	101	.3%	.3%	.2%	.1%	
ICL	10.2	6.0	3.5	279	.3%	.3%	.3%	.4%	
Fides Industrielle Automation	9.8	1.5	7.0	100	.3%	.1%	.6%	.1%	
MCS	9.0	.0	8.0	0	.2%	.0%	.7%	.0%	
Sony	8.5	7.4	.0	493	.2%	.4%	.0%	.6%	
Radan Computational	7.9	2.7	3.9	267	.2%	.1%	.3%	.3%	
Wiechers Datentechnik	7.0	4.0	2.1	90	.2%	.2%	.2%	.1%	
MARC	7.0	.0	7.0	0	.2%	.0%	.6%	.0%	
MacNeal-Schwendler	6.0	.0	5.8	0	.2%	.0%	.5%	.0%	
Technische Computer Systeme	5.8	1.2	4.7	153	.2%	.1%	.4%	.2%	
Mechanical Dynamics	5.8	.0	5.2	0	.2%	.0%	.4%	.0%	
Valisys	5.6	.0	5.6	0	.1%	.0%	.5%	.0%	
Spatial Technology	5.0	.0	5.0	0	.1%	.0%	.4%	.0%	
Engineering Mechanics	4.4	.2	3.7	212	.1%	.0%	.3%	.3%	
Mentor Graphics	4.1	1.2	1.7	40	.1%	.1%	.1%	.1%	
Hakuto	3.9	2.3	1.5	66	.1%	.1%	.1%	.1%	
(Continued)									

(Continued)

Table 2 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
Platform: Technical Workstation
Region: Worldwide
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Ontos	3.8	.0	3.8	0	.1%	.0%	.3%	.0%
XAO Industrie	3.7	1.3	2.2	133	.1%	.1%	.2%	.2%
Marcus Computer Systeme	3.6	1.9	1.2	113	.1%	.1%	.1%	.1%
Wisdom Systems	3.4	.0	2.6	0	.1%	.0%	.2%	.0%
Exapt	3.4	1.7	1.2	108	.1%	.1%	.1%	.1%
CADIX	3.2	1.3	1.6	24	.1%	.1%	.1%	.0%
Catalpa	2.6	.9	1.3	21	.1%	.0%	.1%	.0%
Caroline Informatique	2.4	.5	1.7	33	.1%	.0%	.1%	.0%
ISKA	2.1	1.0	.9	39	.1%	.0%	.1%	.1%
Kubota Computer	2.1	1.4	.7	356	.1%	.1%	.1%	.5%
CAMTEK	2.0	.0	1.6	0	.1%	.0%	.1%	.0%
Ricoh—NO OEM	1.9	.0	1.6	0	.0%	.0%	.1%	.0%
debis Systemhaus	1.8	.5	1.1	11	.0%	.0%	.1%	.0%
Century Research Center	1.8	.9	.7	10	.0%	.0%	.1%	.0%
Micro Engineering Solutions	1.4	.4	.9	13	.0%	.0%	.1%	.0%
Wacom	1.3	.3	1.0	13	.0%	.0%	.1%	.0%
FEA	1.2	.3	.3	21	.0%	.0%	.0%	.0%
Object Design	1.0	.0	1.0	0	.0%	.0%	.1%	.0%
CAD Centre	1.0	.0	.8	0	.0%	.0%	.1%	.0%
FEGS	1.0	.0	.8	0	.0%	.0%	.1%	.0%
Accugraph	1.0	.5	.4	36	.0%	.0%	.0%	.0%
Objectivity	.9	.0	.9	0	.0%	.0%	.1%	.0%
Zuken	.8	.3	.5	5	.0%	.0%	.0%	.0%
Computational Mechanics	.6	.0	.6	0	.0%	.0%	.1%	.0%

(Continued)

Table 2 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
Platform: Technical Workstation
Region: Worldwide
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Everex Systems	.5	.5	.0	57	.0%	.0%	.0%	.1%
Whesoe Computing Systems	.4	.0	.4	0	.0%	.0%	.0%	.0%
Spectrum Graphics	.3	.1	.2	3	.0%	.0%	.0%	.0%
Ithaca Software	.3	.0	.3	0	.0%	.0%	.0%	.0%
A/E Microsystems	.2	.2	.0	21	.0%	.0%	.0%	.0%
Serbi	.2	.0	.2	0	.0%	.0%	.0%	.0%
Solbourne	.2	.2	.0	44	.0%	.0%	.0%	.1%
DAPCO	.2	.0	.1	0	.0%	.0%	.0%	.0%
Georgia Tech Research Corp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
Algor Interactive Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
Point Control	.1	.0	.1	0	.0%	.0%	.0%	.0%
CADKEY	.1	.0	.0	3	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.0	0	.0%	.0%	.0%	.0%
Lamp Software	.0	.0	.0	2	.0%	.0%	.0%	.0%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	3,880.8	1,969.0	1,197.4	78,251	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	2,682.3	1,347.4	780.3	55,767	69.1%	68.4%	65.2%	71.3%
All Asian-Based Companies	701.9	437.6	192.5	16,340	18.1%	22.2%	16.1%	20.9%
All European-Based Companies	496.6	184.1	224.6	6,144	12.8%	9.3%	18.8%	7.9%
All Hardware Companies	608.9	515.3	2.6	29,092	15.7%	26.2%	.2%	37.2%
All Turnkey & SW Companies	3,271.9	1,453.7	1,194.8	49,159	84.3%	73.8%	99.8%	62.8%

Source: Dataquest (February 1992)

Table 3
1991 Preliminary CAD/CAM/CAE Market Share

Application: Platform: Region: Units:	Mechanical Host-Dependent Worldwide Millions of U.S. Dollars/Actual Units	Market Share									
		Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM		1,008.3	564.6	242.0	15,400	43.8%	41.1%	51.0%	41.1%	51.0%	44.9%
Digital		269.7	194.2	.0	0	11.7%	14.1%	.0%	14.1%	.0%	.0%
Nihon Unisys		130.1	87.2	16.9	1,021	5.7%	6.3%	3.6%	6.3%	3.6%	3.0%
Computervision		87.0	35.2	19.8	2,354	3.8%	2.6%	4.2%	2.6%	4.2%	6.9%
Control Data		86.8	37.3	13.0	497	3.8%	2.7%	2.7%	2.7%	2.7%	1.4%
Fujitsu		84.6	52.4	23.7	1,430	3.7%	3.8%	5.0%	3.8%	5.0%	4.2%
NEC		80.4	61.9	12.1	210	3.5%	4.5%	2.5%	4.5%	2.5%	.6%
EDS Unigraphics		52.8	26.8	18.6	1,252	2.3%	1.9%	3.9%	1.9%	3.9%	3.6%
MacNeal-Schwendler		31.3	.0	30.0	0	1.4%	.0%	6.3%	.0%	6.3%	.0%
Schlumberger		28.0	9.0	11.5	444	1.2%	.7%	2.4%	.7%	2.4%	1.3%
Intergraph		25.5	12.8	4.0	239	1.1%	.9%	.8%	.9%	.8%	.7%
Hitachi		25.2	12.1	10.6	446	1.1%	.9%	2.2%	.9%	2.2%	1.3%
Norsk Data		23.5	10.3	3.5	172	1.0%	.7%	.7%	.7%	.7%	.5%
SDRC		12.1	.0	12.1	0	.5%	.0%	2.6%	.0%	2.6%	.0%
Toshiba—NO OEM		9.3	4.7	3.7	129	.4%	.3%	.8%	.3%	.8%	.4%
Exapt		9.3	4.6	3.2	108	.4%	.3%	.7%	.3%	.7%	.3%
Swanson Analysis		9.3	.0	9.3	0	.4%	.0%	2.0%	.0%	2.0%	.0%
Unisys		8.7	4.4	3.1	120	.4%	.3%	.6%	.3%	.6%	.4%
CADAM		8.5	.0	7.4	0	.4%	.0%	1.6%	.0%	1.6%	.0%
PDA Engineering		7.5	.0	6.2	0	.3%	.0%	1.3%	.0%	1.3%	.0%
MCS		6.6	.0	5.8	0	.3%	.0%	1.2%	.0%	1.2%	.0%
Mitsubishi Electric		6.5	3.1	1.9	95	.3%	.2%	.4%	.2%	.4%	.3%
Cisigraph		4.2	1.5	1.5	74	.2%	.1%	.3%	.1%	.3%	.2%
Toyo Information Systems-NO OEM		4.1	2.2	1.3	24	.2%	.2%	.3%	.2%	.3%	.1%

(Continued)

Table 3 (Continued)

1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Host-Dependent
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Fides Industrielle Automation	3.6	.5	2.9	7	.2%	.0%	.6%	.0%
Hitachi Zosen Info Systems	3.5	.0	.0	0	.2%	.0%	.0%	.0%
MARC	3.0	.0	3.0	0	.1%	.0%	.6%	.0%
Mechanical Dynamics	1.8	.0	1.6	0	.1%	.0%	.3%	.0%
Computational Mechanics	1.7	.0	1.7	0	.1%	.0%	.4%	.0%
Kewill Systems	1.6	.5	.9	16	.1%	.0%	.2%	.0%
Framasoft	1.4	.0	.8	0	.1%	.0%	.2%	.0%
Century Research Center	1.3	.7	.5	7	.1%	.0%	.1%	.0%
Whesoe Computing Systems	.8	.0	.8	0	.0%	.0%	.2%	.0%
FEES	.7	.0	.6	0	.0%	.0%	.1%	.0%
Kubota Computer	.7	.5	.2	65	.0%	.0%	.0%	.2%
Olivetti	.3	.3	.0	7	.0%	.0%	.0%	.0%
debis Systemhaus	.3	.1	.2	2	.0%	.0%	.0%	.0%
FEA	.3	.1	.1	5	.0%	.0%	.0%	.0%
Georgia Tech Research Corp.	.2	.0	.2	0	.0%	.0%	.0%	.0%
Engineering Systems Corp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
CADKEY	.1	.1	.0	2	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
Mutoh Industries—NO OEM	.0	.0	.0	0	.0%	.0%	.0%	.0%

(Continued)

Mechanical Applications Preliminary Market Share

Table 3 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Host-Dependent
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Other Companies	259.9	246.9	.0	10,208	11.3%	18.0%	.0%	29.7%
All Companies	2,300.4	1,373.6	474.5	34,335	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	1,907.2	1,131.2	387.7	30,517	82.9%	82.4%	81.7%	88.9%
All Asian-Based Companies	345.6	224.7	70.8	3,428	15.0%	16.4%	14.9%	10.0%
All European-Based Companies	47.6	17.7	16.0	390	2.1%	1.3%	3.4%	1.1%
All Hardware Companies	548.7	449.4	2.8	10,315	23.9%	32.7%	.6%	30.0%
All Turnkey & SW Companies	1,751.7	924.2	471.7	24,020	76.1%	67.3%	99.4%	70.0%

Source: Dataquest (February 1992)

Table 4
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
Platform: Server
Region: Worldwide
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	230.1	134.0	50.3	1,469	43.4%	40.2%	60.0%	31.9%
Digital	127.1	91.5	.0	0	23.9%	27.5%	.0%	.0%
Sun	77.9	64.4	.0	1,983	14.7%	19.3%	.0%	43.0%
Intergraph	25.5	12.8	6.1	257	4.8%	3.8%	7.3%	5.6%
Schlumberger	17.1	5.6	6.9	156	3.2%	1.7%	8.3%	3.4%
MacNeal-Schwendler	16.4	.0	15.8	0	3.1%	.0%	18.8%	.0%
Computervision	7.0	2.0	2.0	54	1.3%	.6%	2.3%	1.2%
Toshiba—NO OEM	6.5	5.9	.0	0	1.2%	1.8%	.0%	.0%
Hewlett-Packard	6.3	5.2	.0	306	1.2%	1.6%	.0%	6.6%
Silicon Graphics	5.2	4.3	.0	117	1.0%	1.3%	.0%	2.5%
Control Data	4.2	2.2	.8	5	.8%	.7%	.9%	.1%
Mutoh Industries—NO OEM	2.8	2.1	.7	76	.5%	.6%	.8%	1.7%
Sumitomo Denko Workstation	2.2	2.2	.0	162	.4%	.7%	.0%	3.5%
Sharp System Products—NO OEM	1.6	.8	.8	7	.3%	.2%	.9%	.1%
Rasna Corporation	.5	.0	.5	0	.1%	.0%	.6%	.0%
Solbourne	.3	.3	.0	13	.1%	.1%	.0%	.3%
A/E Microsystems	.0	.0	.0	2	.0%	.0%	.0%	.0%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	530.7	333.2	83.8	4,607	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	517.6	322.2	82.4	4,362	97.5%	96.7%	98.3%	94.7%
All Asian-Based Companies	13.1	11.0	1.5	245	2.5%	3.3%	1.7%	5.3%
All European-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Hardware Companies	218.9	167.5	.1	2,775	41.3%	50.3%	.1%	60.2%
All Turnkey & SW Companies	311.8	165.7	83.7	1,832	58.7%	49.7%	99.9%	39.8%

Source: Dataquest (February 1992)

Table 5 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Platform: Region: Units:	Mechanical Personal Computer Worldwide Millions of U.S. Dollars/Actual Units	Market Share									
Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Software Revenue	Hardware Units Shipped	
Wacom	8.4	1.6	5.8	141	.6%	.2%	1.5%	.1%			
Cimatron	8.0	3.6	3.6	324	.6%	.4%	.9%	.2%			
Research Machines	7.2	7.2	.0	1,162	.5%	.8%	.0%	.7%			
DAT Standard Info Systems	6.5	.0	6.1	0	.5%	.0%	1.6%	.0%			
Mitsubishi Electric	5.8	3.9	2.0	510	.4%	.4%	.5%	.3%			
Swanson Analysis	5.8	.0	5.8	0	.4%	.0%	1.5%	.0%			
Intergraph	5.1	.0	4.8	0	.4%	.0%	1.2%	.0%			
ADRA Systems	4.8	.0	4.3	0	.4%	.0%	1.1%	.0%			
Anilam Electronics	4.7	1.4	2.8	58	.4%	.2%	.7%	.0%			
Algor Interactive Systems	4.6	.0	4.0	0	.3%	.0%	1.0%	.0%			
Serbi	4.4	.0	4.4	0	.3%	.0%	1.1%	.0%			
Moda CAD	4.2	1.0	2.9	35	.3%	.1%	.7%	.0%			
Pathtrace	4.1	1.1	2.7	60	.3%	.1%	.7%	.0%			
Everex Systems	4.0	4.0	.0	1,265	.3%	.5%	.0%	.8%			
MCS	3.9	.0	3.5	0	.3%	.0%	.9%	.0%			
Engineering Mechanics	3.2	.2	2.7	392	.2%	.0%	.7%	.2%			
Clarix	3.1	.0	3.1	0	.2%	.0%	.8%	.0%			
Superdraft	3.1	1.4	1.5	168	.2%	.2%	.4%	.1%			
Micrografix	3.0	.0	3.0	0	.2%	.0%	.8%	.0%			
Aries Technology	3.0	.0	2.7	0	.2%	.0%	.7%	.0%			
Whesoe Computing Systems	2.9	.0	2.9	0	.2%	.0%	.7%	.0%			
Olivetti	2.5	2.2	.0	429	.2%	.3%	.0%	.3%			
X-TRA	2.5	.5	1.1	105	.2%	.1%	.3%	.1%			
Sharp System Products—NO OEM	2.5	1.3	1.2	31	.2%	.2%	.3%	.0%			
(Continued)											

(Continued)

Table 5 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
American Small Business Comp.	2.4	.0	2.4	0	.2%	.0%	.6%	.0%
Micro Engineering Solutions	2.3	.7	1.5	35	.2%	.1%	.4%	.0%
Mitsui Engineering	2.1	1.5	.4	14	.2%	.2%	.1%	.0%
PAFEC	2.0	.0	2.0	0	.2%	.0%	.5%	.0%
ISICAD	1.9	.0	1.9	0	.1%	.0%	.5%	.0%
Foresight Resources	1.9	.0	1.7	0	.1%	.0%	.4%	.0%
Robocom	1.7	.0	1.7	0	.1%	.0%	.4%	.0%
Hahn & Kolb	1.6	1.0	.5	31	.1%	.1%	.1%	.0%
Schlumberger	1.6	.4	.8	24	.1%	.0%	.2%	.0%
FEA	1.4	.3	.3	27	.1%	.0%	.1%	.0%
Rasna Corporation	1.3	.0	1.3	0	.1%	.0%	.3%	.0%
Point Control	1.3	.0	1.3	0	.1%	.0%	.3%	.0%
Marcus Computer Systems	1.2	.7	.4	39	.1%	.1%	.1%	.0%
Evolution Computing	1.2	.0	1.2	0	.1%	.0%	.3%	.0%
MacNeal-Schwendler	1.1	.0	1.1	0	.1%	.0%	.3%	.0%
S.T.L.D. s.r.l.	1.0	.0	1.0	0	.1%	.0%	.2%	.0%
Vision 3D	.9	.5	.2	6	.1%	.1%	.1%	.0%
CAMTEK	.9	.0	.7	0	.1%	.0%	.2%	.0%
Cadtronic	.8	.5	.4	24	.1%	.1%	.1%	.0%
Innovative Data Design	.8	.0	.8	0	.1%	.0%	.2%	.0%
Aura CAD/CAM Systems	.7	.0	.6	0	.1%	.0%	.2%	.0%
A.I. Systems	.7	.0	.7	0	.0%	.0%	.2%	.0%
GRAPHISOFT	.6	.0	.6	0	.0%	.0%	.2%	.0%

(Continued)

Table 5 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
Platform: Personal Computer
Region: Worldwide
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Caroline Informatique	.6	.1	.4	7	.0%	.0%	.1%	.0%
Machinery Sales	.6	.0	.6	0	.0%	.0%	.2%	.0%
ACERI SA	.6	.1	.3	3	.0%	.0%	.1%	.0%
Norsk Data	.5	.3	.1	8	.0%	.0%	.0%	.0%
CAD Lab	.5	.0	.4	0	.0%	.0%	.1%	.0%
Uniras	.4	.0	.4	0	.0%	.0%	.1%	.0%
Cascade Graphics	.4	.0	.4	0	.0%	.0%	.1%	.0%
Ithaca Software	.4	.0	.4	0	.0%	.0%	.1%	.0%
Ashlar	.3	.0	.3	0	.0%	.0%	.1%	.0%
Mc2 Engineering Software	.3	.0	.3	0	.0%	.0%	.1%	.0%
debis Systemhaus	.3	.1	.2	6	.0%	.0%	.0%	.0%
Synthesis	.3	.0	.3	0	.0%	.0%	.1%	.0%
Engineering Systems Corp.	.3	.0	.2	0	.0%	.0%	.1%	.0%
Mega CADD	.2	.0	.2	0	.0%	.0%	.1%	.0%
CAD-Capture	.2	.0	.0	0	.0%	.0%	.0%	.0%
ESDU International	.2	.0	.2	0	.0%	.0%	.0%	.0%
Comshoppe	.1	.0	.1	0	.0%	.0%	.0%	.0%
IGC Technology	.1	.0	.1	0	.0%	.0%	.0%	.0%
Accugraph	.1	.0	.1	0	.0%	.0%	.0%	.0%
Radan Computational	.1	.0	.0	4	.0%	.0%	.0%	.0%
Lamp Software	.1	.0	.0	3	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.0	1	.0%	.0%	.0%	.0%
Number One Systems	.1	.0	.0	1	.0%	.0%	.0%	.0%
A/E Microsystems	.0	.0	.0	2	.0%	.0%	.0%	.0%

(Continued)

Mechanical Applications Preliminary Market Share

Table 5 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: Worldwide
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Other Companies	201.6	201.6	.1	53,087	15.3%	23.5%	.0%	33.7%
All Companies	1,321.6	857.0	392.4	157,691	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	862.4	620.1	204.8	139,150	65.3%	72.4%	52.2%	88.2%
All Asian-Based Companies	301.0	175.8	105.6	14,175	22.8%	20.5%	26.9%	9.0%
All European-Based Companies	158.2	61.0	82.0	4,366	12.0%	7.1%	20.9%	2.8%
All Hardware Companies	649.4	618.9	.0	138,816	49.1%	72.2%	.0%	88.0%
All Turnkey & SW Companies	672.3	238.1	392.4	18,874	50.9%	27.8%	100.0%	12.0%

Source: Dataquest (February 1992)

Table 6
1991 Preliminary CAD/CAM/CAE Market Share

Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Market Share			
						Hardware Revenue	Software Revenue	Hardware Units Shipped	Hardware Units Shipped
IBM	355.9	209.8	78.4	10,393	15.5%	16.2%	13.0%	10.6%	10.6%
Digital	234.0	168.4	.0	1,624	10.2%	13.0%	.0%	1.7%	1.7%
EDS Unigraphics	170.5	87.6	55.7	2,534	7.4%	6.8%	9.2%	2.6%	2.6%
Computervision	155.2	39.4	44.3	1,732	6.8%	3.0%	7.4%	1.8%	1.8%
Hewlett-Packard	152.9	112.5	13.9	9,554	6.7%	8.7%	2.3%	9.8%	9.8%
Sun	125.8	108.3	.0	7,080	5.5%	8.4%	.0%	7.2%	7.2%
Intergraph	88.7	45.9	19.2	935	3.9%	3.5%	3.2%	1.0%	1.0%
Compaq	66.7	66.7	.0	11,408	2.9%	5.1%	.0%	11.7%	11.7%
Schlumberger	62.3	20.9	24.1	653	2.7%	1.6%	4.0%	.7%	.7%
Control Data	60.5	31.2	10.6	776	2.6%	2.4%	1.8%	.8%	.8%
Apple Computer	58.9	51.8	.0	12,330	2.6%	4.0%	.0%	12.6%	12.6%
Autodesk	57.8	.0	57.8	0	2.5%	.0%	9.6%	.0%	.0%
Silicon Graphics	49.7	43.6	.0	1,572	2.2%	3.4%	.0%	1.6%	1.6%
SDRC	38.3	.0	38.3	0	1.7%	.0%	6.4%	.0%	.0%
Parametric Technology	28.3	.0	26.0	0	1.2%	.0%	4.3%	.0%	.0%
MacNeal-Schwendler	26.7	.0	25.6	0	1.2%	.0%	4.3%	.0%	.0%
Unisys	23.4	12.0	8.2	358	1.0%	.9%	1.4%	.4%	.4%
CADAM	22.2	9.4	10.9	1,342	1.0%	.7%	1.8%	1.4%	1.4%
PDA Engineering	19.5	.0	16.2	0	.9%	.0%	2.7%	.0%	.0%
Allas Research	19.3	.0	17.6	0	.8%	.0%	2.9%	.0%	.0%
Auto-Trol	17.9	7.2	6.3	211	.8%	.6%	1.0%	.2%	.2%
Cimline	17.7	3.5	10.6	338	.8%	.3%	1.8%	.3%	.3%
Gerber Systems	16.2	8.0	5.4	220	.7%	.6%	.9%	.2%	.2%
Swanson Analysis	16.1	.0	16.1	0	.7%	.0%	2.7%	.0%	.0%

(Continued)

Table 6 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: All Platforms
 Region: North America
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
MCS	15.0	.0	13.3	0	.7%	.0%	2.2%	.0%
Cisgraph	14.7	5.1	5.1	128	.6%	.4%	.9%	.1%
ADRA Systems	13.6	4.7	7.5	241	.6%	.4%	1.2%	.2%
ICAD	13.5	.0	10.8	0	.6%	.0%	1.8%	.0%
CADKEY	13.0	.0	13.0	0	.6%	.0%	2.2%	.0%
Matra Datavision	10.9	4.9	4.4	119	.5%	.4%	.7%	.1%
Aries Technology	10.5	.0	9.5	0	.5%	.0%	1.6%	.0%
Dell Computer	9.2	9.2	.0	2,399	.4%	.7%	.0%	2.5%
CNC Software	5.5	.0	5.5	0	.2%	.0%	.9%	.0%
Cimatron	4.4	2.0	2.0	111	.2%	.2%	.3%	.1%
Vallsys	4.2	.0	4.2	0	.2%	.0%	.7%	.0%
Everex Systems	4.0	4.0	.0	1,190	.2%	.3%	.0%	1.2%
Algor Interactive Systems	3.9	.0	3.4	0	.2%	.0%	.6%	.0%
Ontos	3.6	.0	3.6	0	.2%	.0%	.6%	.0%
Mechanical Dynamics	3.3	.0	3.0	0	.1%	.0%	.5%	.0%
Micro Engineering Solutions	3.0	.8	1.9	38	.1%	.1%	.3%	.0%
Moda CAD	2.7	.7	1.9	22	.1%	.1%	.3%	.0%
Engineering Mechanics	2.7	.1	2.3	211	.1%	.0%	.4%	.2%
Wisdom Systems	2.6	.0	1.9	0	.1%	.0%	.3%	.0%
American Small Business Comp.	2.1	.0	2.1	0	.1%	.0%	.3%	.0%
Spatial Technology	2.0	.0	2.0	0	.1%	.0%	.3%	.0%
MARC	2.0	.0	2.0	0	.1%	.0%	.3%	.0%
Micrografx	2.0	.0	2.0	0	.1%	.0%	.3%	.0%
Mentor Graphics	2.0	.6	.8	19	.1%	.0%	.1%	.0%

(Continued)

Table 6 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
Platform: All Platforms
Region: North America
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Claris	1.6	.0	1.6	0	.1%	.0%	.3%	.0%
Delcam International	1.4	.5	.7	24	.1%	.0%	.1%	.0%
Investronica SA	1.2	.9	.1	46	.1%	.1%	.0%	.0%
Evolution Computing	1.1	.0	1.1	0	.0%	.0%	.2%	.0%
Accugraph	1.0	.4	.4	34	.0%	.0%	.1%	.0%
Foresight Resources	1.0	.0	.9	0	.0%	.0%	.1%	.0%
Pathtrace	.9	.3	.6	14	.0%	.0%	.1%	.0%
Computational Mechanics	.9	.0	.9	0	.0%	.0%	.1%	.0%
Innovative Data Design	.8	.0	.8	0	.0%	.0%	.1%	.0%
Object Design	.8	.0	.8	0	.0%	.0%	.1%	.0%
Objectivity	.7	.0	.7	0	.0%	.0%	.1%	.0%
GRAPHISOFT	.6	.0	.6	0	.0%	.0%	.1%	.0%
Point Control	.6	.0	.6	0	.0%	.0%	.1%	.0%
Rasna Corporation	.6	.0	.6	0	.0%	.0%	.1%	.0%
Aura CAD/CAM Systems	.6	.0	.5	0	.0%	.0%	.1%	.0%
Machinery Sales	.6	.0	.6	0	.0%	.0%	.1%	.0%
A.I. Systems	.6	.0	.6	0	.0%	.0%	.1%	.0%
Solbourne	.5	.4	.0	46	.0%	.0%	.0%	.0%
Uniras	.4	.0	.4	0	.0%	.0%	.1%	.0%
Ithaca Software	.3	.0	.3	0	.0%	.0%	.1%	.0%
Ashlar	.3	.0	.3	0	.0%	.0%	.1%	.0%
Cascade Graphics	.3	.0	.3	0	.0%	.0%	.1%	.0%
FEGS	.3	.0	.3	0	.0%	.0%	.0%	.0%
A/E Microsystems	.3	.2	.0	25	.0%	.0%	.0%	.0%

(Continued)

Mechanical Applications Preliminary Market Share

Table 6 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: All Platforms
 Region: North America
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Engineering Systems Corp.	.3	.0	.2	0	.0%	.0%	.0%	.0%
Georgia Tech Research Corp.	.3	.0	.3	0	.0%	.0%	.0%	.0%
Mc2 Engineering Software	.2	.0	.2	0	.0%	.0%	.0%	.0%
Mega CADD	.2	.0	.2	0	.0%	.0%	.0%	.0%
Synthesis	.1	.0	.1	0	.0%	.0%	.0%	.0%
Technische Computer Systeme	.1	.0	.1	3	.0%	.0%	.0%	.0%
Vision 3D	.1	.0	.0	0	.0%	.0%	.0%	.0%
IGC Technology	.1	.0	.1	0	.0%	.0%	.0%	.0%
Comshoppe	.1	.0	.1	0	.0%	.0%	.0%	.0%
Zuken	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	241.9	234.3	.1	30,140	10.5%	18.1%	.0%	30.8%
All Companies	2,295.1	1,295.3	602.1	97,875	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	2,260.1	1,281.5	587.9	97,429	98.5%	98.9%	97.6%	99.5%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	34.9	13.8	14.2	446	1.5%	1.1%	2.4%	.5%
All Hardware Companies	923.9	797.5	2.2	82,593	40.3%	61.6%	.4%	84.4%
All Turnkey & SW Companies	1,371.2	497.8	599.9	15,282	59.7%	38.4%	99.6%	15.6%

Source: Dataquest (February 1992)

Table 7

1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: North America
 Units: Millions of U.S. Dollars/Actual Units

Company	Total			Market Share					Total			Hardware			Software			Hardware			Software			Hardware			Units			
	Factory	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	Revenue	
EDS Unigraphics	138.1			71.1			44.9		1,936	13.8%			15.2%			13.6%			8.8%				13.8%			15.2%			13.6%	8.8%
Computervision	130.0			34.8			32.8		1,477	13.0%			7.4%			10.0%			6.7%				13.0%			7.4%			10.0%	6.7%
Hewlett-Packard	124.7			89.9			13.9		5,011	12.4%			19.2%			4.2%			22.7%				12.4%			19.2%			4.2%	22.7%
Sun	88.1			77.1			.0		6,240	8.8%			16.5%			.0%			28.3%				8.8%			16.5%			.0%	28.3%
Intergraph	59.4			32.5			11.4		677	5.9%			6.9%			3.5%			3.1%				5.9%			6.9%			3.5%	3.1%
Silicon Graphics	46.7			41.1			.0		1,498	4.7%			8.8%			.0%			6.8%				4.7%			8.8%			.0%	6.8%
Schlumberger	43.6			15.0			16.4		404	4.4%			3.2%			5.0%			1.8%				4.4%			3.2%			5.0%	1.8%
Digital	43.5			31.3			.0		1,624	4.3%			6.7%			.0%			7.4%				4.3%			6.7%			.0%	7.4%
SDRC	33.3			.0			33.3		0	3.3%			.0%			10.1%			.0%				3.3%			.0%			10.1%	.0%
Parametric Technology	28.3			.0			26.0		0	2.8%			.0%			7.9%			.0%				2.8%			.0%			7.9%	.0%
Control Data	24.1			15.4			5.1		575	2.4%			3.3%			1.5%			2.6%				2.4%			3.3%			1.5%	2.6%
IBM	24.0			13.9			5.3		805	2.4%			3.0%			1.6%			3.6%				2.4%			3.0%			1.6%	3.6%
Alias Research	19.3			.0			17.6		0	1.9%			.0%			5.3%			.0%				1.9%			.0%			5.3%	.0%
Unisys	18.1			9.2			6.3		283	1.8%			2.0%			1.9%			1.3%				1.8%			2.0%			1.9%	1.3%
Auto-Trol	17.9			7.2			6.3		211	1.8%			1.5%			1.9%			1.0%				1.8%			1.5%			1.9%	1.0%
Cimline	17.7			3.5			10.6		338	1.8%			.8%			3.2%			1.5%				1.8%			.8%			3.2%	1.5%
Gerber Systems	16.2			8.0			5.4		220	1.6%			1.7%			1.6%			1.0%				1.6%			1.7%			1.6%	1.0%
PDA Engineering	14.6			.0			12.1		0	1.5%			.0%			3.7%			.0%				1.5%			.0%			3.7%	.0%
ICAD	13.5			.0			10.8		0	1.3%			.0%			3.3%			.0%				1.3%			.0%			3.3%	.0%
Claigraph	13.2			4.6			4.6		102	1.3%			1.0%			1.4%			.5%				1.3%			1.0%			1.4%	.5%
Matra Datavision	10.9			4.9			4.4		119	1.1%			1.1%			1.3%			.5%				1.1%			1.1%			1.3%	.5%
ADRA Systems	10.5			4.7			4.7		241	1.0%			1.0%			1.4%			1.1%				1.0%			1.0%			1.4%	1.1%
Aries Technology	8.4			.0			7.6		0	.8%			.0%			2.3%			.0%				.8%			.0%			2.3%	.0%
Swanson Analysis	7.7			.0			7.7		0	.8%			.0%			2.3%			.0%				.8%			.0%			2.3%	.0%

(Continued)

Table 7 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: North America
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Autodesk	6.9	.0	6.9	0	.7%	.0%	2.1%	.0%
MCS	6.9	.0	6.2	0	.7%	.0%	1.9%	.0%
Valisys	4.2	.0	4.2	0	.4%	.0%	1.3%	.0%
CADAM	3.7	.0	3.1	0	.4%	.0%	.9%	.0%
Ontos	3.6	.0	3.6	0	.4%	.0%	1.1%	.0%
MacNeal-Schwendler	2.9	.0	2.8	0	.3%	.0%	.9%	.0%
Cimatron	2.8	1.3	1.3	48	.3%	.3%	.4%	.2%
Wisdom Systems	2.6	.0	1.9	0	.3%	.0%	.6%	.0%
Mechanical Dynamics	2.4	.0	2.2	0	.2%	.0%	.7%	.0%
Spatial Technology	2.0	.0	2.0	0	.2%	.0%	.6%	.0%
Mentor Graphics	2.0	.6	.8	19	.2%	.1%	.2%	.1%
Engineering Mechanics	1.5	.1	1.3	74	.2%	.0%	.4%	.3%
Delcam International	1.4	.5	.7	24	.1%	.1%	.2%	.1%
MARC	1.4	.0	1.4	0	.1%	.0%	.4%	.0%
Micro Engineering Solutions	1.1	.3	.7	10	.1%	.1%	.2%	.0%
Accugraph	.9	.4	.4	33	.1%	.1%	.1%	.1%
Object Design	.8	.0	.8	0	.1%	.0%	.2%	.0%
Objectivity	.7	.0	.7	0	.1%	.0%	.2%	.0%
Everex Systems	.4	.4	.0	51	.0%	.1%	.0%	.2%
Computational Mechanics	.4	.0	.4	0	.0%	.0%	.1%	.0%
A/E Microsystems	.2	.2	.0	21	.0%	.0%	.0%	.1%
Solbourne	.2	.2	.0	36	.0%	.0%	.0%	.2%
Ithaca Software	.2	.0	.2	0	.0%	.0%	.1%	.0%
FEES	.2	.0	.1	0	.0%	.0%	.0%	.0%

(Continued)

Table 7 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
Platform: Technical Workstation
Region: North America
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Technische Computer Systeme	.1	.0	.1	3	.0%	.0%	.0%	.0%
Algor Interactive Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
Georgia Tech Research Corp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
Point Control	.1	.0	.1	0	.0%	.0%	.0%	.0%
Zuken	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	1,001.6	468.3	329.2	22,084	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	972.5	457.0	317.5	21,787	97.1%	97.6%	96.5%	98.7%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	29.1	11.3	11.6	297	2.9%	2.4%	3.5%	1.3%
All Hardware Companies	244.3	203.9	1.0	13,010	24.4%	43.5%	.3%	58.9%
All Turnkey & SW Companies	757.3	264.4	328.1	9,075	75.6%	56.5%	99.7%	41.1%

Source: Dataquest (February 1992)

Table 8
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Host-Dependent
 Region: North America
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	252.1	141.2	60.5	3,985	36.7%	33.2%	47.5%	35.5%
Digital	129.5	93.2	.0	0	18.9%	21.9%	.0%	.0%
Control Data	34.7	14.9	5.2	199	5.1%	3.5%	4.1%	1.8%
EDS Unigraphics	32.4	16.5	10.8	598	4.7%	3.9%	8.5%	5.3%
Computervision	16.3	4.1	4.0	172	2.4%	1.0%	3.1%	1.5%
MacNeal-Schwendler	15.2	.0	14.6	0	2.2%	.0%	11.5%	.0%
Intergraph	13.3	6.7	2.1	122	1.9%	1.6%	1.7%	1.1%
Schlumberger	11.2	3.6	4.6	178	1.6%	.8%	3.6%	1.6%
Unisys	5.3	2.7	1.9	75	.8%	.6%	1.5%	.7%
Swanson Analysis	5.2	.0	5.2	0	.8%	.0%	4.1%	.0%
MCS	5.1	.0	4.4	0	.7%	.0%	3.5%	.0%
SDRC	5.0	.0	5.0	0	.7%	.0%	3.9%	.0%
PDA Engineering	4.9	.0	4.1	0	.7%	.0%	3.2%	.0%
CADAM	2.5	.0	2.2	0	.4%	.0%	1.7%	.0%
Cislgraph	1.5	.5	.5	26	.2%	.1%	.4%	.2%
Mechanical Dynamics	.9	.0	.8	0	.1%	.0%	.6%	.0%
MARC	.6	.0	.6	0	.1%	.0%	.5%	.0%
Computational Mechanics	.5	.0	.5	0	.1%	.0%	.4%	.0%
Georgia Tech Research Corp.	.2	.0	.2	0	.0%	.0%	.1%	.0%
FEGS	.1	.0	.1	0	.0%	.0%	.1%	.0%
Engineering Systems Corp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%

(Continued)

Table 8 (Continued)

1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Host-Dependent
 Region: North America
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Other Companies	149.7	142.2	.0	5,879	21.8%	33.4%	.0%	52.3%
All Companies	686.2	425.6	127.2	11,235	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	684.1	425.0	126.2	11,209	99.7%	99.9%	99.1%	99.8%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	2.1	.5	1.1	26	.3%	.1%	.9%	.2%
All Hardware Companies	286.7	238.6	1.1	5,919	41.8%	56.1%	.9%	52.7%
All Turnkey & SW Companies	399.5	186.9	126.1	5,315	58.2%	43.9%	99.1%	47.3%

Source: Dataquest (February 1992)

Table 9
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Server
 Region: North America
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Digital	61.0	43.9	.0	0	31.5%	35.5%	.0%	.0%
IBM	57.6	33.6	12.6	390	29.7%	27.1%	46.3%	23.5%
Sun	37.7	31.2	.0	841	19.5%	25.2%	.0%	50.6%
Intergraph	13.3	6.7	3.2	136	6.9%	5.4%	11.8%	8.2%
MacNeal-Schwendler	8.0	.0	7.7	0	4.1%	.0%	28.3%	.0%
Schlumberger	6.9	2.2	2.8	62	3.5%	1.8%	10.3%	3.8%
Silicon Graphics	3.0	2.5	.0	73	1.5%	2.0%	.0%	4.4%
Hewlett-Packard	2.6	2.2	.0	129	1.4%	1.8%	.0%	7.7%
Control Data	1.7	.9	.3	2	.9%	.7%	1.2%	.1%
Computervision	1.5	.4	.4	14	.8%	.3%	1.5%	.8%
Solbourne	.3	.3	.0	11	.1%	.2%	.0%	.7%
Rasna Corporation	.2	.0	.2	0	.1%	.0%	.6%	.0%
A/E Microsystems	.0	.0	.0	2	.0%	.0%	.0%	.1%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	193.8	123.8	27.1	1,660	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	193.8	123.8	27.1	1,660	100.0%	100.0%	100.0%	100.0%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Hardware Companies	105.3	80.6	.1	1,160	54.4%	65.1%	.2%	69.9%
All Turnkey & SW Companies	88.4	43.2	27.1	500	45.6%	34.9%	99.8%	30.1%

Source: Dataquest (February 1992)

Table 10
1991 Preliminary CAD/CAM/CAB Market Share

Application: Mechanical
Platform: Personal Computer
Region: North America
Units: Millions of U.S. Dollars/Actual Units

Company	Total			Market Share			Hardware Units Shipped
	Factory Revenue	Hardware Revenue	Software Revenue	Factory Revenue	Hardware Revenue	Software Revenue	
Compaq	66.7	66.7	.0	16.1%	24.0%	.0%	18.1%
Apple Computer	58.9	51.8	.0	14.2%	18.7%	.0%	19.6%
Autodesk	50.8	.0	50.8	12.3%	.0%	42.8%	.0%
Hewlett-Packard	25.5	20.4	.0	6.2%	7.4%	.0%	7.0%
IBM	22.2	21.1	.0	5.4%	7.6%	.0%	8.3%
CADAM	16.0	9.4	5.6	3.9%	3.4%	4.7%	2.1%
CADKEY	13.0	.0	13.0	3.1%	.0%	10.9%	.0%
Dell Computer	9.2	9.2	.0	2.2%	3.3%	.0%	3.8%
ComputerVision	7.5	.0	7.1	1.8%	.0%	6.0%	.1%
CNC Software	5.5	.0	5.5	1.3%	.0%	4.6%	.0%
Algor Interactive Systems	3.8	.0	3.4	.9%	.0%	2.8%	.0%
Everex Systems	3.6	3.6	.0	.9%	1.3%	.0%	1.8%
Swanson Analysis	3.2	.0	3.2	.8%	.0%	2.7%	.0%
ADRA Systems	3.1	.0	2.8	.8%	.0%	2.4%	.0%
MCS	3.0	.0	2.7	.7%	.0%	2.3%	.0%
Moda CAD	2.7	.7	1.9	.7%	.2%	1.6%	.0%
Intergraph	2.7	.0	2.5	.6%	.0%	2.1%	.0%
Artes Technology	2.1	.0	1.9	.5%	.0%	1.6%	.0%
American Small Business Comp.	2.1	.0	2.1	.5%	.0%	1.8%	.0%
Micrografix	2.0	.0	2.0	.5%	.0%	1.7%	.0%
Micro Engineering Solutions	1.9	.5	1.2	.5%	.2%	1.0%	.0%
Cimatron	1.6	.7	.7	.4%	.3%	.6%	.1%
Clarix	1.6	.0	1.6	.4%	.0%	1.3%	.0%
Investronica SA	1.2	.9	.1	.3%	.3%	.1%	.1%

(Continued)

Table 10 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
Platform: Personal Computer
Region: North America
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Engineering Mechanics	1.1	.1	1.0	137	.3%	.0%	.8%	.2%
Evolution Computing	1.1	.0	1.1	0	.3%	.0%	.9%	.0%
Foresight Resources	1.0	.0	.9	0	.2%	.0%	.7%	.0%
Pathtrace	.9	.3	.6	14	.2%	.1%	.5%	.0%
Innovative Data Design	.8	.0	.8	0	.2%	.0%	.6%	.0%
GRAPHISOFT	.6	.0	.6	0	.2%	.0%	.5%	.0%
Schlumberger	.6	.2	.3	10	.1%	.1%	.3%	.0%
Aura CAD/CAM Systems	.6	.0	.5	0	.1%	.0%	.4%	.0%
Machinery Sales	.6	.0	.6	0	.1%	.0%	.5%	.0%
A.I. Systems	.6	.0	.6	0	.1%	.0%	.5%	.0%
Point Control	.5	.0	.5	0	.1%	.0%	.5%	.0%
MacNeal-Schwendler	.5	.0	.5	0	.1%	.0%	.4%	.0%
Rasna Corporation	.4	.0	.4	0	.1%	.0%	.4%	.0%
Uniras	.4	.0	.4	0	.1%	.0%	.4%	.0%
Ashlar	.3	.0	.3	0	.1%	.0%	.3%	.0%
Cascade Graphics	.3	.0	.3	0	.1%	.0%	.3%	.0%
Mc2 Engineering Software	.2	.0	.2	0	.1%	.0%	.2%	.0%
Engineering Systems Corp.	.2	.0	.2	0	.1%	.0%	.1%	.0%
Ithaca Software	.2	.0	.2	0	.0%	.0%	.1%	.0%
Mega CADD	.2	.0	.2	0	.0%	.0%	.1%	.0%
Synthesis	.1	.0	.1	0	.0%	.0%	.1%	.0%
Vision 3D	.1	.0	.0	0	.0%	.0%	.0%	.0%
IGC Technology	.1	.0	.1	0	.0%	.0%	.1%	.0%
Accugraph	.1	.0	.1	0	.0%	.0%	.1%	.0%

(Continued)

Table 10 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: North America
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Comshoppe	.1	.0	.1	0	.0%	.0%	.1%	.0%
A/E Microsystems	.0	.0	.0	2	.0%	.0%	.0%	.0%
Other Companies	92.2	92.1	.1	24,261	22.3%	33.2%	.1%	38.6%
All Companies	413.5	277.7	118.6	62,896	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	409.8	275.8	117.1	62,773	99.1%	99.3%	98.7%	99.8%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	3.8	1.9	1.5	123	.9%	.7%	1.3%	.2%
All Hardware Companies	287.6	274.3	.0	62,504	69.5%	98.8%	.0%	99.4%
All Turnkey & SW Companies	125.9	3.3	118.6	392	30.5%	1.2%	100.0%	.6%

Source: Dataquest (February 1992)

Table 11 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Platform: Region: Units:	Mechanical All Platforms Europe Millions of U.S. Dollars/Actual Units	Market Share									
Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Hardware Revenue	Software Revenue	Hardware Units Shipped
ISKON Software	17.8	8.9	6.2	254	.6%	.5%	.7%	.3%			
Digital Klenzle	17.3	8.8	4.9	244	.6%	.5%	.6%	.2%			
MacNeal-Schwendler	16.7	.0	16.1	0	.5%	.0%	1.9%	.0%			
Hahn & Kolb	16.1	9.7	4.8	230	.5%	.6%	.6%	.2%			
Kewill Systems	15.5	4.7	8.5	310	.5%	.3%	1.0%	.3%			
CADAM	14.8	6.3	7.3	895	.5%	.4%	.9%	.9%			
Cimatron	14.6	6.6	6.6	360	.5%	.4%	.8%	.4%			
Delcam International	14.3	5.0	7.1	240	.5%	.3%	.8%	.2%			
CAD Lab	14.0	.0	11.3	0	.4%	.0%	1.3%	.0%			
PAPEC	13.2	.0	13.2	0	.4%	.0%	1.5%	.0%			
Exapt	12.7	6.2	4.3	216	.4%	.4%	.5%	.2%			
Gerber Systems	12.4	6.1	4.1	168	.4%	.4%	.5%	.2%			
Framasoft	11.6	.0	7.0	0	.4%	.0%	.8%	.0%			
Albert Nestler	11.0	5.0	6.1	300	.4%	.3%	.7%	.3%			
Fides Industrielle Automation	11.0	1.7	7.7	107	.4%	.1%	.9%	.1%			
ItalCad	10.8	5.1	2.6	101	.3%	.3%	.3%	.1%			
Cimlinc	10.3	2.1	6.2	197	.3%	.1%	.7%	.2%			
ICL	10.2	6.0	3.5	279	.3%	.4%	.4%	.3%			
Unisys	10.1	5.1	3.5	140	.3%	.3%	.4%	.1%			
Cadiron	9.8	4.9	3.9	151	.3%	.3%	.5%	.2%			
Parametric Technology	9.4	.0	8.7	0	.3%	.0%	1.0%	.0%			
Tebis	9.3	1.4	6.5	46	.3%	.1%	.8%	.0%			
PDA Engineering	9.0	.0	7.5	0	.3%	.0%	.9%	.0%			
Ziegler	8.7	.0	8.7	0	.3%	.0%	1.0%	.0%			

(Continued)

(Continued)

Table 11 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Company	Application: Platform: Region: Units:	Total Factory Revenue	Millions of U.S. Dollars/Actual Units				Market Share			
			Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Hardware Units Shipped
Swanson Analysis	Mechanical	8.4	.0	8.4	0	.3%	.0%	1.0%	.0%	.0%
Radan Computational	All Platforms	7.9	2.8	4.0	271	.3%	.2%	.5%	.3%	.3%
Research Machines	Europe	7.2	7.2	.0	1,162	.2%	.4%	.0%	1.2%	.0%
Auto-Trol		7.1	2.8	2.5	84	.2%	.2%	.3%	.1%	.1%
DAT Standard Info ssystemes		6.5	.0	6.1	0	.2%	.0%	.7%	.0%	.0%
Technische Computer Systeme		5.4	1.1	4.3	142	.2%	.1%	.5%	.1%	.1%
Marcus Computer Systeme		4.9	2.6	1.6	152	.2%	.2%	.2%	.2%	.2%
Alias Research		4.8	.0	4.3	0	.2%	.0%	.5%	.0%	.0%
Serbi		4.6	.0	4.6	0	.1%	.0%	.5%	.0%	.0%
XAO Industrie		3.7	1.3	2.2	133	.1%	.1%	.3%	.1%	.1%
ICAD		3.6	.0	2.9	0	.1%	.0%	.3%	.0%	.0%
Anilam Electronics		3.2	1.0	1.9	40	.1%	.1%	.2%	.0%	.0%
MCS		3.1	.0	2.8	0	.1%	.0%	.3%	.0%	.0%
Whesoe Computing Systems		3.1	.0	3.1	0	.1%	.0%	.4%	.0%	.0%
Caroline Informatique		3.0	.6	2.1	40	.1%	.0%	.2%	.0%	.0%
ADRA Systems		2.9	1.0	1.6	52	.1%	.1%	.2%	.1%	.1%
Olivetti		2.9	2.4	.0	436	.1%	.1%	.0%	.4%	.0%
CAMTEK		2.8	.0	2.3	0	.1%	.0%	.3%	.0%	.0%
FEA		2.7	.7	.7	51	.1%	.0%	.1%	.1%	.1%
Superdraft		2.6	1.2	1.3	142	.1%	.1%	.2%	.1%	.1%
Catalpa		2.6	.9	1.3	21	.1%	.1%	.1%	.0%	.0%
X-TRA		2.5	.5	1.1	105	.1%	.0%	.1%	.1%	.1%
MARC		2.5	.0	2.5	0	.1%	.0%	.3%	.0%	.0%
Pathtrace		2.5	.7	1.6	36	.1%	.0%	.2%	.0%	.0%

(Continued)

Table 11 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Europe
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
debis Systemhaus	2.4	.6	1.4	19	.1%	.0%	.2%	.0%
ISKA	2.1	1.0	.9	39	.1%	.1%	.1%	.0%
Aries Technology	2.0	.0	1.8	0	.1%	.0%	.2%	.0%
CNC Software	1.8	.0	1.8	0	.1%	.0%	.2%	.0%
Robocom	1.7	.0	1.7	0	.1%	.0%	.2%	.0%
CADKEY	1.5	1.0	.5	150	.0%	.1%	.1%	.2%
Dell Computer	1.5	1.5	.0	391	.0%	.1%	.0%	.4%
Spatial Technology	1.5	.0	1.5	0	.0%	.0%	.2%	.0%
Computational Mechanics	1.4	.0	1.4	0	.0%	.0%	.2%	.0%
FEES	1.4	.0	1.1	0	.0%	.0%	.1%	.0%
Mechanical Dynamics	1.4	.0	1.2	0	.0%	.0%	.1%	.0%
Mentor Graphics	1.2	.3	.5	11	.0%	.0%	.1%	.0%
Moda CAD	1.1	.3	.7	9	.0%	.0%	.1%	.0%
Micrografix	1.0	.0	1.0	0	.0%	.0%	.1%	.0%
CAD Centre	1.0	.0	.8	0	.0%	.0%	.1%	.0%
S.T.L.D. s.r.l.	1.0	.0	1.0	0	.0%	.0%	.1%	.0%
Foresight Resources	.9	.0	.8	0	.0%	.0%	.1%	.0%
Valisys	.8	.0	.8	0	.0%	.0%	.1%	.0%
Cadtronic	.8	.5	.4	24	.0%	.0%	.0%	.0%
Vision 3D	.8	.4	.2	6	.0%	.0%	.0%	.0%
Algor Interactive Systems	.7	.0	.6	0	.0%	.0%	.1%	.0%
Rasna Corporation	.6	.0	.6	0	.0%	.0%	.1%	.0%
ACERI SA	.6	.1	.3	3	.0%	.0%	.0%	.0%
Wisdom Systems	.5	.0	.4	0	.0%	.0%	.0%	.0%

(Continued)

Mechanical Applications Preliminary Market Share

Table 11 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Europe
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Mutoh Industries—NO OEM	.5	.2	.2	0	.0%	.0%	.0%	.0%
Point Control	.4	.0	.4	0	.0%	.0%	.0%	.0%
Everex Systems	.4	.3	.0	106	.0%	.0%	.0%	.1%
Micro Engineering Solutions	.4	.1	.2	4	.0%	.0%	.0%	.0%
Spectrum Graphics	.3	.1	.2	3	.0%	.0%	.0%	.0%
CAD-Capture	.2	.0	.0	0	.0%	.0%	.0%	.0%
Ontos	.2	.0	.2	0	.0%	.0%	.0%	.0%
Evolution Computing	.2	.0	.2	0	.0%	.0%	.0%	.0%
ESDU International	.2	.0	.2	0	.0%	.0%	.0%	.0%
American Small Business Comp.	.2	.0	.2	0	.0%	.0%	.0%	.0%
DAPCO	.2	.0	.1	0	.0%	.0%	.0%	.0%
Synthesis	.2	.0	.2	0	.0%	.0%	.0%	.0%
Objectivity	.1	.0	.1	0	.0%	.0%	.0%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.1	1	.0%	.0%	.0%	.0%
A.I. Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
Lamp Software	.1	.0	.1	4	.0%	.0%	.0%	.0%
Cascade Graphics	.1	.0	.1	0	.0%	.0%	.0%	.0%
Solbourne	.1	.1	.0	8	.0%	.0%	.0%	.0%
Object Design	.1	.0	.1	0	.0%	.0%	.0%	.0%
Comshoppe	.1	.0	.1	0	.0%	.0%	.0%	.0%
Number One Systems	.1	.0	.0	1	.0%	.0%	.0%	.0%
Mega CADD	.1	.0	.1	0	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%

(Continued)

Table 11 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Europe
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Zuken	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	146.8	143.1	.0	22,387	4.7%	8.6%	.0%	22.9%
All Companies	3,129.8	1,656.3	854.4	97,949	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	2,494.7	1,417.6	562.8	87,919	79.7%	85.6%	65.9%	89.8%
All Asian-Based Companies	.5	.2	.2	0	.0%	.0%	.0%	.0%
All European-Based Companies	634.6	238.4	291.4	10,030	20.3%	14.4%	34.1%	10.2%
All Hardware Companies	720.0	615.1	2.8	64,857	23.0%	37.1%	.3%	66.2%
All Turnkey & SW Companies	2,409.8	1,041.2	851.6	33,092	77.0%	62.9%	99.7%	33.8%

Source: Dataquest (February 1992)

Table 12
1991 Preliminary CAD/CAM/CAE Market Share

Application: Platform: Region: Units:	Mechanical Technical Workstation Europe Millions of U.S. Dollars/Actual Units	Market Share									
Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Software Revenue	Hardware Units Shipped	
Computervision	474.7	194.0	114.6	4,489	27.9%	24.3%	21.6%	15.8%			
Hewlett-Packard	275.5	184.7	44.1	8,794	16.2%	23.1%	8.3%	31.0%			
EDS Unigraphics	87.6	44.8	34.1	1,003	5.1%	5.6%	6.4%	3.5%			
Matra Datavision	69.2	24.2	31.1	609	4.1%	3.0%	5.9%	2.1%			
Schlumberger	59.9	20.6	22.6	555	3.5%	2.6%	4.3%	2.0%			
Siemens Nixdorf Info systems	57.9	28.9	20.3	791	3.4%	3.6%	3.8%	2.8%			
Sun	53.8	47.1	.0	2,729	3.2%	5.9%	.0%	9.6%			
Intergraph	39.5	21.6	7.6	427	2.3%	2.7%	1.4%	1.5%			
STI-Sraessle	38.0	8.7	20.9	357	2.2%	1.1%	4.0%	1.3%			
IBM	36.7	21.3	8.1	1,051	2.2%	2.7%	1.5%	3.7%			
Digital	36.2	26.1	.0	1,354	2.1%	3.3%	.0%	4.8%			
Silicon Graphics	34.1	30.0	.0	907	2.0%	3.8%	.0%	3.2%			
Control Data	30.7	19.6	6.5	732	1.8%	2.4%	1.2%	2.6%			
Ferranti	27.9	10.3	12.8	243	1.6%	1.3%	2.4%	.9%			
SDRC	24.4	.0	24.4	0	1.4%	.0%	4.6%	.0%			
Cisgraph	20.8	7.3	7.3	161	1.2%	.9%	1.4%	.6%			
Norsk Data	20.3	11.8	4.1	253	1.2%	1.5%	.8%	.9%			
ISICAD	18.1	8.8	6.1	142	1.1%	1.1%	1.1%	.5%			
ISYKON Software	17.8	8.9	6.2	254	1.0%	1.1%	1.2%	.9%			
Digital Kienzle	17.3	8.8	4.9	244	1.0%	1.1%	.9%	.9%			
Hahn & Kolb	14.5	8.7	4.4	199	.9%	1.1%	.8%	.7%			
Delcam International	14.3	5.0	7.1	240	.8%	.6%	1.3%	.8%			
Kewill Systems	14.0	4.2	7.7	294	.8%	.5%	1.5%	1.0%			
CAD Lab	13.6	.0	10.9	0	.8%	.0%	2.1%	.0%			
(Continued)											

(Continued)

Table 12 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Platform: Region: Units:	Mechanical Technical Workstation Europe Millions of U.S. Dollars/Actual Units	Market Share									
Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Hardware Revenue	Software Revenue	Hardware Units Shipped
Gerber Systems	12.4	6.1	4.1	168	.7%	.8%	.8%	.6%	.8%	.8%	.6%
PAPEC	11.2	.0	11.2	0	.7%	.0%	2.1%	.0%	.0%	2.1%	.0%
Albert Nestler	11.0	5.0	6.1	300	.6%	.6%	1.1%	300	.6%	1.1%	1.1%
ItalCad	10.8	5.1	2.6	101	.6%	.6%	.5%	101	.6%	.5%	.4%
Framasoft	10.4	.0	6.3	0	.6%	.0%	1.2%	0	.0%	1.2%	.0%
Cimlinc	10.3	2.1	6.2	197	.6%	.3%	1.2%	197	.3%	1.2%	.7%
ICL	10.2	6.0	3.5	279	.6%	.7%	.7%	279	.7%	.7%	1.0%
Cimatron	10.1	4.5	4.5	176	.6%	.6%	.9%	176	.6%	.9%	.6%
Parametric Technology	9.4	.0	8.7	0	.6%	.0%	1.6%	0	.0%	1.6%	.0%
Fides Industrielle Automation	9.3	1.4	6.5	100	.5%	.2%	1.2%	100	.2%	1.2%	.4%
Radan Computational	7.9	2.7	3.9	267	.5%	.3%	.7%	267	.3%	.7%	.9%
Unisis	7.8	4.0	2.7	111	.5%	.5%	.5%	111	.5%	.5%	.4%
Auto-Trol	7.1	2.8	2.5	84	.4%	.4%	.5%	84	.4%	.5%	.3%
Wiechers Datentechnik	7.0	4.0	2.1	90	.4%	.5%	.4%	90	.5%	.4%	.3%
PDA Engineering	6.8	.0	5.6	0	.4%	.0%	1.1%	0	.0%	1.1%	.0%
Technische Computer Systeme	5.4	1.1	4.3	142	.3%	.1%	.8%	142	.1%	.8%	.5%
Alias Research	4.8	.0	4.3	0	.3%	.0%	.8%	0	.0%	.8%	.0%
Autodesk	4.2	.0	4.2	0	.2%	.0%	.8%	0	.0%	.8%	.0%
Swanson Analysis	4.0	.0	4.0	0	.2%	.0%	.8%	0	.0%	.8%	.0%
XAO Industrie	3.7	1.3	2.2	133	.2%	.2%	.4%	133	.2%	.4%	.5%
Marcus Computer Systems	3.6	1.9	1.2	113	.2%	.2%	.2%	113	.2%	.2%	.4%
ICAD	3.6	.0	2.9	0	.2%	.0%	.5%	0	.0%	.5%	.0%
Exapt	3.4	1.7	1.2	108	.2%	.2%	.2%	108	.2%	.2%	.4%
Catalpa	2.6	.9	1.3	21	.1%	.1%	.2%	21	.1%	.2%	.1%
(Continued)											

(Continued)

Table 12 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: Europe
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Caroline Informatique	2.4	.5	1.7	33	.1%	.1%	.3%	.1%
CADAM	2.4	.0	2.1	0	.1%	.0%	.4%	.0%
ADRA Systems	2.3	1.0	1.0	52	.1%	.1%	.2%	.2%
ISKA	2.1	1.0	.9	39	.1%	.1%	.2%	.1%
CAMTEK	2.0	.0	1.6	0	.1%	.0%	.3%	.0%
MacNeal-Schwendler	1.8	.0	1.8	0	.1%	.0%	.3%	.0%
debis Systemhaus	1.8	.5	1.1	11	.1%	.1%	.2%	.0%
MARC	1.8	.0	1.8	0	.1%	.0%	.3%	.0%
Aries Technology	1.6	.0	1.4	0	.1%	.0%	.3%	.0%
Spatial Technology	1.5	.0	1.5	0	.1%	.0%	.3%	.0%
MCS	1.4	.0	1.3	0	.1%	.0%	.2%	.0%
Mentor Graphics	1.2	.3	.5	11	.1%	.0%	.1%	.0%
FEA	1.1	.3	.3	20	.1%	.0%	.1%	.1%
Mechanical Dynamics	1.1	.0	.9	0	.1%	.0%	.2%	.0%
CAD Centre	1.0	.0	.8	0	.1%	.0%	.2%	.0%
Vallsys	.8	.0	.8	0	.0%	.0%	.2%	.0%
FECS	.8	.0	.7	0	.0%	.0%	.1%	.0%
Wisdom Systems	.5	.0	.4	0	.0%	.0%	.1%	.0%
Spectrum Graphics	.3	.1	.2	3	.0%	.0%	.0%	.0%
Whesoe Computing Systems	.3	.0	.3	0	.0%	.0%	.1%	.0%
Computational Mechanics	.2	.0	.2	0	.0%	.0%	.0%	.0%
Serbi	.2	.0	.2	0	.0%	.0%	.0%	.0%
Ontos	.2	.0	.2	0	.0%	.0%	.0%	.0%
DAPCO	.2	.0	.1	0	.0%	.0%	.0%	.0%

(Continued)

Table 12 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
Platform: Technical Workstation
Region: Europe
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Mutoh Industries—NO OEM	.2	.1	.1	0	.0%	.0%	.0%	.0%
Micro Engineering Solutions	.1	.0	.1	1	.0%	.0%	.0%	.0%
Objectivity	.1	.0	.1	0	.0%	.0%	.0%	.0%
CADKEY	.1	.0	.0	3	.0%	.0%	.0%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Object Design	.1	.0	.1	0	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.0	0	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
Everex Systems	.0	.0	.0	5	.0%	.0%	.0%	.0%
Lamp Software	.0	.0	.0	2	.0%	.0%	.0%	.0%
Algor Interactive Systems	.0	.0	.0	0	.0%	.0%	.0%	.0%
Point Control	.0	.0	.0	0	.0%	.0%	.0%	.0%
Solbourne	.0	.0	.0	6	.0%	.0%	.0%	.0%
Zuken	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	1,703.4	799.7	529.6	28,404	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	1,258.6	635.0	327.0	22,821	73.9%	79.4%	61.7%	80.3%
All Asian-Based Companies	.2	.1	.1	0	.0%	.0%	.0%	.0%
All European-Based Companies	444.7	164.6	202.6	5,583	26.1%	20.6%	38.2%	19.7%
All Hardware Companies	201.8	167.0	1.3	8,943	11.8%	20.9%	.3%	31.5%
All Turnkey & SW Companies	1,501.6	632.7	528.3	19,461	88.2%	79.1%	99.7%	68.5%

Source: Dataquest (February 1992)

Table 13
1991 Preliminary CAD/CAM/CAE Market Share

Application: Platform: Region: Units:	Mechanical Host-Dependent Europe Millions of U.S. Dollars/Actual Units	Market Share										
Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	385.3	215.7	92.5	5,620	49.6%	48.8%	57.3%	46.7%				
Digital	107.9	77.7	.0	0	13.9%	17.6%	.0%	.0%				
Computervision	59.3	24.9	13.6	2,004	7.6%	5.6%	8.4%	16.7%				
Control Data	44.2	19.0	6.6	253	5.7%	4.3%	4.1%	2.1%				
Norsk Data	23.5	10.3	3.5	172	3.0%	2.3%	2.2%	1.4%				
EDS Unigraphics	16.7	8.4	6.6	587	2.1%	1.9%	4.1%	4.9%				
Schlumberger	15.4	4.9	6.4	244	2.0%	1.1%	3.9%	2.0%				
MacNeal-Schwendler	9.5	.0	9.2	0	1.2%	.0%	5.7%	.0%				
Exapt	9.3	4.6	3.2	108	1.2%	1.0%	2.0%	.9%				
Intergraph	8.8	4.4	1.4	85	1.1%	1.0%	.9%	.7%				
SDRC	3.6	.0	3.6	0	.5%	.0%	2.3%	.0%				
Swanson Analysis	2.7	.0	2.7	0	.3%	.0%	1.7%	.0%				
Cisgraph	2.3	.8	.8	41	.3%	.2%	.5%	.3%				
Unisys	2.3	1.1	.8	29	.3%	.3%	.5%	.2%				
PDA Engineering	2.3	.0	1.9	0	.3%	.0%	1.2%	.0%				
CADAM	1.7	.0	1.5	0	.2%	.0%	.9%	.0%				
Fides Industrielle Automation	1.7	.3	1.2	7	.2%	.1%	.7%	.1%				
Kewill Systems	1.6	.5	.9	16	.2%	.1%	.5%	.1%				
Computational Mechanics	1.2	.0	1.2	0	.2%	.0%	.7%	.0%				
Parasoft	1.2	.0	.7	0	.1%	.0%	.4%	.0%				
MCS	1.1	.0	.9	0	.1%	.0%	.6%	.0%				
MARC	.8	.0	.8	0	.1%	.0%	.5%	.0%				
Whesoe Computing Systems	.6	.0	.6	0	.1%	.0%	.4%	.0%				
FECS	.6	.0	.5	0	.1%	.0%	.3%	.0%				
(Continued)												

(Continued)

Table 13 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Host-Dependent
 Region: Europe
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Olivetti	.3	.3	.0	7	.0%	.1%	.0%	.1%
Mechanical Dynamics	.3	.0	.3	0	.0%	.0%	.2%	.0%
debis Systemhaus	.3	.1	.2	2	.0%	.0%	.1%	.0%
FEA	.3	.1	.1	5	.0%	.0%	.0%	.0%
CADKEY	.1	.1	.0	2	.0%	.0%	.0%	.0%
Mutoh Industries—NO CRM	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	72.6	69.0	.0	2,851	9.3%	15.6%	.0%	23.7%
All Companies	777.2	442.1	161.4	12,032	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	734.5	425.3	148.6	11,676	94.5%	96.2%	92.1%	97.0%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	42.7	16.8	12.7	357	5.5%	3.8%	7.9%	3.0%
All Hardware Companies	190.4	151.0	1.4	2,908	24.5%	34.2%	.9%	24.2%
All Turnkey & SW Companies	586.9	291.1	159.9	9,124	75.5%	65.8%	99.1%	75.8%

Source: Dataquest (February 1992)

Table 14
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Server
 Region: Europe
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	87.9	51.2	19.2	542	44.5%	42.3%	60.0%	37.7%
Digital	50.8	36.6	.0	0	25.7%	30.2%	.0%	.0%
Sun	23.0	19.0	.0	505	11.7%	15.7%	.0%	35.2%
Schlumberger	9.4	3.1	3.8	86	4.8%	2.5%	11.8%	6.0%
Intergraph	8.8	4.4	2.1	87	4.5%	3.7%	6.6%	6.0%
Computervision	5.4	1.6	1.5	40	2.7%	1.3%	4.8%	2.8%
MacNeal-Schwendler	5.0	.0	4.8	0	2.5%	.0%	15.0%	.0%
Hewlett-Packard	2.6	2.2	.0	129	1.3%	1.8%	.0%	8.9%
Silicon Graphics	2.2	1.8	.0	44	1.1%	1.5%	.0%	3.1%
Control Data	2.2	1.1	.4	3	1.1%	.9%	1.2%	.2%
Rasna Corporation	.2	.0	.2	0	.1%	.0%	.5%	.0%
Solbourne	.0	.0	.0	2	.0%	.0%	.0%	.1%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	197.6	121.1	32.1	1,437	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	197.6	121.1	32.1	1,437	100.0%	100.0%	100.0%	100.0%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Hardware Companies	79.6	60.4	.1	822	40.3%	49.9%	.2%	57.2%
All Turnkey & SW Companies	118.0	60.6	32.0	615	59.7%	50.1%	99.8%	42.8%

Source: Dataquest (February 1992)

Table 15
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
Platform: Personal Computer
Region: Europe
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Compaq	76.0	76.0	.0	13,000	16.8%	25.9%	.0%	23.2%
Hewlett-Packard	33.1	26.5	.0	5,712	7.3%	9.0%	.0%	10.2%
Autodesk	30.8	.0	30.8	0	6.8%	.0%	23.5%	.0%
IBM	29.7	28.2	.0	6,949	6.6%	9.6%	.0%	12.4%
Investronica SA	26.5	21.2	2.7	1,060	5.9%	7.2%	2.0%	1.9%
Apple Computer	24.7	21.7	.0	5,171	5.5%	7.4%	.0%	9.2%
Vero International Software	20.8	.0	18.9	0	4.6%	.0%	14.4%	.0%
Wiechers Datentechnik	20.0	11.4	6.0	577	4.4%	3.9%	4.6%	1.0%
CADAM	10.7	6.3	3.7	895	2.4%	2.1%	2.8%	1.6%
Caditron	9.8	4.9	3.9	151	2.2%	1.7%	3.0%	.3%
Tebis	9.3	1.4	6.5	46	2.1%	.5%	4.9%	.1%
Ziegler	8.7	.0	8.7	0	1.9%	.0%	6.6%	.0%
Research Machines	7.2	7.2	.0	1,162	1.6%	2.5%	.0%	2.1%
Computervision	6.5	.3	6.1	61	1.4%	.1%	4.6%	.1%
DAT Standard info ssystems	6.5	.0	6.1	0	1.4%	.0%	4.7%	.0%
Cimatron	4.5	2.0	2.0	184	1.0%	.7%	1.5%	.3%
Serbi	4.4	.0	4.4	0	1.0%	.0%	3.3%	.0%
Anilam Electronics	3.2	1.0	1.9	40	.7%	.3%	1.5%	.1%
Superdraft	2.6	1.2	1.3	142	.6%	.4%	1.0%	.3%
Olivetti	2.5	2.2	.0	429	.6%	.7%	.0%	.8%
X-TRA	2.5	.5	1.1	105	.6%	.2%	.9%	.2%
Pathtrace	2.5	.7	1.6	36	.5%	.2%	1.2%	.1%
Whessoe Computing Systems	2.2	.0	2.2	0	.5%	.0%	1.6%	.0%
PAFEC	2.0	.0	2.0	0	.4%	.0%	1.5%	.0%

(Continued)

Mechanical Applications Preliminary Market Share

Table 15 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
Platform: Personal Computer
Region: Europe
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
CNC Software	1.8	.0	1.8	0	.4%	.0%	1.4%	.0%
ISICAD	1.8	.0	1.8	0	.4%	.0%	1.4%	.0%
Intergraph	1.8	.0	1.7	0	.4%	.0%	1.3%	.0%
Swanson Analysis	1.7	.0	1.7	0	.4%	.0%	1.3%	.0%
Robocom	1.7	.0	1.7	0	.4%	.0%	1.3%	.0%
Hahn & Kolb	1.6	1.0	.5	31	.4%	.3%	.4%	.1%
Dell Computer	1.5	1.5	.0	391	.3%	.5%	.0%	.7%
FEA	1.4	.3	.3	25	.3%	.1%	.3%	.0%
CADKEY	1.4	.9	.4	145	.3%	.3%	.3%	.3%
Marcus Computer Systeme	1.2	.7	.4	39	.3%	.2%	.3%	.1%
Moda CAD	1.1	.3	.7	9	.2%	.1%	.6%	.0%
Micrografx	1.0	.0	1.0	0	.2%	.0%	.8%	.0%
S.T.L.D. s.r.l.	1.0	.0	1.0	0	.2%	.0%	.7%	.0%
CAMTEK	.9	.0	.7	0	.2%	.0%	.5%	.0%
Foresight Resources	.9	.0	.8	0	.2%	.0%	.6%	.0%
Schlumberger	.9	.2	.4	13	.2%	.1%	.3%	.0%
Cadtronic	.8	.5	.4	24	.2%	.2%	.3%	.0%
Vision 3D	.8	.4	.2	6	.2%	.1%	.1%	.0%
ADRA Systems	.7	.0	.6	0	.2%	.0%	.5%	.0%
Algor Interactive Systems	.6	.0	.6	0	.1%	.0%	.4%	.0%
MCS	.6	.0	.6	0	.1%	.0%	.4%	.0%
Caroline Informatique	.6	.1	.4	7	.1%	.0%	.3%	.0%
ACERI SA	.6	.1	.3	3	.1%	.0%	.2%	.0%
Norsk Data	.5	.3	.1	8	.1%	.1%	.1%	.0%

(Continued)

Table 15 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: Europe
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
CAD Lab	.5	.0	.4	0	.1%	.0%	.3%	.0%
Rasna Corporation	.4	.0	.4	0	.1%	.0%	.3%	.0%
Aries Technology	.4	.0	.4	0	.1%	.0%	.3%	.0%
Point Control	.4	.0	.4	0	.1%	.0%	.3%	.0%
MacNeal-Schwendler	.3	.0	.3	0	.1%	.0%	.3%	.0%
Everex Systems	.3	.3	.0	101	.1%	.1%	.0%	.2%
debis Systemhaus	.3	.1	.2	6	.1%	.0%	.1%	.0%
Mutoh Industries—NO OEM	.3	.2	.1	0	.1%	.1%	.1%	.0%
Micro Engineering Solutions	.2	.1	.1	3	.0%	.0%	.1%	.0%
CAD-Capture	.2	.0	.0	0	.0%	.0%	.0%	.0%
Evolution Computing	.2	.0	.2	0	.0%	.0%	.1%	.0%
American Small Business Comp.	.2	.0	.2	0	.0%	.0%	.1%	.0%
ESDU International	.2	.0	.2	0	.0%	.0%	.1%	.0%
Synthesis	.2	.0	.2	0	.0%	.0%	.1%	.0%
A.I. Systems	.1	.0	.1	0	.0%	.0%	.1%	.0%
Cascade Graphics	.1	.0	.1	0	.0%	.0%	.1%	.0%
Radan Computational	.1	.0	.0	4	.0%	.0%	.0%	.0%
Lamp Software	.1	.0	.0	2	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.0	1	.0%	.0%	.0%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Mega CADD	.1	.0	.1	0	.0%	.0%	.0%	.0%
Comshoppe	.1	.0	.1	0	.0%	.0%	.0%	.0%
Number One Systems	.1	.0	.0	1	.0%	.0%	.0%	.0%

(Continued)

Mechanical Applications Preliminary Market Share

Table 15 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: Europe
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Other Companies	74.2	74.2	.0	19,536	16.4%	25.3%	.0%	34.8%
All Companies	451.5	293.5	131.3	56,076	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	304.0	236.3	55.1	51,986	67.3%	80.5%	42.0%	92.7%
All Asian-Based Companies	.3	.2	.1	0	.1%	.1%	.1%	.0%
All European-Based Companies	147.2	57.0	76.1	4,090	32.6%	19.4%	57.9%	7.3%
All Hardware Companies	248.2	236.7	.0	52,183	55.0%	80.7%	.0%	93.1%
All Turnkey & SW Companies	203.4	56.7	131.3	3,892	45.0%	19.3%	100.0%	6.9%

Source: Dataquest (February 1992)

Table 16
1991 Preliminary CAD/CAM/CAB Market Share

Application: Platform: Region: Units:	Mechanical All Platforms Asia Millions of U.S. Dollars/Actual Units	Market Share									
Company	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Software Revenue	Hardware Units Shipped	
IBM	469.3	272.3	105.9	11,135	19.1%	18.2%	16.1%	15.4%			
NEC	268.0	186.4	60.2	11,806	10.9%	12.5%	9.2%	16.3%			
Nihon Unisys	206.5	138.3	26.8	1,919	8.4%	9.3%	4.1%	2.7%			
Fujitsu	204.6	126.8	57.3	4,581	8.3%	8.5%	8.7%	6.3%			
Hitachi	157.5	75.6	66.2	4,875	6.4%	5.1%	10.1%	6.7%			
Hewlett-Packard	108.2	76.2	13.3	5,705	4.4%	5.1%	2.0%	7.9%			
Toshiba—NO OEM	93.3	49.3	34.7	2,415	3.8%	3.3%	5.3%	3.3%			
Computervision	77.9	33.7	34.9	959	3.2%	2.3%	5.3%	1.3%			
Silicon Graphics	69.4	65.9	.0	1,715	2.8%	4.4%	.0%	2.4%			
Hitachi Zosen Info Systems	58.8	46.9	.6	595	2.4%	3.1%	.1%	.8%			
Muroh Industries—NO OEM	56.1	30.4	20.5	1,345	2.3%	2.0%	3.1%	1.9%			
Hakuto	55.0	33.0	22.0	1,350	2.2%	2.2%	3.3%	1.9%			
Sun	54.5	47.0	.0	3,355	2.2%	3.1%	.0%	4.6%			
Mitsubishi Electric	49.0	39.1	6.4	971	2.0%	2.6%	1.0%	1.3%			
Digital	43.9	31.6	.0	305	1.8%	2.1%	.0%	.4%			
CADAM	37.0	15.7	18.2	2,237	1.5%	1.0%	2.8%	3.1%			
Sumitomo Denko Workstation	31.2	31.2	.0	1,739	1.3%	2.1%	.0%	2.4%			
Sharp System Products—NO OEM	31.2	16.2	15.0	205	1.3%	1.1%	2.3%	.3%			
Tokyo Electron—NO OEM	26.8	8.8	12.9	94	1.1%	.6%	2.0%	.1%			
Mitsui Engineering	26.1	18.3	5.2	171	1.1%	1.2%	.8%	.2%			
SDRC	25.2	.0	25.2	0	1.0%	.0%	3.8%	.0%			
Toyo Information Systems-NO OEM	19.8	12.1	5.8	211	.8%	.8%	.9%	.3%			
Graphtec Engineering	14.8	7.4	6.6	319	.6%	.5%	1.0%	.4%			
Omron	13.9	12.6	1.4	402	.6%	.8%	.2%	.6%			
(Continued)											

(Continued)

Table 16 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Platform: Region: Units:	Mechanical All Platforms Asia	Millions of U.S. Dollars/Actual Units	Market Share									
Company			Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped		
EDS Unigraphics			13.8	7.1	4.5	198	.6%	.5%	.7%	.3%		
Autodesk			11.7	.0	11.7	0	.5%	.0%	1.8%	.0%		
Control Data			10.6	5.5	1.9	136	.4%	.4%	.3%	.2%		
Apple Computer			10.4	9.2	.0	2,188	.4%	.6%	.0%	3.0%		
MacNeal-Schwendler			10.4	.0	9.9	0	.4%	.0%	1.5%	.0%		
Intergraph			10.3	5.3	2.2	105	.4%	.4%	.3%	.1%		
Design Automation			10.2	.0	10.2	0	.4%	.0%	1.6%	.0%		
Wacom			9.7	2.0	6.8	155	.4%	.1%	1.0%	.2%		
Parametric Technology			9.4	.0	8.7	0	.4%	.0%	1.3%	.0%		
Andor			8.5	2.1	6.1	77	.3%	.1%	.9%	.1%		
Sony			8.5	7.4	.0	493	.3%	.5%	.0%	.7%		
Schlumberger			7.9	2.6	3.0	83	.3%	.2%	.5%	.1%		
Alias Research			5.6	.0	5.1	0	.2%	.0%	.8%	.0%		
MARC			5.5	.0	5.5	0	.2%	.0%	.8%	.0%		
Matra Datavision			5.1	2.3	2.0	55	.2%	.2%	.3%	.1%		
Compaq			4.7	4.7	.0	796	.2%	.3%	.0%	1.1%		
Unisys			4.6	2.4	1.6	70	.2%	.2%	.2%	.1%		
ADRA Systems			4.4	1.5	2.4	78	.2%	.1%	.4%	.1%		
Cisigraph			4.2	1.5	1.5	37	.2%	.1%	.2%	.1%		
Swanson Analysis			4.0	.0	4.0	0	.2%	.0%	.6%	.0%		
CADIX			3.2	1.3	1.6	24	.1%	.1%	.2%	.0%		
Century Research Center			3.1	1.6	1.1	18	.1%	.1%	.2%	.0%		
Mechanical Dynamics			3.0	.0	2.6	0	.1%	.0%	.4%	.0%		
Cimatron			2.9	1.3	1.3	74	.1%	.1%	.2%	.1%	(Continued)	

(Continued)

Table 16 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
Platform: All Platforms
Region: Asia
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Kubota Computer	2.8	1.8	.9	421	.1%	.1%	.1%	.6%
Delcam International	2.7	.9	1.3	45	.1%	.1%	.2%	.1%
Framasoft	2.6	.0	1.6	0	.1%	.0%	.2%	.0%
Aries Technology	2.6	.0	2.3	0	.1%	.0%	.4%	.0%
Fides Industrielle Automation	2.4	.3	2.2	0	.1%	.0%	.3%	.0%
Ricoh—NO OEM	1.9	.0	1.6	0	.1%	.0%	.2%	.0%
Siemens Nixdorf Info systeme	1.8	.9	.6	25	.1%	.1%	.1%	.0%
PDA Engineering	1.5	.0	1.2	0	.1%	.0%	.2%	.0%
Spatial Technology	1.5	.0	1.5	0	.1%	.0%	.2%	.0%
Cimlinc	1.5	.3	.9	28	.1%	.0%	.1%	.0%
Anilam Electronics	1.4	.4	.8	18	.1%	.0%	.1%	.0%
MCS	1.4	.0	1.2	0	.1%	.0%	.2%	.0%
Auto-Trol	1.3	.5	.5	16	.1%	.0%	.1%	.0%
Mentor Graphics	1.0	.3	.4	9	.0%	.0%	.1%	.0%
ICAD	.9	.0	.7	0	.0%	.0%	.1%	.0%
Gerber Systems	.9	.4	.3	12	.0%	.0%	.0%	.0%
ISICAD	.8	.4	.3	6	.0%	.0%	.0%	.0%
Zuken	.8	.3	.5	5	.0%	.0%	.1%	.0%
CADKEY	.8	.0	.8	0	.0%	.0%	.1%	.0%
CNC Software	.7	.0	.7	0	.0%	.0%	.1%	.0%
Whessoe Computing Systems	.7	.0	.7	0	.0%	.0%	.1%	.0%
Rasna Corporation	.6	.0	.6	0	.0%	.0%	.1%	.0%
Valisys	.6	.0	.6	0	.0%	.0%	.1%	.0%
Moda CAD	.4	.1	.3	4	.0%	.0%	.0%	.0%

(Continued)

Table 16 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
Platform: All Platforms
Region: Asia
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Point Control	.4	.0	.4	0	.0%	.0%	.1%	.0%
Micro Engineering Solutions	.4	.1	.2	4	.0%	.0%	.0%	.0%
Wisdom Systems	.3	.0	.3	0	.0%	.0%	.0%	.0%
Technische Computer Systeme	.3	.1	.2	8	.0%	.0%	.0%	.0%
Investronica SA	.3	.2	.0	11	.0%	.0%	.0%	.0%
Superdraft	.2	.1	.1	13	.0%	.0%	.0%	.0%
Object Design	.2	.0	.2	0	.0%	.0%	.0%	.0%
PAFEC	.1	.0	.1	0	.0%	.0%	.0%	.0%
Pathtrace	.1	.0	.1	2	.0%	.0%	.0%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Everex Systems	.1	.1	.0	26	.0%	.0%	.0%	.0%
Algor Interactive Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
American Small Business Comp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
Objectivity	.1	.0	.1	0	.0%	.0%	.0%	.0%
Foresight Resources	.0	.0	.0	0	.0%	.0%	.0%	.0%
Mega CADD	.0	.0	.0	0	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
Lamp Software	.0	.0	.0	0	.0%	.0%	.0%	.0%

(Continued)

Table 16 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Asia
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Other Companies	54.2	52.9	.0	8,677	2.2%	3.5%	.0%	12.0%
All Companies	2,459.8	1,492.5	657.1	72,322	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	1,073.8	635.7	274.4	37,846	43.7%	42.6%	41.8%	52.3%
All Asian-Based Companies	1,361.1	848.8	370.1	34,188	55.3%	56.9%	56.3%	47.3%
All European-Based Companies	24.9	8.0	12.6	288	1.0%	.5%	1.9%	.4%
All Hardware Companies	329.1	291.9	.4	28,449	13.4%	19.6%	.1%	39.3%
All Turnkey & SW Companies	2,130.7	1,200.6	656.7	43,873	86.6%	80.4%	99.9%	60.7%

Source: Dataquest (February 1992)

Table 17
1991 Preliminary CAD/CAM/CAE Market Share

Application: Platform: Region: Units:		Mechanical Technical Workstation Asia	Millions of U.S. Dollars/Actual Units														
		Total				Hardware				Software			Market Share				
Company		Factory	Revenue	Hardware	Revenue	Software	Revenue	Shipped	Units	Factory	Revenue	Hardware	Revenue	Software	Revenue	Shipped	Units
NEC		120.6		67.5		43.4		6,244		10.7%		10.0%		13.4%		23,5%	
Hewlett-Packard		91.5		62.9		13.3		2,939		8.1%		9.3%		4.1%		11.1%	
Fujitsu		85.5		53.0		23.9		2,013		7.6%		7.8%		7.4%		7.6%	
Hitachi		78.8		37.8		33.1		1,640		7.0%		5.6%		10.2%		6.2%	
Nihon Unisys		76.3		51.2		9.9		899		6.8%		7.5%		3.1%		3.4%	
Silicon Graphics		69.4		65.9		.0		1,715		6.1%		9.7%		.0%		6.4%	
Computervision		67.1		27.8		32.6		790		5.9%		4.1%		10.0%		3.0%	
Hitachi Zosen Info Systems		55.2		46.9		.6		595		4.9%		6.9%		.2%		2.2%	
Toshiba—NO OEM		54.1		27.1		21.6		490		4.8%		4.0%		6.7%		1.8%	
Sun		38.2		33.4		.0		2,736		3.4%		4.9%		.0%		10.3%	
Mitsubishi Electric		36.8		32.2		2.5		366		3.3%		4.7%		.8%		1.4%	
IBM		32.4		18.8		7.1		990		2.9%		2.8%		2.2%		3.7%	
Sumitomo Denko Workstation		29.1		29.1		.0		1,577		2.6%		4.3%		.0%		5.9%	
Sharp System Products—NO OEM		27.1		14.1		13.0		168		2.4%		2.1%		4.0%		.6%	
Tokyo Electron—NO OEM		26.8		8.8		12.9		94		2.4%		1.3%		4.0%		.4%	
Mitsui Engineering		23.9		16.8		4.8		157		2.1%		2.5%		1.5%		.6%	
SDRC		22.0		.0		22.0		0		1.9%		.0%		6.8%		.0%	
Mutoh Industries—NO OEM		19.6		9.4		6.7		225		1.7%		1.4%		2.1%		.8%	
Toyo Information Systems—NO OEM		15.8		9.9		4.5		187		1.4%		1.5%		1.4%		.7%	
Graphtec Engineering		14.8		7.4		6.6		319		1.3%		1.1%		2.0%		1.2%	
Omron		13.9		12.6		1.4		402		1.2%		1.9%		.4%		1.5%	
EDS Unigraphics		11.2		5.8		3.6		151		1.0%		.8%		1.1%		.6%	
Parametric Technology		9.4		.0		8.7		0		.8%		.0%		2.7%		.0%	
Sony		8.5		7.4		.0		493		.8%		1.1%		.0%		1.9%	
																	(Continued)

(Continued)

Table 17 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: Asia
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Digital	8.2	5.9	.0	305	.7%	.9%	.0%	1.1%
Intergraph	6.9	3.8	1.3	74	.6%	.6%	.4%	.3%
CADAM	6.1	.0	5.2	0	.5%	.0%	1.6%	.0%
Alias Research	5.6	.0	5.1	0	.5%	.0%	1.6%	.0%
Schlumberger	5.5	1.9	2.1	51	.5%	.3%	.6%	.2%
Matra Datavision	5.1	2.3	2.0	55	.5%	.3%	.6%	.2%
Control Data	4.2	2.7	.9	101	.4%	.4%	.3%	.4%
Hakuto	3.9	2.3	1.5	66	.3%	.3%	.5%	.2%
MARC	3.9	.0	3.9	0	.3%	.0%	1.2%	.0%
Cisigraph	3.8	1.3	1.3	29	.3%	.2%	.4%	.1%
Unisys	3.6	1.8	1.2	56	.3%	.3%	.4%	.2%
ADRA Systems	3.4	1.5	1.5	78	.3%	.2%	.5%	.3%
CADIX	3.2	1.3	1.6	24	.3%	.2%	.5%	.1%
Delcam International	2.7	.9	1.3	45	.2%	.1%	.4%	.2%
Framasoft	2.4	.0	1.5	0	.2%	.0%	.4%	.0%
Mechanical Dynamics	2.4	.0	2.1	0	.2%	.0%	.6%	.0%
Kubota Computer	2.1	1.4	.7	356	.2%	.2%	.2%	1.3%
Aries Technology	2.0	.0	1.8	0	.2%	.0%	.6%	.0%
Swanson Analysis	1.9	.0	1.9	0	.2%	.0%	.6%	.0%
Ricoh—NO OEM	1.9	.0	1.6	0	.2%	.0%	.5%	.0%
Cimatron	1.9	.8	.8	32	.2%	.1%	.3%	.1%
Siemens Nixdorf Info systeme	1.8	.9	.6	25	.2%	.1%	.2%	.1%
Century Research Center	1.8	.9	.7	10	.2%	.1%	.2%	.0%
Spatial Technology	1.5	.0	1.5	0	.1%	.0%	.5%	.0%

(Continued)

Mechanical Applications Preliminary Market Share

Table 17 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: Asia
 Units: Millions of U.S. Dollars/Actual Units

Company	Market Share							
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Cimline	1.5	.3	.9	28	.1%	.0%	.3%	.1%
Autodesk	1.4	.0	1.4	0	.1%	.0%	.4%	.0%
Auto-Trol	1.3	.5	.5	16	.1%	.1%	.1%	.1%
Wacom	1.3	.3	1.0	13	.1%	.0%	.3%	.0%
MacNeal-Schwendler	1.1	.0	1.1	0	.1%	.0%	.3%	.0%
PDA Engineering	1.1	.0	.9	0	.1%	.0%	.3%	.0%
Mentor Graphics	1.0	.3	.4	9	.1%	.0%	.1%	.0%
ICAD	.9	.0	.7	0	.1%	.0%	.2%	.0%
Gerber Systems	.9	.4	.3	12	.1%	.1%	.1%	.0%
Zuken	.8	.3	.5	5	.1%	.0%	.1%	.0%
ISICAD	.8	.4	.3	6	.1%	.1%	.1%	.0%
MCS	.6	.0	.6	0	.1%	.0%	.2%	.0%
Valisys	.6	.0	.6	0	.0%	.0%	.2%	.0%
Fides Industrielle Automation	.5	.1	.4	0	.0%	.0%	.1%	.0%
Wisdom Systems	.3	.0	.3	0	.0%	.0%	.1%	.0%
Technische Computer Systeme	.3	.1	.2	8	.0%	.0%	.1%	.0%
Object Design	.2	.0	.2	0	.0%	.0%	.1%	.0%
Micro Engineering Solutions	.1	.0	.1	1	.0%	.0%	.0%	.0%
PAFEC	.1	.0	.1	0	.0%	.0%	.0%	.0%
Whessoe Computing Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Objectivity	.1	.0	.1	0	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
Point Control	.0	.0	.0	0	.0%	.0%	.0%	.0%

(Continued)

Table 17 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: Asia
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Everex Systems	.0	.0	.0	1	.0%	.0%	.0%	.0%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	1,128.5	677.9	324.9	26,592	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	408.3	234.0	124.1	10,058	36.2%	34.5%	38.2%	37.8%
All Asian-Based Companies	701.7	437.5	192.4	16,340	62.2%	64.5%	59.2%	61.4%
All European-Based Companies	18.6	6.4	8.5	194	1.6%	.9%	2.6%	.7%
All Hardware Companies	155.2	138.4	.2	6,702	13.7%	20.4%	.1%	25.2%
All Turnkey & SW Companies	973.4	539.6	324.8	19,890	86.3%	79.6%	99.9%	74.8%

Source: Dataquest (February 1992)

Table 18
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Host-Dependent
 Region: Asia
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	340.7	190.8	81.8	5,317	43.7%	40.7%	46.3%	53.0%
Nihon Unisys	130.1	87.2	16.9	1,021	16.7%	18.6%	9.6%	10.2%
Fujitsu	84.6	52.4	23.7	1,430	10.8%	11.2%	13.4%	14.3%
NEC	80.4	61.9	12.1	210	10.3%	13.2%	6.8%	2.1%
Hitachi	25.2	12.1	10.6	446	3.2%	2.6%	6.0%	4.4%
Digital	24.3	17.5	.0	0	3.1%	3.7%	.0%	.0%
Computervision	10.6	5.9	2.0	169	1.4%	1.3%	1.1%	1.7%
Toshiba—NO OEM	9.3	4.7	3.7	129	1.2%	1.0%	2.1%	1.3%
Mitsubishi Electric	6.5	3.1	1.9	95	.8%	.7%	1.0%	.9%
Control Data	6.1	2.6	.9	35	.8%	.6%	.5%	.3%
MacNeal-Schwendler	5.9	.0	5.7	0	.8%	.0%	3.2%	.0%
CADAM	4.2	.0	3.7	0	.5%	.0%	2.1%	.0%
Toyo Information Systems—NO OEM	4.1	2.2	1.3	24	.5%	.5%	.7%	.2%
Hitachi Zosen Info Systems	3.5	.0	.0	0	.5%	.0%	.0%	.0%
SDRC	3.3	.0	3.3	0	.4%	.0%	1.9%	.0%
EDS Unigraphics	2.6	1.3	.9	47	.3%	.3%	.5%	.5%
Fides Industrielle Automation	1.9	.2	1.7	0	.2%	.0%	1.0%	.0%
MARC	1.7	.0	1.7	0	.2%	.0%	.9%	.0%
Intergraph	1.6	.8	.3	16	.2%	.2%	.1%	.2%
Schlumberger	1.4	.5	.6	22	.2%	.1%	.3%	.2%
Swanson Analysis	1.3	.0	1.3	0	.2%	.0%	.7%	.0%
Century Research Center	1.3	.7	.5	7	.2%	.1%	.3%	.1%
Unisys	1.1	.5	.4	15	.1%	.1%	.2%	.1%
Kubota Computer	.7	.5	.2	65	.1%	.1%	.1%	.7%

(Continued)

Table 18 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Host-Dependent
 Region: Asia
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Mechanical Dynamics	.6	.0	.5	0	.1%	.0%	.3%	.0%
MCS	.5	.0	.4	0	.1%	.0%	.2%	.0%
Cisigraph	.4	.1	.2	7	.1%	.0%	.1%	.1%
PDA Engineering	.4	.0	.3	0	.0%	.0%	.2%	.0%
Framasoft	.2	.0	.1	0	.0%	.0%	.1%	.0%
Whesoe Computing Systems	.1	.0	.1	0	.0%	.0%	.1%	.0%
Other Companies	24.9	23.7	.0	980	3.2%	5.1%	.0%	9.8%
All Companies	779.3	468.7	176.5	10,036	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	431.0	243.6	103.6	6,601	55.3%	52.0%	58.7%	65.8%
All Asian-Based Companies	345.6	224.7	70.8	3,428	44.3%	47.9%	40.1%	34.2%
All European-Based Companies	2.7	.4	2.1	7	.3%	.1%	1.2%	.1%
All Hardware Companies	50.5	41.7	.2	987	6.5%	8.9%	.1%	9.8%
All Turnkey & SW Companies	728.7	426.9	176.3	9,049	93.5%	91.1%	99.9%	90.2%

Source: Dataquest (February 1992)

Table 19
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Server
 Region: Asia
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	77.6	45.1	17.0	485	61.9%	56.6%	76.0%	34.3%
Sun	16.4	13.5	.0	619	13.1%	17.0%	.0%	43.8%
Digital	11.4	8.2	.0	0	9.1%	10.3%	.0%	.0%
Toshiba—NO OEM	6.5	5.9	.0	0	5.2%	7.4%	.0%	.0%
MacNeal-Schwendler	3.1	.0	3.0	0	2.5%	.0%	13.3%	.0%
Mutoh Industries—NO OEM	2.8	2.1	.7	76	2.2%	2.6%	3.1%	5.4%
Sumitomo Denko Workstation	2.2	2.2	.0	162	1.7%	2.7%	.0%	11.5%
Sharp System Products—NO OEM	1.6	.8	.8	7	1.2%	1.0%	3.4%	.5%
Intergraph	1.6	.8	.4	15	1.2%	1.0%	1.6%	1.1%
Schlumberger	.9	.3	.4	8	.7%	.4%	1.6%	.6%
Hewlett-Packard	.8	.7	.0	40	.7%	.8%	.0%	2.8%
Control Data	.3	.2	.1	0	.2%	.2%	.3%	.0%
Rasna Corporation	.2	.0	.2	0	.1%	.0%	.8%	.0%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	125.3	79.8	22.4	1,412	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	112.2	68.8	20.9	1,167	89.6%	86.2%	93.5%	82.6%
All Asian-Based Companies	13.1	11.0	1.5	245	10.4%	13.8%	6.5%	17.4%
All European-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Hardware Companies	29.1	22.8	.0	748	23.2%	28.6%	.0%	52.9%
All Turnkey & SW Companies	96.3	57.0	22.4	664	76.8%	71.4%	100.0%	47.1%

Source: Dataquest (February 1992)

Table 20 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
Platform: Personal Computer
Region: Asia
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Aries Technology	.5	.0	.5	0	.1%	.0%	.3%	.0%
Whesoe Computing Systems	.5	.0	.5	0	.1%	.0%	.3%	.0%
Rasna Corporation	.4	.0	.4	0	.1%	.0%	.3%	.0%
Moda CAD	.4	.1	.3	4	.1%	.0%	.2%	.0%
Point Control	.4	.0	.4	0	.1%	.0%	.3%	.0%
Intergraph	.3	.0	.3	0	.1%	.0%	.2%	.0%
Investronica SA	.3	.2	.0	11	.1%	.1%	.0%	.0%
Computervision	.3	.0	.3	0	.1%	.0%	.2%	.0%
MCS	.3	.0	.2	0	.1%	.0%	.2%	.0%
Superdraft	.2	.1	.1	13	.1%	.0%	.1%	.0%
MacNeal-Schwendler	.2	.0	.2	0	.0%	.0%	.1%	.0%
Micro Engineering Solutions	.2	.1	.1	3	.0%	.0%	.1%	.0%
Pathtrace	.1	.0	.1	2	.0%	.0%	.1%	.0%
Everex Systems	.1	.1	.0	25	.0%	.0%	.0%	.1%
Schlumberger	.1	.0	.0	1	.0%	.0%	.0%	.0%
Algor Interactive Systems	.1	.0	.1	0	.0%	.0%	.1%	.0%
ISICAD	.1	.0	.1	0	.0%	.0%	.1%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
American Small Business Comp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
Foresight Resources	.0	.0	.0	0	.0%	.0%	.0%	.0%
Mega CADD	.0	.0	.0	0	.0%	.0%	.0%	.0%
PAFEC	.0	.0	.0	0	.0%	.0%	.0%	.0%
Lamp Software	.0	.0	.0	0	.0%	.0%	.0%	.0%

(Continued)

Table 20 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
Platform: Personal Computer
Region: Asia
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Other Companies	29.2	29.2	.0	7,698	6.8%	11.0%	.0%	22.5%
All Companies	426.7	266.2	133.4	34,282	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	122.3	89.2	25.8	20,020	28.7%	33.5%	19.4%	58.4%
All Asian-Based Companies	300.7	175.7	105.5	14,175	70.5%	66.0%	79.1%	41.3%
All European-Based Companies	3.6	1.3	2.0	87	.8%	.5%	1.5%	.3%
All Hardware Companies	94.4	89.0	.0	20,012	22.1%	33.5%	.0%	58.4%
All Turnkey & SW Companies	332.3	177.1	133.4	14,270	77.9%	66.5%	100.0%	41.6%

Source: Dataquest (February 1992)

Table 21
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Rest of World
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	43.8	26.2	9.4	1,495	29.4%	29.5%	27.2%	22.2%
Digital	14.6	10.5	.0	102	9.8%	11.9%	.0%	1.5%
Intergraph	11.9	6.2	2.6	125	8.0%	6.9%	7.5%	1.9%
Hewlett-Packard	10.5	7.2	1.5	500	7.0%	8.1%	4.2%	7.4%
Computervision	8.2	2.1	2.4	86	5.5%	2.3%	6.9%	1.3%
Compaq	7.8	7.8	.0	1,327	5.2%	8.7%	.0%	19.7%
EDS Unigraphics	5.9	3.0	1.9	87	3.9%	3.4%	5.5%	1.3%
Engineering Mechanics	4.9	.2	4.2	393	3.3%	.3%	12.1%	5.8%
Control Data	3.0	1.6	.5	39	2.0%	1.8%	1.5%	.6%
Sun	2.7	2.3	.0	149	1.8%	2.6%	.0%	2.2%
Cimatron	2.4	1.1	1.1	62	1.6%	1.2%	3.2%	.9%
Delcam International	2.0	.7	1.0	34	1.4%	.8%	3.0%	.5%
SDRC	1.9	.0	1.9	0	1.3%	.0%	5.4%	.0%
Claris	1.6	.0	1.6	0	1.1%	.0%	4.5%	.0%
Vero International Software	1.3	.0	1.2	0	.9%	.0%	3.5%	.0%
CNC Software	1.1	.0	1.1	0	.7%	.0%	3.2%	.0%
MacNeal-Schwendler	1.1	.0	1.0	0	.7%	.0%	3.0%	.0%
Autodesk	1.1	.0	1.1	0	.7%	.0%	3.1%	.0%
Apple Computer	1.0	.8	.0	199	.6%	.9%	.0%	3.0%
Siemens Nixdorf Info systems	.6	.3	.2	8	.4%	.3%	.6%	.1%
Pathtrace	.6	.2	.4	8	.4%	.2%	1.1%	.1%
Unisys	.4	.2	.1	6	.3%	.2%	.4%	.1%

(Continued)

Table 21 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Rest of World
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Whessoe Computing Systems	.3	.0	.3	0	.2%	.0%	1.0%	.0%
Swanson Analysis	.3	.0	.3	0	.2%	.0%	.8%	.0%
Superdraft	.2	.1	.1	13	.2%	.1%	.3%	.2%
Investronica SA	.2	.2	.0	8	.1%	.2%	.1%	.1%
FEA	.1	.0	.0	3	.1%	.0%	.1%	.0%
Aura CAD/CAM Systems	.1	.0	.1	0	.1%	.0%	.3%	.0%
Mc2 Engineering Software	.1	.0	.1	0	.1%	.0%	.2%	.0%
Ithaca Software	.1	.0	.1	0	.1%	.0%	.2%	.0%
Engineering Systems Corp.	.1	.0	.1	0	.1%	.0%	.2%	.0%
Georgia Tech Research Corp.	.1	.0	.1	0	.0%	.0%	.2%	.0%
American Small Business Comp.	.1	.0	.1	0	.0%	.0%	.2%	.0%
Innovative Data Design	.0	.0	.0	0	.0%	.0%	.1%	.0%
Moda CAD	.0	.0	.0	0	.0%	.0%	.1%	.0%
Ziegler	.0	.0	.0	0	.0%	.0%	.1%	.0%
Algor Interactive Systems	.0	.0	.0	0	.0%	.0%	.1%	.0%
Solbourne	.0	.0	.0	3	.0%	.0%	.0%	.0%
Vision 3D	.0	.0	.0	0	.0%	.0%	.0%	.0%
Fides Industrielle Automation	.0	.0	.0	0	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
Foresight Resources	.0	.0	.0	0	.0%	.0%	.0%	.0%
ESDU International	.0	.0	.0	0	.0%	.0%	.0%	.0%

(Continued)

Table 21 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: All Platforms
 Region: Rest of World
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Other Companies	18.7	18.1	.0	2,091	12.6%	20.4%	.0%	31.0%
All Companies	148.9	88.7	34.6	6,739	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	140.9	86.1	30.1	6,602	94.7%	97.1%	87.1%	98.0%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	8.0	2.5	4.5	137	5.3%	2.9%	12.9%	2.0%
All Hardware Companies	52.9	46.5	.1	5,099	35.5%	52.4%	.3%	75.7%
All Turnkey & SW Companies	96.0	42.2	34.5	1,640	64.5%	47.6%	99.7%	24.3%

Source: Dataquest (February 1992)

Table 22
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: Rest of World
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Hewlett-Packard	9.5	6.4	1.5	361	20.1%	27.8%	10.6%	30.8%
Intergraph	8.0	4.4	1.5	91	16.9%	18.8%	11.2%	7.8%
Computervision	6.8	1.8	1.7	78	14.5%	7.9%	12.6%	6.6%
EDS Unigraphics	4.8	2.5	1.5	67	10.1%	10.6%	11.2%	5.7%
IBM	2.9	1.7	.6	97	6.1%	7.2%	4.6%	8.3%
Engineering Mechanics	2.9	.1	2.4	138	6.1%	.6%	17.8%	11.8%
Digital	2.7	2.0	.0	102	5.8%	8.5%	.0%	8.7%
Delcam International	2.0	.7	1.0	34	4.3%	3.1%	7.5%	2.9%
Sun	1.9	1.6	.0	132	3.9%	7.0%	.0%	11.3%
SDRC	1.6	.0	1.6	0	3.5%	.0%	11.9%	.0%
Cimatron	1.6	.7	.7	27	3.3%	3.0%	5.1%	2.3%
Control Data	1.2	.8	.3	29	2.6%	3.3%	1.8%	2.5%
Siemens Nixdorf Info systems	.6	.3	.2	8	1.3%	1.3%	1.5%	.7%
Unisys	.3	.2	.1	5	.6%	.6%	.8%	.4%
Swanson Analysis	.1	.0	.1	0	.3%	.0%	1.0%	.0%
Autodesk	.1	.0	.1	0	.3%	.0%	.9%	.0%
MacNeal-Schwendler	.1	.0	.1	0	.3%	.0%	.8%	.0%
FEA	.1	.0	.0	1	.1%	.0%	.1%	.1%
Georgia Tech Research Corp.	.0	.0	.0	0	.1%	.0%	.3%	.0%
Whesoe Computing Systems	.0	.0	.0	0	.1%	.0%	.2%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.1%	.1%
Solbourne	.0	.0	.0	2	.0%	.0%	.0%	.2%

(Continued)

Table 22 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Technical Workstation
 Region: Rest of World
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	47.2	23.1	13.7	1,170	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	43.0	21.4	11.7	1,100	91.0%	92.6%	85.6%	94.0%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	4.3	1.7	2.0	70	9.0%	7.4%	14.4%	6.0%
All Hardware Companies	7.6	6.1	.1	437	16.1%	26.2%	.4%	37.4%
All Turnkey & SW Companies	39.6	17.1	13.6	733	83.9%	73.8%	99.6%	62.6%

Source: Dataquest (February 1992)

Table 23
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Host-Dependent
 Region: Rest of World
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	30.3	16.9	7.3	478	52.4%	45.4%	76.8%	46.3%
Digital	8.1	5.8	.0	0	14.0%	15.6%	.0%	.0%
Intergraph	1.8	.9	.3	16	3.1%	2.4%	3.0%	1.6%
Control Data	1.7	.7	.3	10	3.0%	2.0%	2.8%	1.0%
EDS Unigraphics	1.1	.6	.4	21	1.9%	1.5%	3.9%	2.0%
Computervision	.9	.2	.2	8	1.5%	.6%	2.2%	.8%
MacNeal-Schwendler	.6	.0	.6	0	1.1%	.0%	6.3%	.0%
SDRC	.2	.0	.2	0	.4%	.0%	2.5%	.0%
Swanson Analysis	.1	.0	.1	0	.2%	.0%	1.0%	.0%
Unisys	.1	.0	.0	1	.2%	.1%	.3%	.1%
Whessoe Computing Systems	.1	.0	.1	0	.1%	.0%	.6%	.0%
Georgia Tech Research Corp.	.0	.0	.0	0	.1%	.0%	.3%	.0%
Engineering Systems Corp.	.0	.0	.0	0	.0%	.0%	.1%	.0%
Fides Industrielle Automation	.0	.0	.0	0	.0%	.0%	.1%	.0%
PEA	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	12.7	12.1	.0	498	22.0%	32.3%	.0%	48.3%
All Companies	57.7	37.3	9.5	1,033	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	57.6	37.3	9.4	1,032	99.8%	100.0%	99.3%	100.0%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	.1	.0	.1	0	.2%	.0%	.7%	.0%
All Hardware Companies	21.2	18.0	.1	500	36.7%	48.4%	.6%	48.4%
All Turnkey & SW Companies	36.5	19.3	9.4	532	63.3%	51.6%	99.4%	51.6%

Source: Dataquest (February 1992)

Table 24
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Server
 Region: Rest of World
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
IBM	6.9	4.1	1.5	52	49.5%	47.3%	66.2%	52.5%
Digital	3.8	2.7	.0	0	27.2%	32.0%	.0%	.0%
Intergraph	1.8	.9	.4	18	12.7%	10.4%	18.9%	18.6%
Sun	.8	.7	.0	18	5.7%	7.7%	.0%	18.0%
MacNeal-Schwendler	.3	.0	.3	0	2.4%	.0%	13.6%	.0%
Hewlett-Packard	.2	.2	.0	9	1.4%	1.8%	.0%	9.3%
Control Data	.1	.1	.0	0	.6%	.6%	.4%	.1%
Computervision	.1	.0	.0	1	.6%	.2%	.9%	.8%
Solbourne	.0	.0	.0	1	.1%	.1%	.0%	.7%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	14.0	8.6	2.3	99	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	14.0	8.6	2.3	99	100.0%	100.0%	100.0%	100.0%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Hardware Companies	4.9	3.6	.0	45	35.0%	42.5%	.0%	46.0%
All Turnkey & SW Companies	9.1	4.9	2.3	53	65.0%	57.5%	100.0%	54.0%

Source: Dataquest (February 1992)

Table 25
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
Platform: Personal Computer
Region: Rest of World
Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Compaq	7.8	7.8	.0	1,327	25.9%	39.4%	.0%	29.9%
IBM	3.7	3.5	.0	869	12.4%	17.9%	.0%	19.6%
Engineering Mechanics	2.1	.1	1.8	255	6.9%	.5%	19.2%	5.7%
Clarls	1.6	.0	1.6	0	5.2%	.0%	17.2%	.0%
Vero International Software	1.3	.0	1.2	0	4.4%	.0%	13.2%	.0%
CNC Software	1.1	.0	1.1	0	3.7%	.0%	12.1%	.0%
Apple Computer	1.0	.8	.0	199	3.2%	4.3%	.0%	4.5%
Autodesk	.9	.0	.9	0	3.1%	.0%	10.2%	.0%
Cimatron	.9	.4	.4	35	2.9%	2.0%	4.4%	.8%
Hewlett-Packard	.8	.6	.0	130	2.5%	3.0%	.0%	2.9%
Pathtrace	.6	.2	.4	8	1.9%	.8%	4.2%	.2%
Computervision	.5	.0	.5	0	1.5%	.0%	4.9%	.0%
Intergraph	.4	.0	.3	0	1.2%	.0%	3.7%	.0%
Whesoe Computing Systems	.2	.0	.2	0	.8%	.0%	2.6%	.0%
Superdraft	.2	.1	.1	13	.8%	.5%	1.2%	.3%
Investronica SA	.2	.2	.0	8	.7%	.8%	.2%	.2%
Aura CAD/CAM Systems	.1	.0	.1	0	.3%	.0%	1.0%	.0%
Mc2 Engineering Software	.1	.0	.1	0	.3%	.0%	.9%	.0%
FEA	.1	.0	.0	1	.3%	.1%	.1%	.0%
Ithaca Software	.1	.0	.1	0	.3%	.0%	.9%	.0%
American Small Business Comp.	.1	.0	.1	0	.2%	.0%	.8%	.0%
Swanson Analysis	.1	.0	.1	0	.2%	.0%	.7%	.0%
Engineering Systems Corp.	.1	.0	.1	0	.2%	.0%	.5%	.0%
Innovative Data Design	.0	.0	.0	0	.1%	.0%	.4%	.0%

(Continued)

Table 25 (Continued)
1991 Preliminary CAD/CAM/CAE Market Share

Application: Mechanical
 Platform: Personal Computer
 Region: Rest of World
 Units: Millions of U.S. Dollars/Actual Units

Company					Market Share			
	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped	Total Factory Revenue	Hardware Revenue	Software Revenue	Hardware Units Shipped
Moda CAD	.0	.0	.0	0	.1%	.1%	.3%	.0%
Algor Interactive Systems	.0	.0	.0	0	.1%	.0%	.4%	.0%
Ziegler	.0	.0	.0	0	.1%	.0%	.4%	.0%
Vision 3D	.0	.0	.0	0	.1%	.1%	.0%	.0%
MacNeal-Schwendler	.0	.0	.0	0	.1%	.0%	.2%	.0%
ESDU International	.0	.0	.0	0	.0%	.0%	.1%	.0%
Foresight Resources	.0	.0	.0	0	.0%	.0%	.1%	.0%
Other Companies	6.1	6.1	.0	1,593	20.2%	30.7%	.0%	35.9%
All Companies	29.9	19.7	9.2	4,438	100.0%	100.0%	100.0%	100.0%
All N.A.-Based Companies	26.3	18.9	6.7	4,371	88.0%	95.8%	73.6%	98.5%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	3.6	.8	2.4	66	12.0%	4.2%	26.4%	1.5%
All Hardware Companies	19.2	18.8	.0	4,116	64.2%	95.3%	.0%	92.8%
All Turnkey & SW Companies	10.7	.9	9.2	321	35.8%	4.7%	100.0%	7.2%

Source: Dataquest (February 1992)

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Forecasts
Mechanical Applications

Source:
Dataquest

CAD/CAM/CAE

Forecasts
Mechanical Applications

Source:
Dataquest

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Forecasts—Mechanical Applications

Forecasting Methodology

Fundamental to the way Dataquest conducts its research is an underlying philosophy that says the best data and analyses come from a well-balanced program. This program includes 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 macroenvironment, which can have major influences on both supply-side and demand-side forecasting. In addition to demographics, analysts look at GNP growth, interest rate fluctuation, currency 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 1992.

Figure 1 is a pictorial summary of the information compendium offered by the Dataquest CAD/CAM/CAE group.

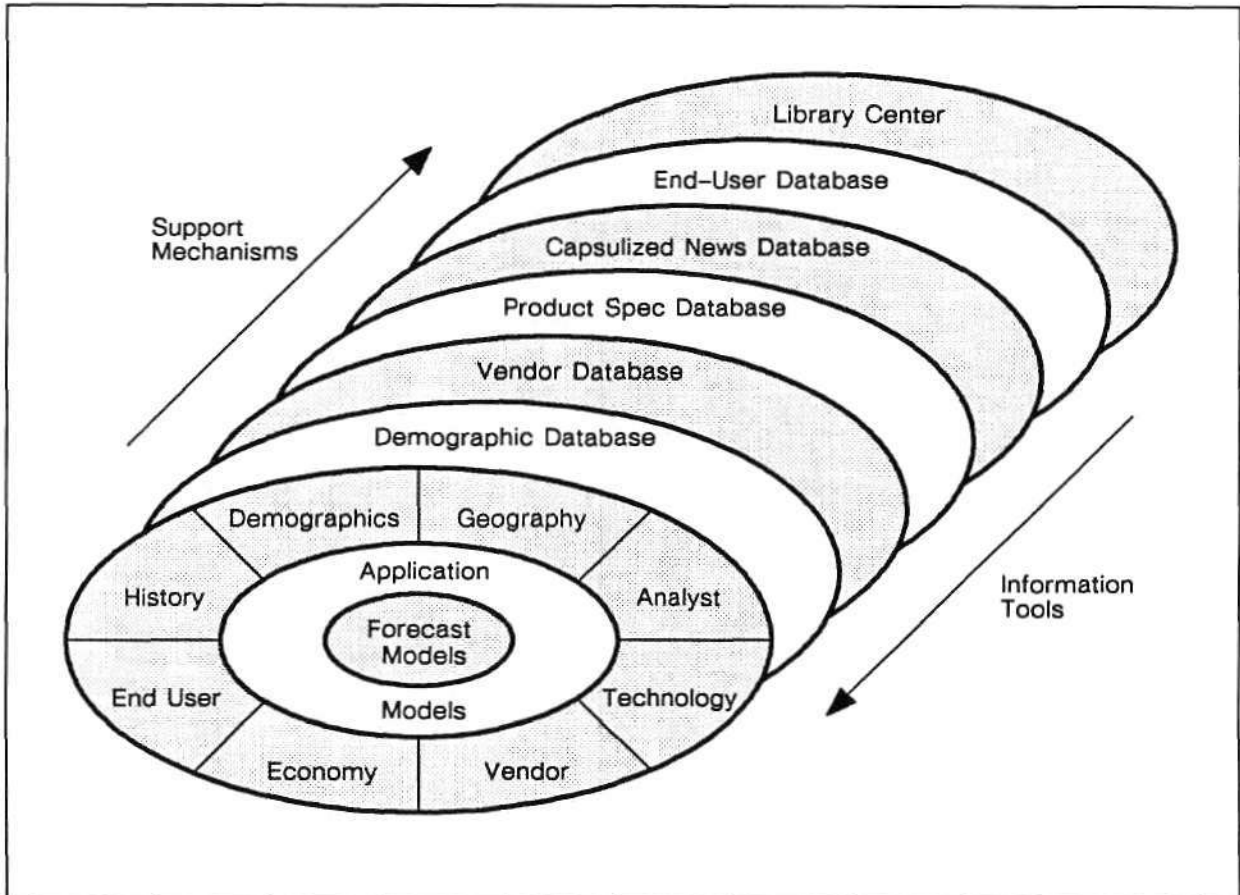
Dataquest's revenue and shipment estimates are based on the following sources:

- Information supplied by company management or gathered from publicly available published sources
- End-user surveys
- Information supplied by other Dataquest industry services relating to components/subsystems of CAD/CAM/CAE
- Information provided by OEMs or resellers of the manufacturers' products
- Senior staff estimates based on reliable historical data and in-depth understanding of a company's products and strategies

The CAD/CAM/CAE industry market estimates and forecasts are derived using the following research techniques:

- "Bottom-up" aggregation—This method involves adding all relevant vendor contributions to arrive at total market estimates for all historical data.
- Segment forecasting—For each application segment tracked by the CAD/CAM/CAE group, individual forecasts are derived following the basic information model defined previously. Specifically, each design phase covered within each application is segmented by channel, product, region, and platform. 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 (TAM) model and a satisfied available market figure to accurately assess the levels of penetration. Installed base and rates of product retirement are also evaluated. In addition, Dataquest analysts 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, constraint is capable of keeping shipments below the demand level.

Figure 1
Information Compendium



Source: Dataquest (September 1991)

TITLE: Final History and Forecast
 APPLICATION: Mechanical
 REGION: Worldwide
 PLATFORM: All Platforms

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	****	****	****	****	****	****	****	****	****	****	*****	*****
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	95,067	138,623	166,313	180,862	224,878	258,810	291,480	320,850	343,310	354,490	24%	10%
Workstation Shipments	114,766	163,589	188,788	203,579	251,290	282,730	313,300	340,000	360,610	369,800	22%	8%
CPU Installed Base	139,964	275,202	430,151	582,235	757,531	916,670	1,116,420	1,347,570	1,601,850	1,868,700	53%	20%
Workstation Installed Base	195,328	355,999	534,240	710,400	907,540	1,101,210	1,326,490	1,580,370	1,855,380	2,140,800	47%	19%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	113.1	77.2	85.0	65.7	59.4	53.5	50.1	47.5	46.2	45.6	-15%	-5%
Hardware-Only ASP	15.0	14.5	10.8	11.8	10.4	9.8	9.2	8.8	8.5	8.5	-9%	-4%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	3,075	3,534	3,747	3,923	4,325	4,612	4,828	4,955	5,124	5,187	9%	4%
CPU Revenue	1,726	2,196	2,617	3,011	3,416	3,299	3,470	3,589	3,717	3,643	19%	1%
Workstation Revenue	913	853	652	438	379	392	378	348	361	278	-20%	-6%
Peripheral Revenue (Turnkey)	436	485	478	473	531	920	980	1,019	1,046	1,266	5%	19%
Software Revenue	746	1,096	1,346	1,558	1,888	2,155	2,441	2,727	2,989	3,260	26%	12%
Bundled	565	610	733	937	1,103	1,209	1,290	1,345	1,337	1,362	18%	4%
Unbundled	181	486	613	621	785	946	1,151	1,382	1,652	1,898	44%	19%
Service Revenue	515	733	887	1,052	1,235	1,323	1,417	1,498	1,594	1,674	24%	6%
Total Revenue	4,336	5,362	5,981	6,533	7,449	8,090	8,686	9,180	9,706	10,121	14%	6%
Increase over Prior Year	51%	24%	12%	9%	14%	9%	7%	6%	6%	4%		

Source: Dataquest
 September 1991

Forecasts—Mechanical Applications

2
TITLE: Final History and Forecast
APPLICATION: Mechanical
REGION: Worldwide
PLATFORM: Technical Workstation

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	====	====	====	====	====	====	====	====	====	====	=====	=====
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	11,053	21,559	33,340	54,210	67,113	82,290	97,670	111,600	123,180	132,030	57%	14%
Workstation Shipments	11,053	21,559	33,340	54,210	67,113	82,290	97,670	111,600	123,180	132,030	57%	14%
CPU Installed Base	16,623	37,998	70,566	122,342	192,116	253,460	338,850	438,500	549,810	669,960	84%	28%
Workstation Installed Base	16,623	37,998	70,566	122,342	192,116	253,460	338,850	438,500	549,810	669,960	84%	28%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	64.8	56.2	54.5	51.4	46.5	43.8	41.8	40.6	40.0	39.9	-8%	-3%
Hardware-Only ASP	26.1	24.6	22.9	19.6	19.9	18.3	16.9	16.0	15.6	15.7	-7%	-5%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	430	739	1,120	1,601	1,849	2,204	2,440	2,650	2,824	2,973	44%	10%
CPU Revenue	365	615	907	1,317	1,512	1,729	1,900	2,052	2,176	2,282	43%	9%
Workstation Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	65	124	214	284	338	475	540	598	648	691	51%	15%
Software Revenue	175	369	558	809	1,052	1,244	1,531	1,843	2,168	2,465	57%	19%
Bundled	138	222	328	534	641	677	771	854	924	986	47%	9%
Unbundled	37	147	229	275	410	567	760	989	1,244	1,479	82%	29%
Service Revenue	79	198	364	572	667	779	892	1,010	1,124	1,226	71%	13%
Total Revenue	684	1,306	2,042	2,983	3,568	4,227	4,863	5,502	6,116	6,664	51%	13%
Increase over Prior Year	148%	91%	56%	46%	20%	18%	15%	13%	11%	9%		

Source: Dataquest
September 1991

TITLE: 3 Final History and Forecast
 APPLICATION: Mechanical
 REGION: Worldwide
 PLATFORM: Host/Server

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	****	****	****	****	****	****	****	****	****	****	*****	*****
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	6,444	8,201	8,021	8,859	11,130	11,520	11,780	11,540	11,620	11,340	15%	0%
Workstation Shipments	26,143	33,166	30,497	31,576	37,541	35,440	33,600	30,680	28,920	26,650	9%	-7%
CPU Installed Base	14,723	22,456	29,661	37,161	45,199	53,780	61,850	69,790	77,980	86,070	32%	14%
Workstation Installed Base	70,087	103,253	133,749	165,326	195,208	238,310	271,910	302,590	331,510	358,160	29%	13%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	511.7	358.3	431.3	321.9	248.6	229.2	218.1	208.2	200.2	193.8	-17%	-5%
Hardware-Only ASP	259.4	246.5	151.3	133.7	113.2	103.2	95.0	87.6	80.8	74.5	-19%	-8%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	2,227	2,227	1,957	1,653	1,662	1,519	1,437	1,306	1,278	1,193	-7%	-6%
CPU Revenue	1,005	1,077	1,134	1,088	1,162	810	760	688	673	499	4%	-16%
Workstation Revenue	913	853	652	438	379	392	378	348	361	278	-20%	-6%
Peripheral Revenue (Turnkey)	309	297	170	127	120	317	299	271	244	415	-21%	28%
Software Revenue	403	496	528	442	505	510	489	452	388	365	6%	-6%
Bundled	335	289	327	314	379	403	387	361	289	260	3%	-7%
Unbundled	68	206	201	129	126	107	102	91	98	105	17%	-4%
Service Revenue	401	494	490	428	506	473	449	409	389	367	6%	-6%
Total Revenue	3,031	3,217	2,974	2,524	2,673	2,503	2,375	2,167	2,054	1,925	-3%	-6%
Increase over Prior Year	28%	6%	-8%	-15%	6%	-6%	-5%	-9%	-5%	-6%		

Source: Dataquest
 September 1991

Forecasts—Mechanical Applications

TITLE: Final History and Forecast
 APPLICATION: Mechanical
 REGION: Worldwide
 PLATFORM: Personal Computer

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	****	****	****	****	****	****	****	****	****	****	****	****
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	77,570	108,864	124,951	117,793	146,636	165,000	182,030	197,710	208,510	211,120	17%	8%
Workstation Shipments	77,570	108,864	124,951	117,793	146,636	165,000	182,030	197,710	208,510	211,120	17%	8%
CPU Installed Base	108,618	214,748	329,925	422,733	520,216	609,440	715,720	839,280	974,060	1,112,670	48%	16%
Workstation Installed Base	108,618	214,748	329,925	422,733	520,216	609,440	715,720	839,280	974,060	1,112,670	48%	16%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	23.5	17.2	23.1	19.9	20.9	21.5	21.3	21.0	20.8	20.8	-3%	-0%
Hardware-Only ASP	3.6	4.2	4.4	4.8	4.6	4.6	4.5	4.5	4.4	4.4	6%	-1%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	419	568	670	668	814	888	951	999	1,022	1,021	18%	5%
CPU Revenue	356	504	576	606	742	760	810	850	868	862	20%	3%
Workstation Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	62	64	94	62	72	129	141	150	154	159	4%	17%
Software Revenue	168	231	261	306	332	401	421	432	434	430	19%	5%
Bundled	92	99	78	90	84	129	132	130	123	116	-2%	7%
Unbundled	76	132	183	217	249	272	289	302	310	314	35%	5%
Service Revenue	35	40	34	52	62	71	76	79	81	81	15%	5%
Total Revenue	622	839	965	1,026	1,208	1,360	1,448	1,511	1,536	1,532	18%	5%
Increase over Prior Year	177%	35%	15%	6%	18%	13%	6%	4%	2%	-0%		

Source: Dataquest
September 1991

TITLE: Final History and Forecast
 APPLICATION: Mechanical
 REGION: North America
 PLATFORM: All Platforms

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	====	====	====	====	====	====	====	====	====	====	=====	=====
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	52,358	72,064	85,759	76,212	82,343	89,100	96,090	102,580	108,610	111,660	12%	6%
Workstation Shipments	60,921	82,145	93,394	83,525	91,246	96,430	102,720	108,540	114,240	116,700	11%	5%
CPU Installed Base	78,521	148,404	227,391	287,319	349,030	378,250	425,510	479,260	539,290	603,570	45%	12%
Workstation Installed Base	109,690	190,011	277,254	345,448	418,996	455,970	511,840	573,510	641,130	712,430	40%	11%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	128.0	91.6	90.7	78.1	78.8	69.6	64.1	60.8	59.0	58.1	-11%	-6%
Hardware-Only ASP	12.4	11.9	9.2	11.3	10.7	9.7	9.3	8.9	8.8	8.6	-4%	-4%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	1,318	1,399	1,270	1,305	1,299	1,241	1,258	1,269	1,354	1,376	-0%	1%
CPU Revenue	768	872	951	1,026	1,023	952	970	985	1,043	933	7%	-2%
Workstation Revenue	387	337	224	163	162	135	126	116	145	82	-20%	-13%
Peripheral Revenue (Turnkey)	164	189	95	116	114	154	161	167	167	361	-9%	26%
Software Revenue	302	373	423	468	540	583	655	731	764	813	16%	9%
Bundled	196	184	156	202	218	202	204	207	161	153	3%	-7%
Unbundled	106	190	267	266	322	381	451	523	603	660	32%	15%
Service Revenue	259	314	309	367	392	387	411	435	468	491	11%	5%
Total Revenue	1,879	2,086	2,002	2,141	2,230	2,211	2,324	2,435	2,586	2,680	4%	4%
Increase over Prior Year	26%	11%	-4%	7%	4%	-1%	5%	5%	6%	4%		

Source: Dataquest
 September 1991

Forecast—Mechanical Applications

6
TITLE: Final History and Forecast
APPLICATION: Mechanical
REGION: North America
PLATFORM: Technical Workstation

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	====	====	====	====	====	====	====	====	====	====	=====	=====
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	5,728	9,218	12,176	18,170	18,618	20,770	24,520	27,910	31,000	33,290	34%	12%
Workstation Shipments	5,728	9,218	12,176	18,170	18,618	20,770	24,520	27,910	31,000	33,290	34%	12%
CPU Installed Base	9,036	18,132	29,841	46,682	70,186	77,600	96,630	119,040	144,550	172,340	67%	20%
Workstation Installed Base	9,036	18,132	29,841	46,682	70,186	77,600	96,630	119,040	144,550	172,340	67%	20%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	56.3	51.3	47.2	50.9	49.1	46.8	45.0	43.8	43.3	43.3	-3%	-2%
Hardware-Only ASP	23.8	23.7	23.5	19.4	18.4	16.7	15.4	14.6	14.2	14.2	-6%	-5%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	186	282	357	491	468	488	528	563	599	631	26%	6%
CPU Revenue	160	233	306	417	396	421	452	479	506	529	25%	6%
Workstation Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	26	49	50	73	72	67	76	84	93	102	29%	7%
Software Revenue	83	120	162	231	292	344	421	502	587	654	37%	17%
Bundled	59	72	74	119	124	120	129	136	143	151	20%	4%
Unbundled	24	48	88	112	168	225	292	367	443	503	63%	24%
Service Revenue	42	78	125	211	212	234	267	300	334	362	50%	11%
Total Revenue	312	480	644	933	972	1,067	1,215	1,365	1,520	1,647	33%	11%
Increase over Prior Year	94%	54%	34%	45%	4%	10%	14%	12%	11%	8%		

Source: Dataquest
 September 1991

TITLE: Final History and Forecast
 APPLICATION: Mechanical
 REGION: North America
 PLATFORM: Host/Server

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	****	****	****	****	****	****	****	****	****	****	****	****
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	3,171	3,669	3,204	3,050	3,556	3,300	3,340	3,320	3,500	3,440	3%	-1%
Workstation Shipments	11,733	13,750	10,838	10,362	12,459	10,630	9,980	9,280	9,130	8,480	2%	-7%
CPU Installed Base	8,327	11,639	14,220	16,317	19,033	19,810	21,190	22,540	24,070	25,550	23%	6%
Workstation Installed Base	39,496	53,245	64,083	74,446	88,999	97,530	107,510	116,790	125,920	134,400	23%	9%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	478.4	344.8	360.5	489.5	365.3	348.9	334.6	320.7	307.1	294.9	-7%	-4%
Hardware-Only ASP	217.8	205.5	152.3	128.1	118.6	108.0	99.1	90.9	83.2	76.5	-14%	-8%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	961	874	648	553	555	454	421	386	427	413	-13%	-6%
CPU Revenue	446	407	380	355	360	242	222	202	227	93	-5%	-24%
Workstation Revenue	387	337	224	163	162	135	126	116	145	82	-20%	-13%
Peripheral Revenue (Turnkey)	128	129	44	35	33	78	73	68	55	238	-29%	48%
Software Revenue	160	187	182	140	145	127	117	108	58	45	-2%	-21%
Bundled	120	100	79	80	91	81	74	70	17	1	-7%	-59%
Unbundled	39	87	103	60	54	46	43	37	41	44	8%	-4%
Service Revenue	207	226	177	141	164	136	126	116	114	108	-6%	-8%
Total Revenue	1,328	1,286	1,006	835	863	717	664	609	598	565	-10%	-8%
Increase over Prior Year	6%	-3%	-22%	-17%	3%	-17%	-7%	-8%	-2%	-5%		

Source: Dataquest
 September 1991

8
TITLE: Final History and Forecast
APPLICATION: Mechanical
REGION: North America
PLATFORM: Personal Computer

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	----	----	----	----	----	----	----	----	----	----	-----	-----
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	43,459	59,177	70,379	54,993	60,169	65,030	68,220	71,350	74,120	74,930	8%	4%
Workstation Shipments	43,459	59,177	70,379	54,993	60,169	65,030	68,220	71,350	74,120	74,930	8%	4%
CPU Installed Base	61,158	118,634	183,329	224,320	259,811	280,840	307,690	337,680	370,660	405,680	44%	9%
Workstation Installed Base	61,158	118,634	183,329	224,320	259,811	280,840	307,690	337,680	370,660	405,680	44%	9%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	19.0	15.4	13.8	10.6	20.8	20.6	20.4	20.2	20.0	20.0	2%	-1%
Hardware-Only ASP	3.4	3.8	3.7	4.7	4.6	4.6	4.5	4.5	4.4	4.4	8%	-1%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	171	242	266	261	276	298	309	320	329	332	13%	4%
CPU Revenue	161	232	265	254	267	289	297	304	310	310	14%	3%
Workstation Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	10	11	1	7	9	9	12	16	19	22	-4%	20%
Software Revenue	59	67	78	98	103	111	117	121	119	114	15%	2%
Bundled	16	12	2	3	3	1	1	1	1	1	-34%	-20%
Unbundled	42	55	76	94	100	110	116	120	118	113	24%	2%
Service Revenue	10	11	8	15	16	18	19	19	20	20	14%	5%
Total Revenue	239	320	352	373	395	427	445	460	468	467	13%	3%
Increase over Prior Year	221%	34%	10%	6%	6%	8%	4%	3%	2%	-0%		

Source: Dataquest
September 1991

9
 TITLE: Final History and Forecast
 APPLICATION: Mechanical
 REGION: Europe
 PLATFORM: All Platforms

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	****	****	****	****	****	****	****	****	****	****	*****	*****
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	24,245	38,180	49,568	61,512	77,637	90,290	103,330	115,030	123,180	126,850	34%	10%
Workstation Shipments	30,041	45,253	57,539	70,953	86,707	98,490	110,580	121,090	128,650	131,980	30%	9%
CPU Installed Base	34,811	72,409	119,440	173,804	238,915	301,900	380,300	470,640	569,140	671,310	62%	23%
Workstation Installed Base	47,250	91,927	146,969	210,934	283,516	357,510	443,950	541,040	645,680	753,650	57%	22%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	111.8	55.5	69.4	68.4	64.0	60.3	56.6	53.6	52.1	52.0	-13%	-4%
Hardware-Only ASP	12.0	13.4	13.4	13.0	10.7	10.0	9.3	8.6	8.4	8.3	-3%	-5%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	870	942	1,360	1,489	1,585	1,785	1,851	1,887	1,930	1,960	16%	4%
CPU Revenue	489	574	975	1,140	1,265	1,293	1,347	1,383	1,414	1,428	27%	2%
Workstation Revenue	252	228	215	175	123	125	119	107	102	97	-16%	-5%
Peripheral Revenue (Turnkey)	129	140	170	175	197	367	385	396	414	435	11%	17%
Software Revenue	225	421	500	584	750	764	871	994	1,147	1,300	35%	12%
Bundled	177	188	271	353	443	380	391	397	409	426	26%	-1%
Unbundled	47	233	229	231	307	384	480	597	738	874	59%	23%
Service Revenue	112	270	360	441	550	599	638	675	725	774	49%	7%
Total Revenue	1,207	1,634	2,220	2,514	2,885	3,148	3,360	3,556	3,802	4,034	24%	7%
Increase over Prior Year	73%	35%	36%	13%	15%	9%	7%	6%	7%	6%		

Source: Dataquest
 September 1991

Forecast—Mechanical Applications

10
 TITLE: Final History and Forecast
 APPLICATION: Mechanical
 REGION: Europe
 PLATFORM: Technical Workstation

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	====	====	====	====	====	====	====	====	====	====	=====	=====
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	3,451	7,482	13,950	20,980	25,036	29,790	34,030	38,040	41,180	43,300	64%	12%
Workstation Shipments	3,451	7,482	13,950	20,980	25,036	29,790	34,030	38,040	41,180	43,300	64%	12%
CPU Installed Base	4,819	12,266	26,031	46,330	71,267	95,000	124,800	158,610	195,560	234,620	96%	27%
Workstation Installed Base	4,819	12,266	26,031	46,330	71,267	95,000	124,800	158,610	195,560	234,620	96%	27%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	67.0	46.0	49.4	52.9	52.5	49.8	47.8	46.5	45.8	45.8	-6%	-3%
Hardware-Only ASP	37.2	25.9	25.8	19.6	20.7	18.8	17.3	16.5	16.1	16.1	-14%	-5%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	163	235	474	667	767	954	1,025	1,092	1,144	1,181	47%	9%
CPU Revenue	136	191	386	561	642	749	797	843	877	900	47%	7%
Workstation Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	27	43	88	107	124	205	227	249	267	281	46%	18%
Software Revenue	62	160	240	340	467	474	579	711	857	999	66%	16%
Bundled	53	77	138	223	298	239	262	284	301	316	54%	1%
Unbundled	9	83	101	116	169	235	317	427	556	684	109%	32%
Service Revenue	19	84	159	264	335	388	437	492	547	596	104%	12%
Total Revenue	244	479	873	1,271	1,568	1,816	2,040	2,296	2,548	2,777	59%	12%
Increase over Prior Year	252%	96%	82%	46%	23%	16%	12%	12%	11%	9%		

Source: Dataquest
 September 1991

TITLE: Final History and Forecast
 APPLICATION: Mechanical
 REGION: Europe
 PLATFORM: Host/Server

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	====	====	====	====	====	====	====	====	====	====	=====	=====
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	1,264	2,841	3,267	2,832	3,521	3,720	3,740	3,580	3,660	3,760	29%	1%
Workstation Shipments	7,059	9,915	11,238	12,273	12,591	11,920	10,990	9,640	9,130	8,880	16%	-7%
CPU Installed Base	2,596	5,432	8,659	11,330	14,112	17,360	20,310	23,210	26,190	29,270	53%	16%
Workstation Installed Base	15,035	24,950	36,187	48,460	58,713	72,980	83,970	93,610	102,740	111,610	41%	14%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	568.0	236.6	359.7	400.4	266.3	250.0	239.5	229.4	219.6	210.8	-17%	-5%
Hardware-Only ASP	542.7	217.0	139.6	149.9	119.0	109.4	101.2	93.2	85.6	78.7	-32%	-8%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	601	564	707	593	545	526	487	427	403	389	-2%	-7%
CPU Revenue	262	259	429	380	383	271	249	216	202	194	10%	-13%
Workstation Revenue	252	228	215	175	123	125	119	107	102	97	-16%	-5%
Peripheral Revenue (Turnkey)	88	77	64	38	39	130	119	104	98	98	-18%	20%
Software Revenue	128	189	172	142	170	154	144	128	126	133	7%	-5%
Bundled	111	92	115	112	133	120	111	97	93	96	5%	-6%
Unbundled	18	97	57	30	36	33	33	31	33	37	20%	0%
Service Revenue	86	173	187	158	191	183	170	150	143	142	22%	-6%
Total Revenue	816	926	1,067	894	906	863	801	704	672	664	3%	-6%
Increase over Prior Year	40%	13%	15%	-16%	1%	-5%	-7%	-12%	-5%	-1%		

Source: Dataquest
 September 1991

12
 TITLE: Final History and Forecast
 APPLICATION: Mechanical
 REGION: Europe
 PLATFORM: Personal Computer

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	====	====	====	====	====	====	====	====	====	====	=====	=====
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	19,530	27,856	32,351	37,701	49,080	56,780	65,560	73,410	78,340	79,800	26%	10%
Workstation Shipments	19,530	27,856	32,351	37,701	49,080	56,780	65,560	73,410	78,340	79,800	26%	10%
CPU Installed Base	27,396	54,711	84,750	116,144	153,536	189,530	235,180	288,820	347,390	407,420	54%	22%
Workstation Installed Base	27,396	54,711	84,750	116,144	153,536	189,530	235,180	288,820	347,390	407,420	54%	22%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	16.3	10.3	14.2	23.2	19.2	23.9	24.0	23.9	23.8	23.7	4%	4%
Hardware-Only ASP	3.8	4.4	4.6	4.9	4.8	4.7	4.7	4.6	4.6	4.6	6%	-1%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	106	143	178	229	273	306	339	368	384	390	27%	7%
CPU Revenue	92	124	160	199	239	273	301	324	336	334	27%	7%
Workstation Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	14	19	19	30	34	33	38	44	48	56	24%	11%
Software Revenue	34	72	88	102	114	137	149	156	164	168	35%	8%
Bundled	13	19	18	18	12	20	18	16	15	15	-3%	4%
Unbundled	21	53	70	85	102	116	130	139	149	153	48%	8%
Service Revenue	7	13	14	18	24	27	30	33	35	36	36%	9%
Total Revenue	147	229	280	349	411	469	518	556	583	593	29%	8%
Increase over Prior Year	227%	56%	22%	25%	18%	14%	10%	7%	5%	2%		

Source: Dataquest
 September 1991

TITLE: Final History and Forecast
 APPLICATION: Mechanical
 REGION: Asia
 PLATFORM: All Platforms

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	16,767	25,313	28,250	39,899	60,523	73,480	84,460	94,050	100,810	103,810	38%	11%
Workstation Shipments	21,622	32,509	34,401	45,158	68,133	80,970	91,440	100,230	106,120	108,210	33%	10%
CPU Installed Base	23,883	48,735	75,235	110,362	155,601	218,270	286,500	366,110	452,900	542,860	60%	28%
Workstation Installed Base	33,213	65,264	97,942	138,464	185,207	262,690	338,710	425,310	518,050	612,890	54%	27%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	98.7	97.8	107.2	57.2	49.7	45.1	42.7	41.0	39.9	39.2	-16%	-5%
Hardware-Only ASP	26.9	24.4	12.1	10.1	9.1	9.3	9.0	8.6	8.4	8.6	-24%	-1%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	786	1,088	1,044	1,047	1,358	1,492	1,612	1,680	1,710	1,718	15%	5%
CPU Revenue	405	684	644	786	1,066	987	1,076	1,132	1,164	1,180	27%	2%
Workstation Revenue	247	260	193	85	80	119	118	110	99	87	-25%	2%
Peripheral Revenue (Turnkey)	134	144	207	175	212	386	419	438	447	450	12%	16%
Software Revenue	211	288	408	482	571	772	871	947	1,017	1,078	28%	14%
Bundled	187	230	298	366	426	606	671	714	739	756	23%	12%
Unbundled	25	59	111	116	145	166	200	234	278	322	55%	17%
Service Revenue	131	134	202	223	270	310	337	352	362	368	20%	6%
Total Revenue	1,128	1,510	1,654	1,751	2,199	2,574	2,820	2,980	3,089	3,164	18%	8%
Increase over Prior Year	78%	34%	10%	6%	26%	17%	10%	6%	4%	2%		

Source: Dataquest
 September 1991

14
 TITLE: Final History and Forecast
 APPLICATION: Mechanical
 REGION: Asia
 PLATFORM: Technical Workstation

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	====	====	====	====	====	====	====	====	====	====	=====	=====
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	1,463	4,254	6,619	14,165	22,424	30,530	37,570	43,620	48,550	52,600	98%	19%
Workstation Shipments	1,463	4,254	6,619	14,165	22,424	30,530	37,570	43,620	48,550	52,600	98%	19%
CPU Installed Base	2,177	6,410	12,935	26,757	47,374	76,580	111,950	153,690	200,430	251,220	116%	40%
Workstation Installed Base	2,177	6,410	12,935	26,757	47,374	76,580	111,950	153,690	200,430	251,220	116%	40%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	95.0	94.1	78.3	50.1	39.6	37.9	36.4	35.5	35.1	35.1	-20%	-2%
Hardware-Only ASP	25.4	25.4	16.8	20.5	22.1	20.7	19.1	18.2	17.8	17.8	-3%	-4%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	68	206	273	420	591	735	855	953	1,032	1,105	72%	13%
CPU Revenue	57	178	201	320	454	537	623	695	753	806	68%	12%
Workstation Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	11	28	72	100	137	198	231	258	279	299	90%	17%
Software Revenue	27	85	150	230	281	412	514	605	695	778	80%	23%
Bundled	23	70	112	185	212	310	370	421	463	502	74%	19%
Unbundled	4	15	37	45	69	102	144	184	231	276	108%	32%
Service Revenue	15	33	74	87	110	144	173	197	219	240	64%	17%
Total Revenue	110	324	497	737	982	1,291	1,541	1,756	1,946	2,123	73%	17%
Increase over Prior Year	199%	195%	54%	48%	33%	32%	19%	14%	11%	9%		

Source: Dataquest
 September 1991

TITLE: Final History and Forecast
 APPLICATION: Mechanical
 REGION: Asia
 PLATFORM: Host/Server

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	====	====	====	====	====	====	====	====	====	====	====	====
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	1,664	1,456	1,365	2,802	3,868	4,270	4,440	4,360	4,170	3,870	23%	0%
Workstation Shipments	6,520	8,652	7,516	8,061	11,477	11,760	11,420	10,540	9,490	8,270	15%	-6%
CPU Installed Base	3,088	4,542	5,879	8,546	10,959	15,460	19,090	22,650	26,180	29,570	37%	22%
Workstation Installed Base	12,418	21,071	28,586	36,647	40,566	59,880	71,300	81,840	91,330	99,610	34%	20%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	504.1	689.1	639.0	227.4	198.5	186.6	179.1	171.7	164.5	158.0	-21%	-4%
Hardware-Only ASP	286.0	391.1	176.2	95.0	73.5	67.8	62.4	57.3	52.6	48.5	-29%	-8%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	581	710	554	459	517	493	481	446	403	353	-3%	-7%
CPU Revenue	248	367	300	324	391	272	265	245	221	194	12%	-13%
Workstation Revenue	247	260	193	85	80	119	118	110	99	87	-25%	2%
Peripheral Revenue (Turnkey)	86	82	60	50	46	102	99	92	83	72	-15%	10%
Software Revenue	111	115	166	150	180	216	213	202	191	176	13%	-0%
Bundled	101	94	127	113	146	189	188	180	169	154	10%	1%
Unbundled	10	21	39	36	34	27	24	22	22	22	36%	-8%
Service Revenue	97	85	116	117	139	141	139	130	119	107	9%	-5%
Total Revenue	789	910	835	727	836	850	833	779	714	636	1%	-5%
Increase over Prior Year	59%	15%	-8%	-13%	15%	2%	-2%	-7%	-8%	-11%		

Source: Dataquest
 September 1991

16
 TITLE: Final History and Forecast
 APPLICATION: Mechanical
 REGION: Asia
 PLATFORM: Personal Computer

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	13,639	19,603	20,266	22,932	34,231	38,680	42,450	46,070	48,090	47,340	26%	7%
Workstation Shipments	13,639	19,603	20,266	22,932	34,231	38,680	42,450	46,070	48,090	47,340	26%	7%
CPU Installed Base	18,618	37,783	56,421	75,059	97,267	126,230	155,460	189,770	226,290	262,060	51%	22%
Workstation Installed Base	18,618	37,783	56,421	75,059	97,267	126,230	155,460	189,770	226,290	262,060	51%	22%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	30.3	25.7	33.2	19.7	21.8	21.1	20.8	20.6	20.4	20.4	-8%	-1%
Hardware-Only ASP	4.0	5.7	7.0	4.7	4.3	4.3	4.2	4.2	4.2	4.2	2%	-0%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	138	172	217	167	250	264	277	281	274	259	16%	1%
CPU Revenue	100	139	143	142	221	178	188	192	189	180	22%	-4%
Workstation Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	37	33	74	25	29	86	89	89	85	79	-6%	22%
Software Revenue	73	89	93	102	110	144	144	140	132	124	11%	2%
Bundled	62	66	58	68	69	107	113	112	107	100	2%	8%
Unbundled	11	23	35	34	41	37	31	27	25	24	39%	-11%
Service Revenue	19	16	12	18	21	25	25	25	24	22	3%	1%
Total Revenue	230	277	322	287	381	433	446	446	429	405	14%	1%
Increase over Prior Year	123%	21%	16%	-11%	33%	14%	3%	-0%	-4%	-6%		

Source: Dataquest
 September 1991

TITLE: Final History and Forecast
 APPLICATION: Mechanical
 REGION: Rest of World
 PLATFORM: All Platforms

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	****	****	****	****	****	****	****	****	****	****	****	****
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	1,697	3,067	2,735	3,238	4,376	5,940	7,600	9,190	10,710	12,160	27%	23%
Workstation Shipments	2,183	3,681	3,454	3,943	5,204	6,850	8,550	10,130	11,590	12,910	24%	20%
CPU Installed Base	2,749	5,654	8,085	10,750	13,985	18,250	24,110	31,560	40,530	50,950	50%	30%
Workstation Installed Base	5,175	8,798	12,075	15,555	19,820	25,040	31,990	40,520	50,510	61,820	40%	26%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	123.5	62.1	69.8	83.0	67.8	64.0	58.5	50.6	46.5	42.9	-14%	-9%
Hardware-Only ASP	52.3	30.2	18.0	15.0	11.7	10.3	9.4	8.8	8.2	7.5	-31%	-9%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	100	105	74	82	84	93	107	120	129	134	-4%	10%
CPU Revenue	64	66	48	59	62	67	78	88	96	102	-1%	11%
Workstation Revenue	28	27	20	15	15	13	14	15	14	12	-15%	-4%
Peripheral Revenue (Turnkey)	9	12	6	8	8	13	15	17	19	19	-3%	21%
Software Revenue	9	13	15	23	27	37	45	54	61	69	33%	21%
Bundled	6	8	9	16	16	21	24	26	27	28	28%	12%
Unbundled	3	4	6	8	11	16	21	28	34	41	44%	31%
Service Revenue	13	14	16	22	24	27	31	35	39	41	16%	12%
Total Revenue	122	132	105	127	134	157	183	209	229	244	2%	13%
Increase over Prior Year	131%	8%	-20%	21%	6%	17%	16%	15%	9%	7%		

Source: Dataquest
 September 1991

18
 TITLE: Final History and Forecast
 APPLICATION: Mechanical
 REGION: Rest of World
 PLATFORM: Technical Workstation

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	----	----	----	----	----	----	----	----	----	----	-----	-----
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	411	605	594	895	1,034	1,200	1,540	2,030	2,460	2,840	26%	22%
Workstation Shipments	411	605	594	895	1,034	1,200	1,540	2,030	2,460	2,840	26%	22%
CPU Installed Base	591	1,190	1,758	2,573	3,289	4,280	5,470	7,160	9,270	11,770	54%	29%
Workstation Installed Base	591	1,190	1,758	2,573	3,289	4,280	5,470	7,160	9,270	11,770	54%	29%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	57.6	32.5	38.5	45.9	38.4	36.6	35.2	34.3	33.9	33.9	-10%	-2%
Hardware-Only ASP	27.2	26.6	20.4	15.7	15.5	14.1	13.0	12.3	12.0	12.0	-13%	-5%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	13	15	17	23	24	27	33	42	49	56	16%	18%
CPU Revenue	12	12	13	19	19	23	28	35	41	46	13%	19%
Workstation Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	1	3	3	4	5	4	5	7	8	10	35%	16%
Software Revenue	3	5	6	9	11	14	18	23	28	34	39%	25%
Bundled	2	3	3	7	7	8	10	13	16	18	32%	20%
Unbundled	1	1	2	2	4	6	8	11	13	16	59%	32%
Service Revenue	2	3	6	10	11	12	15	20	24	27	47%	21%
Total Revenue	18	23	28	42	46	53	66	86	102	117	26%	21%
Increase over Prior Year	111%	26%	21%	51%	8%	16%	25%	30%	19%	15%		

Source: Dataquest
 September 1991

19
TITLE: Final History and Forecast
APPLICATION: Mechanical
REGION: Rest of World
PLATFORM: Host/Server

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	====	====	====	====	====	====	====	====	====	====	=====	=====
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	345	235	185	176	186	220	260	280	290	270	-14%	8%
Workstation Shipments	830	849	905	880	1,013	1,140	1,210	1,220	1,170	1,010	5%	-0%
CPU Installed Base	712	844	902	968	1,094	1,140	1,250	1,390	1,540	1,670	11%	9%
Workstation Installed Base	3,138	3,987	4,892	5,773	6,930	7,920	9,130	10,350	11,520	12,540	22%	13%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	474.3	496.3	482.0	699.9	452.8	432.5	414.8	397.5	380.7	365.5	-1%	-4%
Hardware-Only ASP	218.0	317.4	202.3	170.9	188.6	171.7	157.6	144.5	132.3	121.7	-4%	-8%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	84	79	48	47	45	46	48	47	45	38	-14%	-3%
CPU Revenue	49	44	26	29	28	25	25	24	22	19	-13%	-8%
Workstation Revenue	28	27	20	15	15	13	14	15	14	12	-15%	-4%
Peripheral Revenue (Turnkey)	7	8	3	3	3	8	8	8	8	7	-23%	23%
Software Revenue	4	6	7	10	10	14	15	15	13	11	27%	2%
Bundled	3	4	5	8	9	13	14	13	11	9	27%	1%
Unbundled	1	1	2	2	1	1	1	1	2	2	24%	8%
Service Revenue	11	10	10	11	12	13	14	14	13	11	4%	-3%
Total Revenue	98	95	66	68	68	74	77	75	71	60	-9%	-2%
Increase over Prior Year	132%	-3%	-31%	4%	-1%	9%	5%	-3%	-6%	-15%		

Source: Dataquest
September 1991

Forecast--Mechanical Applications

TITLE: Final History and Forecast
 APPLICATION: Mechanical
 REGION: Rest of World
 PLATFORM: Personal Computer

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	CAGR 86-90	CAGR 90-95
	====	====	====	====	====	====	====	====	====	====	=====	=====
UNIT SHIPMENT DATA (Workstation Shipments)												
CPU Shipments	941	2,228	1,956	2,167	3,156	4,510	5,800	6,880	7,960	9,060	35%	23%
Workstation Shipments	941	2,228	1,956	2,167	3,156	4,510	5,800	6,880	7,960	9,060	35%	23%
CPU Installed Base	1,446	3,620	5,424	7,209	9,601	12,840	17,380	23,010	29,710	37,510	61%	31%
Workstation Installed Base	1,446	3,620	5,424	7,209	9,601	12,840	17,380	23,010	29,710	37,510	61%	31%
CALCULATED AVERAGE SYSTEM PRICE DATA (Thousands of U.S. Dollars)												
Turnkey ASP	18.9	13.5	10.0	9.6	6.2	6.1	6.1	6.0	6.0	6.0	-24%	-1%
Hardware-Only ASP	3.4	4.3	4.5	5.1	4.6	4.6	4.5	4.5	4.4	4.4	8%	-1%
REVENUE DATA (Millions of U.S. Dollars)												
Hardware Revenue	4	10	9	11	15	20	26	31	35	40	40%	22%
CPU Revenue	4	10	9	11	14	20	25	29	33	37	41%	21%
Workstation Revenue	0	0	0	0	0	0	0	0	0	0	NA	NA
Peripheral Revenue (Turnkey)	0	1	0	0	0	1	1	2	2	3	14%	49%
Software Revenue	2	3	2	5	6	9	12	16	19	24	35%	34%
Bundled	0	1	0	1	0	0	0	0	0	0	-33%	28%
Unbundled	1	2	2	4	6	8	12	16	19	24	42%	34%
Service Revenue	0	0	0	1	1	1	2	2	2	3	54%	28%
Total Revenue	6	13	11	16	21	30	40	49	57	67	39%	26%
Increase over Prior Year	208%	136%	-15%	42%	30%	44%	31%	23%	16%	18%		

Source: Dataquest
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Market Share Estimates
Mechanical Applications

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CAD/CAM/CAE

Market Share Estimates
Mechanical Applications

Source:
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Market Share Estimates—Mechanical Applications

Market Share Estimates

The following is a description of the information reported in the *Market Share Estimates* book for each segment:

- **Source**—All companies in database; overview of industry
- **Mechanical Applications**—All companies in database with mechanical revenue
- **AEC and GIS Applications**—All companies in database with AEC or GIS revenue
- **Electronic Design Automation Applications**—All companies in database with EDA revenue
- **Europe**—All European-based companies and all other companies with more than \$1 million in European revenue
- **Asia**—All Asian-based companies and all other companies with more than \$1 million in Asian revenue
- **Personal CAD and Distribution Channels**—All companies in database with PC revenue
- **Second quarter (March 31)**: We provide complete preliminary forecast tables, including a new five-year forecast period.
- **Third quarter (July 1)**: We send complete final updated market share tables based on additional data collection and analysis over the previous six months as well as company history tables. 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.
- **Fourth quarter (October 1)**: We provide complete final forecast tables, taking into consideration changes in the market during the previous six months.

Since January, when the preliminary market share numbers were published, over 35 new companies have been added to the market share database. This brings the total number of companies recognized in the CAD/CAM/CAE market to 430. The market share numbers also have been rechecked and verified for all vendors worldwide. Year-end 1990 financial results released this past spring have also been checked and incorporated into the final numbers.

Market Database Methodology

Dataquest's CAD/CAM/CAE industry service is committed to consistently delivering to clients the most accurate data available on the CAD/CAM/CAE industry, both in terms of market history and forecast. Our annual delivery schedule is designed to meet that commitment, as follows:

- **First quarter (January 31)**—We will provide complete preliminary market share tables for the year just completed. Historical database is opened for changes for a six-month period.

Additionally, a number of companies significantly improved or made changes to their reporting methods during this past update cycle. These changes have been incorporated into this update. Dataquest's policy is to continually update its market information for any year, based on any new data received, in order to arrive at the most accurate market representation possible.

TABLE NUMBER: 1
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: Worldwide
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
-----	-----	-----	-----	-----	-----	-----	-----	-----
IBM	1,414.7	878.7	291.9	36,367	19.0%	20.3%	15.5%	14.5%
Computervision	782.2	302.3	216.4	7,361	10.5%	7.0%	11.5%	2.9%
Hewlett-Packard	503.9	356.8	60.7	25,746	6.8%	8.2%	3.2%	10.2%
Digital	485.5	354.4	.0	3,354	6.5%	8.2%	.0%	1.3%
McDonnell Douglas	247.5	127.7	85.5	3,289	3.3%	3.0%	4.5%	1.3%
Sun	225.2	194.8	.0	11,288	3.0%	4.5%	.0%	4.5%
NEC	198.6	138.1	44.6	8,598	2.7%	3.2%	2.4%	3.4%
Nihon Unisys	183.5	122.9	23.9	1,670	2.5%	2.8%	1.3%	.7%
Intergraph	169.7	90.6	33.9	1,767	2.3%	2.1%	1.8%	.7%
Control Data	168.4	93.1	23.0	2,160	2.3%	2.2%	1.2%	.9%
Fujitsu	162.1	100.5	45.4	3,599	2.2%	2.3%	2.4%	1.4%
Hitachi	156.2	75.0	65.6	4,800	2.1%	1.7%	3.5%	1.9%
Compaq	150.6	150.6	.0	25,088	2.0%	3.5%	.0%	10.0%
Schlumberger	141.5	50.4	51.8	1,484	1.9%	1.2%	2.7%	.6%
Silicon Graphics	139.6	126.8	.0	3,271	1.9%	2.9%	.0%	1.3%
Autodesk	90.4	.0	90.4	0	1.2%	.0%	4.8%	.0%
Apple Computer	89.6	78.8	.0	17,220	1.2%	1.8%	.0%	6.9%
Matra Datavision	82.6	37.2	33.1	901	1.1%	.9%	1.8%	.4%
SDRC	80.5	.0	80.5	0	1.1%	.0%	4.3%	.0%
Toshiba--NO OEM	69.1	34.5	27.6	1,801	.9%	.8%	1.5%	.7%
CADAM	60.1	26.3	29.0	3,750	.8%	.6%	1.5%	1.5%
Hitachi Zosen Info Systems	58.8	46.9	.6	595	.8%	1.1%	.0%	.2%
Siemens	54.7	27.4	19.2	727	.7%	.6%	1.0%	.3%
MacNeal-Schwendler	53.2	.0	51.1	0	.7%	.0%	2.7%	.0%
Mutoh Industries--NO OEM	45.2	23.7	16.9	1,150	.6%	.5%	.9%	.5%
Cisigraph	43.2	15.2	15.0	400	.6%	.4%	.8%	.2%
Hakuto	41.7	28.8	12.9	1,220	.6%	.7%	.7%	.5%
Mitsubishi Electric	38.4	30.3	5.1	741	.5%	.7%	.3%	.3%
Norsk Data	38.0	19.2	6.6	372	.5%	.4%	.4%	.1%
Unisys	38.0	19.4	13.3	581	.5%	.4%	.7%	.2%
Tokyo Electron--NO OEM	33.5	11.1	16.1	122	.4%	.3%	.9%	.0%
Auto-Trol	31.5	12.6	11.1	371	.4%	.3%	.6%	.1%
Gerber Systems	29.5	14.5	9.8	399	.4%	.3%	.5%	.2%

(Continued)

TABLE NUMBER: 1
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: Worldwide
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Cimlinc	29.5	5.9	17.7	563	.4%	.1%	.9%	.2%
STI-Straessle	28.8	6.6	15.8	269	.4%	.2%	.8%	.1%
PDA Engineering	28.4	.0	28.4	0	.4%	.0%	1.5%	.0%
Sumitomo Denko Workstation	28.4	28.4	.0	2,075	.4%	.7%	.0%	.8%
Sharp System Products--NO OEM	27.8	14.5	13.4	184	.4%	.3%	.7%	.1%
Investronica SA	27.0	21.6	2.7	1,080	.4%	.5%	.1%	.4%
Parametric Technology	26.5	.0	24.3	0	.4%	.0%	1.3%	.0%
Swanson Analysis	24.6	.0	24.6	0	.3%	.0%	1.3%	.0%
Alias Research	22.8	.0	22.8	0	.3%	.0%	1.2%	.0%
Ferranti	21.8	8.1	10.0	201	.3%	.2%	.5%	.1%
MCS	20.7	.0	18.3	0	.3%	.0%	1.0%	.0%
Wiechers Datentechnik	20.3	16.2	4.1	494	.3%	.4%	.2%	.2%
Mitsui Engineering	19.8	13.9	4.0	129	.3%	.3%	.2%	.1%
Vero International Software	19.2	.0	17.5	0	.3%	.0%	.9%	.0%
Delcam International	18.8	6.6	9.4	312	.3%	.2%	.5%	.1%
ADRA Systems	18.0	6.2	10.0	320	.2%	.1%	.5%	.1%
Toyo Information Systems--NO OEM	16.9	10.2	4.9	176	.2%	.2%	.3%	.1%
PAFEC	16.1	.0	16.1	0	.2%	.0%	.9%	.0%
Cimatron	15.9	7.2	7.2	471	.2%	.2%	.4%	.2%
Mannesmann PROCAD	15.7	8.0	4.4	218	.2%	.2%	.2%	.1%
Hahn & Kolb	15.4	9.3	4.6	220	.2%	.2%	.2%	.1%
ISICAD	15.4	7.3	5.6	143	.2%	.2%	.3%	.1%
ISYKON Software	15.4	7.7	5.4	220	.2%	.2%	.3%	.1%
CADKEY	15.2	1.0	14.2	150	.2%	.0%	.8%	.1%
Graphtec Engineering	13.9	7.0	6.3	300	.2%	.2%	.3%	.1%
Kewill Systems	12.5	3.8	6.9	250	.2%	.1%	.4%	.1%
Exapt	12.3	6.0	4.2	211	.2%	.1%	.2%	.1%
Fides Industrielle Automation	12.2	1.4	11.0	75	.2%	.0%	.6%	.0%
CAD Lab	11.5	.0	9.2	0	.2%	.0%	.5%	.0%
Aries Technology	11.0	.0	9.9	0	.1%	.0%	.5%	.0%
ItalCad	10.8	5.1	2.6	101	.1%	.1%	.1%	.0%
Framasoft	10.5	.0	6.3	0	.1%	.0%	.3%	.0%
ICAD	10.5	.0	8.4	0	.1%	.0%	.4%	.0%

(Continued)

TABLE NUMBER: 1
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: Worldwide
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Design Automation	10.2	.0	10.2	0	.1%	.0%	.5%	.0%
MARC	9.1	.0	9.1	0	.1%	.0%	.5%	.0%
Omron	9.1	8.1	.9	261	.1%	.2%	.0%	.1%
ICL	8.7	5.1	3.0	239	.1%	.1%	.2%	.1%
Tebis	8.4	1.3	5.9	42	.1%	.0%	.3%	.0%
Wacom	7.8	1.6	5.5	123	.1%	.0%	.3%	.0%
Caditron	7.8	3.9	3.1	120	.1%	.1%	.2%	.0%
Andor	7.8	1.9	5.5	70	.1%	.0%	.3%	.0%
Dell Computer	7.6	7.6	.0	1,907	.1%	.2%	.0%	.8%
Radan Computational	7.5	2.6	3.8	255	.1%	.1%	.2%	.1%
Albert Nestler	7.4	2.4	3.2	95	.1%	.1%	.2%	.0%
Ziegler	7.4	.0	7.4	0	.1%	.0%	.4%	.0%
Research Machines	6.9	6.9	.0	1,056	.1%	.2%	.0%	.4%
Sony	6.7	5.9	.0	390	.1%	.1%	.0%	.2%
DAT Standard Information system	6.4	.0	6.1	0	.1%	.0%	.3%	.0%
Engineering Mechanics	6.3	2.1	3.6	500	.1%	.0%	.2%	.2%
CNC Software	6.0	.0	6.0	0	.1%	.0%	.3%	.0%
Mechanical Dynamics	6.0	.0	5.3	0	.1%	.0%	.3%	.0%
Technische Computer Systeme	5.8	1.2	4.6	147	.1%	.0%	.2%	.1%
rotring euroCAD	5.5	3.4	2.0	147	.1%	.1%	.1%	.1%
Mentor Graphics	4.7	1.4	2.0	47	.1%	.0%	.1%	.0%
Everex Systems	4.7	4.7	.0	1,431	.1%	.1%	.0%	.6%
Marcus Computer Systeme	4.4	2.3	1.5	137	.1%	.1%	.1%	.1%
Algor Interactive Systems	4.3	.0	3.8	0	.1%	.0%	.2%	.0%
Moda CAD	4.2	1.0	2.9	35	.1%	.0%	.2%	.0%
Pathtrace	4.1	1.1	2.7	58	.1%	.0%	.1%	.0%
Whessoe Computing Systems	4.0	.0	4.0	0	.1%	.0%	.2%	.0%
Micro Engineering Solutions	3.5	1.0	2.3	44	.0%	.0%	.1%	.0%
Anilam Electronics	3.2	1.0	1.9	40	.0%	.0%	.1%	.0%
Intercad	3.1	1.6	.9	151	.0%	.0%	.0%	.1%
Serbi	3.1	.0	3.1	0	.0%	.0%	.2%	.0%
Wisdom Systems	3.0	.0	2.3	0	.0%	.0%	.1%	.0%

(Continued)

TABLE NUMBER: 1
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: Worldwide
 UNITS: Millions of Dollars/Actual Units

Company	Total Market Share Estimates				Market Share			
	Total Revenue	Hardware Revenue	Software Revenue	Units Shipped	Total Revenue	Hardware Revenue	Software Revenue	Units Shipped
XAO Industrie	3.0	1.1	1.8	108	.0%	.0%	.1%	.0%
Olivetti	2.9	2.4	.0	436	.0%	.1%	.0%	.2%
Clar's	2.8	.0	2.8	0	.0%	.0%	.1%	.0%
CADIX	2.7	1.1	1.4	20	.0%	.0%	.1%	.0%
Superaft	2.7	1.3	1.3	147	.0%	.0%	.1%	.1%
Century Research Center	2.7	1.4	1.0	15	.0%	.0%	.1%	.0%
FEA Limited	2.7	.6	.6	50	.0%	.0%	.0%	.0%
debis Systemhaus	2.6	.7	1.5	90	.0%	.0%	.1%	.0%
CAMTEK	2.5	.0	2.1	0	.0%	.0%	.1%	.0%
Caroline Informatique	2.3	.5	1.6	30	.0%	.0%	.1%	.0%
Catalpa	2.2	.8	1.1	18	.0%	.0%	.1%	.0%
American Small Business Comp.	2.1	.0	2.1	0	.0%	.0%	.1%	.0%
Micrografix	2.0	.0	2.0	0	.0%	.0%	.1%	.0%
JSKA	2.0	.9	.8	37	.0%	.0%	.0%	.0%
Ontologic	1.9	.0	1.9	0	.0%	.0%	.1%	.0%
Rich--MO OEM	1.8	.0	1.5	0	.0%	.0%	.1%	.0%
Robocom	1.6	.0	1.6	0	.0%	.0%	.1%	.0%
Kubota Computer	1.5	1.0	.5	208	.0%	.0%	.0%	.1%
CAD Centre	1.5	.0	.8	0	.0%	.0%	.0%	.0%
Forasight Resources	1.4	.0	1.3	0	.0%	.0%	.1%	.0%
Computational Mechanics	1.4	.0	1.4	0	.0%	.0%	.1%	.0%
FEES	1.4	.0	1.1	0	.0%	.0%	.1%	.0%
Accugraph	1.4	.6	.6	35	.0%	.0%	.0%	.0%
Evolution Computing	1.2	.0	1.2	0	.0%	.0%	.1%	.0%
Point Control	1.0	.0	1.0	0	.0%	.0%	.1%	.0%
Vision 3D	.9	.5	.2	6	.0%	.0%	.0%	.0%
S.T.L.D. S.r.l.	.8	.0	.8	0	.0%	.0%	.0%	.0%
Zuken	.8	.4	.4	5	.0%	.0%	.0%	.0%
Rasna Corporation	.8	.0	.8	0	.0%	.0%	.0%	.0%
Aura CAD/CAM Systems	.7	.0	.6	0	.0%	.0%	.0%	.0%
Innovative Data Design	.7	.0	.7	0	.0%	.0%	.0%	.0%
A.I. Systems	.7	.0	.7	0	.0%	.0%	.0%	.0%

(Continued)

TABLE NUMBER: 1
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: Worldwide
 UNITS: Millions of Dollars/Actual Units

Company =====					----- Market Share -----			
	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====
Ithaca Software	.6	.0	.6	0	.0%	.0%	.0%	.0%
ACERI SA	.6	.1	.3	3	.0%	.0%	.0%	.0%
GRAPHISOFT	.6	.0	.6	0	.0%	.0%	.0%	.0%
Machinery Sales	.6	.0	.6	0	.0%	.0%	.0%	.0%
Object Design	.5	.0	.5	0	.0%	.0%	.0%	.0%
Premise	.5	.0	.5	0	.0%	.0%	.0%	.0%
Solbourne	.5	.4	.0	33	.0%	.0%	.0%	.0%
Engineering Software	.5	.0	.4	13	.0%	.0%	.0%	.0%
Objectivity	.5	.0	.5	0	.0%	.0%	.0%	.0%
Cadtronic	.4	.2	.2	13	.0%	.0%	.0%	.0%
Cascade Graphics	.4	.0	.4	0	.0%	.0%	.0%	.0%
Uniras	.4	.0	.4	0	.0%	.0%	.0%	.0%
Engineering Systems Corp.	.4	.0	.3	0	.0%	.0%	.0%	.0%
Pelton Engineering	.4	.0	.4	0	.0%	.0%	.0%	.0%
Ashlar	.3	.0	.3	0	.0%	.0%	.0%	.0%
Spectrum Graphics	.3	.1	.2	3	.0%	.0%	.0%	.0%
Georgia Tech Research Corp.	.3	.0	.3	0	.0%	.0%	.0%	.0%
A/E Microsystems	.3	.2	.0	25	.0%	.0%	.0%	.0%
Mc2 Engineering Software	.3	.0	.3	0	.0%	.0%	.0%	.0%
Synthesis	.3	.0	.3	0	.0%	.0%	.0%	.0%
Mega CADD	.2	.0	.2	0	.0%	.0%	.0%	.0%
ESDU International	.2	.0	.2	0	.0%	.0%	.0%	.0%
CAD-Capture	.2	.0	.0	0	.0%	.0%	.0%	.0%
DAPCO	.1	.0	.1	0	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.1	1	.0%	.0%	.0%	.0%
Comshoppe	.1	.0	.1	0	.0%	.0%	.0%	.0%
IGC Technology	.1	.0	.1	0	.0%	.0%	.0%	.0%
Lamp Software	.1	.0	.1	5	.0%	.0%	.0%	.0%
Imagine That	.1	.0	.1	0	.0%	.0%	.0%	.0%
Number One Systems	.0	.0	.0	1	.0%	.0%	.0%	.0%

(Continued)

TABLE NUMBER: 1 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: Worldwide
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Other Companies	467.9	454.7	.0	64,341	6.3%	10.5%	.0%	25.6%
All Companies	7,449.0	4,327.2	1,888.3	251,290	100.0%	100.0%	100.0%	100.0%
All U.S.-Based Companies	5,570.7	3,371.9	1,202.8	213,082	74.8%	77.9%	63.7%	84.8%
All Asian-Based Companies	1,144.7	707.0	313.9	28,252	15.4%	16.3%	16.6%	11.2%
All European-Based Companies	733.6	248.3	371.5	9,956	9.8%	5.7%	19.7%	4.0%
All Hardware Companies	1,934.9	1,683.5	.0	169,845	26.0%	38.9%	.0%	67.6%
All Turnkey & SW Companies	5,514.2	2,643.7	1,888.3	81,445	74.0%	61.1%	100.0%	32.4%

Source: Dataquest
 June 1991

TABLE NUMBER: 2
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Technical Workstation
 REGION: Worldwide
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Computervision	683.5	266.1	184.1	5,374	19.2%	14.4%	17.5%	8.0%
Hewlett-Packard	426.4	294.5	60.7	14,501	12.0%	15.9%	5.8%	21.6%
McDonnell Douglas	203.1	105.0	70.0	2,337	5.7%	5.7%	6.7%	3.5%
Sun	157.7	138.7	.0	8,747	4.4%	7.5%	.0%	13.0%
IBM	146.7	89.3	30.9	3,613	4.1%	4.8%	2.9%	5.4%
Intergraph	139.1	78.0	25.0	1,539	3.9%	4.2%	2.4%	2.3%
Silicon Graphics	137.9	125.5	.0	3,240	3.9%	6.8%	.0%	4.8%
Digital	100.5	73.4	.0	3,354	2.8%	4.0%	.0%	5.0%
Schlumberger	99.1	34.0	37.3	846	2.8%	1.8%	3.5%	1.3%
NEC	89.4	50.1	32.2	4,697	2.5%	2.7%	3.1%	7.0%
Matra Datavision	82.6	37.2	33.1	901	2.3%	2.0%	3.1%	1.3%
Hitachi	78.1	37.5	32.8	1,622	2.2%	2.0%	3.1%	2.4%
SDRC	70.0	.0	70.0	0	2.0%	.0%	6.7%	.0%
Control Data	68.3	46.5	11.6	1,597	1.9%	2.5%	1.1%	2.4%
Fujitsu	66.5	41.2	18.6	1,565	1.9%	2.2%	1.8%	2.3%
Nihon Unisys	58.7	39.3	7.6	691	1.6%	2.1%	.7%	1.0%
Hitachi Zosen Info Systems	55.2	46.9	.6	595	1.5%	2.5%	.1%	.9%
Siemens	54.7	27.4	19.2	727	1.5%	1.5%	1.8%	1.1%
Cisigraph	38.9	13.6	13.6	314	1.1%	.7%	1.3%	.5%
Toshiba--NO OEM	35.9	18.0	14.4	315	1.0%	1.0%	1.4%	.5%
Tokyo Electron--NO OEM	33.5	11.1	16.1	122	.9%	.6%	1.5%	.2%
Auto-Trol	31.5	12.6	11.1	371	.9%	.7%	1.1%	.6%
Gerber Systems	29.5	14.5	9.8	399	.8%	.8%	.9%	.6%
Cimlinc	29.5	5.9	17.7	563	.8%	.3%	1.7%	.8%
Unisys	29.3	14.9	10.3	458	.8%	.8%	1.0%	.7%
STI-Straessle	28.8	6.6	15.8	269	.8%	.4%	1.5%	.4%
Mitsubishi Electric	28.0	24.5	1.9	279	.8%	1.3%	.2%	.4%
Parametric Technology	26.5	.0	24.3	0	.7%	.0%	2.3%	.0%
Sumitomo Denko Workstation	25.8	25.8	.0	1,955	.7%	1.4%	.0%	2.9%
Sharp System Products--NO OEM	24.2	12.6	11.6	150	.7%	.7%	1.1%	.2%
Alias Research	22.8	.0	22.8	0	.6%	.0%	2.2%	.0%
Ferranti	21.8	8.1	10.0	201	.6%	.4%	1.0%	.3%
PDA Engineering	19.1	.0	19.1	0	.5%	.0%	1.8%	.0%

(Continued)

TABLE NUMBER: 2
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Technical Workstation
 REGION: Worldwide
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Delcam International	18.8	6.6	9.4	312	.5%	.4%	.9%	.5%
Mitsui Engineering	18.0	12.6	3.6	118	.5%	.7%	.3%	.2%
Norsk Data	17.5	10.1	3.5	218	.5%	.5%	.3%	.3%
Mutoh Industries--NO OEM	16.7	8.1	5.6	169	.5%	.4%	.5%	.3%
Mannesmann PROCAD	15.7	8.0	4.4	218	.4%	.4%	.4%	.3%
ISYKON Software	15.4	7.7	5.4	220	.4%	.4%	.5%	.3%
ISICAD	14.0	7.3	4.2	143	.4%	.4%	.4%	.2%
Graphtec Engineering	13.9	7.0	6.3	300	.4%	.4%	.6%	.4%
Hahn & Kolb	13.9	8.3	4.2	190	.4%	.5%	.4%	.3%
ADRA Systems	13.9	6.2	6.2	320	.4%	.3%	.6%	.5%
PAFEC	13.7	.0	13.7	0	.4%	.0%	1.3%	.0%
Toyo Information Systems--NO OEM	12.8	8.0	3.7	152	.4%	.4%	.3%	.2%
Swanson Analysis	11.6	.0	11.6	0	.3%	.0%	1.1%	.0%
MacNeal-Schwendler	11.4	.0	11.0	0	.3%	.0%	1.0%	.0%
Kewill Systems	11.3	3.4	6.2	237	.3%	.2%	.6%	.4%
Cimatron	11.2	5.0	5.0	330	.3%	.3%	.5%	.5%
CAD Lab	11.0	.0	8.8	0	.3%	.0%	.8%	.0%
ItalCad	10.8	5.1	2.6	101	.3%	.3%	.2%	.2%
ICAD	10.5	.0	8.4	0	.3%	.0%	.8%	.0%
MCS	9.5	.0	8.5	0	.3%	.0%	.8%	.0%
Framasoft	9.5	.0	5.7	0	.3%	.0%	.5%	.0%
Omron	9.1	8.1	.9	261	.3%	.4%	.1%	.4%
Autodesk	9.0	.0	9.0	0	.3%	.0%	.9%	.0%
Aries Technology	8.8	.0	7.9	0	.2%	.0%	.8%	.0%
ICL	8.7	5.1	3.0	239	.2%	.3%	.3%	.4%
CADAM	8.5	.0	7.2	0	.2%	.0%	.7%	.0%
Radan Computational	7.5	2.6	3.7	251	.2%	.1%	.4%	.4%
Albert Nestler	7.4	2.4	3.2	95	.2%	.1%	.3%	.1%
Sony	6.7	5.9	.0	390	.2%	.3%	.0%	.6%
Technische Computer Systeme	5.8	1.2	4.6	147	.2%	.1%	.4%	.2%
Wiechers Datentechnik	5.7	4.5	1.1	80	.2%	.2%	.1%	.1%
Mentor Graphics	4.7	1.4	2.0	47	.1%	.1%	.2%	.1%
MARC	4.6	.0	4.6	0	.1%	.0%	.4%	.0%

(Continued)

TABLE NUMBER: 2
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Technical Workstation
 REGION: Worldwide
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
*****	*****	*****	*****	*****	*****	*****	*****	*****
Mechanical Dynamics	4.2	.0	3.7	0	.1%	.0%	.4%	.0%
Engineering Mechanics	3.7	1.2	2.1	277	.1%	.1%	.2%	.4%
Marcus Computer Systeme	3.4	1.8	1.1	105	.1%	.1%	.1%	.2%
rottring euroCAD	3.3	2.2	1.1	96	.1%	.1%	.1%	.1%
Exapt	3.3	1.6	1.1	107	.1%	.1%	.1%	.2%
Wisdom Systems	3.0	.0	2.3	0	.1%	.0%	.2%	.0%
XAO Industrie	3.0	1.1	1.8	108	.1%	.1%	.2%	.2%
CADIX	2.7	1.1	1.4	20	.1%	.1%	.1%	.0%
Fides Industrielle Automation	2.4	.3	2.2	32	.1%	.0%	.2%	.0%
Catalpa	2.2	.8	1.1	18	.1%	.0%	.1%	.0%
ISKA	2.0	.9	.8	37	.1%	.0%	.1%	.1%
debis Systemhaus	2.0	.5	1.2	64	.1%	.0%	.1%	.1%
Ontologic	1.9	.0	1.9	0	.1%	.0%	.2%	.0%
Caroline Informatique	1.8	.4	1.3	25	.1%	.0%	.1%	.0%
CAMTEK	1.8	.0	1.5	0	.0%	.0%	.1%	.0%
Ricoh--NO OEM	1.8	.0	1.5	0	.0%	.0%	.1%	.0%
CAD Centre	1.5	.0	.8	0	.0%	.0%	.1%	.0%
Micro Engineering Solutions	1.4	.4	.9	13	.0%	.0%	.1%	.0%
Century Research Center	1.4	.7	.5	8	.0%	.0%	.0%	.0%
Wacom	1.3	.3	1.0	13	.0%	.0%	.1%	.0%
Hakuto	1.3	.9	.4	18	.0%	.0%	.0%	.0%
Accugraph	1.2	.6	.5	34	.0%	.0%	.0%	.1%
FEA Limited	1.1	.3	.3	20	.0%	.0%	.0%	.0%
Kubota Computer	.8	.6	.3	143	.0%	.0%	.0%	.2%
Zuken	.8	.4	.4	5	.0%	.0%	.0%	.0%
FECS	.7	.0	.6	0	.0%	.0%	.1%	.0%
Object Design	.5	.0	.5	0	.0%	.0%	.0%	.0%
Computational Mechanics	.5	.0	.5	0	.0%	.0%	.0%	.0%
Objectivity	.5	.0	.5	0	.0%	.0%	.0%	.0%
Whesoe Computing Systems	.4	.0	.4	0	.0%	.0%	.0%	.0%
Everex Systems	.4	.4	.0	46	.0%	.0%	.0%	.1%

(Continued)

TABLE NUMBER: 2 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Technical Workstation
 REGION: Worldwide
 UNITS: Millions of Dollars/Actual Units

Company =====					----- Market Share -----			
	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====
Spectrum Graphics	.3	.1	.2	3	.0%	.0%	.0%	.0%
Ithaca Software	.3	.0	.3	0	.0%	.0%	.0%	.0%
Solbourne	.2	.2	.0	17	.0%	.0%	.0%	.0%
A/E Microsystems	.2	.2	.0	21	.0%	.0%	.0%	.0%
Serbi	.2	.0	.2	0	.0%	.0%	.0%	.0%
Algor Interactive Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
DAPCO	.1	.0	.1	0	.0%	.0%	.0%	.0%
Georgia Tech Research Corp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
Point Control	.1	.0	.1	0	.0%	.0%	.0%	.0%
CADKEY	.1	.0	.0	3	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.0	0	.0%	.0%	.0%	.0%
Lamp Software	.0	.0	.0	2	.0%	.0%	.0%	.0%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	3,567.9	1,850.2	1,051.5	67,113	100.0%	100.0%	100.0%	100.0%
All U.S.-Based Companies	2,511.3	1,316.8	669.5	47,859	70.4%	71.2%	63.7%	71.3%
All Asian-Based Companies	582.6	360.6	161.1	13,586	16.3%	19.5%	15.3%	20.2%
All European-Based Companies	474.1	172.8	220.9	5,668	13.3%	9.3%	21.0%	8.4%
All Hardware Companies	551.0	468.1	.0	23,576	15.4%	25.3%	.0%	35.1%
All Turnkey & SW Companies	3,017.0	1,382.1	1,051.5	43,536	84.6%	74.7%	100.0%	64.9%

Source: Dataquest
 June 1991

TABLE NUMBER: 3
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Host/Server
 REGION: Worldwide
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
IBM	1,186.6	712.0	261.0	14,560	44.4%	42.8%	51.7%	38.8%
Digital	385.0	281.0	.0	0	14.4%	16.9%	.0%	.0%
Nihon Unisys	124.8	83.6	16.2	979	4.7%	5.0%	3.2%	2.6%
Control Data	100.1	46.6	11.4	563	3.7%	2.8%	2.3%	1.5%
Computervision	84.6	35.7	19.2	1,857	3.2%	2.1%	3.8%	4.9%
Fujitsu	69.7	43.2	19.5	1,179	2.6%	2.6%	3.9%	3.1%
Sun	67.6	56.1	.0	2,541	2.5%	3.4%	.0%	6.8%
NEC	59.6	46.0	8.8	162	2.2%	2.8%	1.7%	.4%
McDonnell Douglas	44.4	22.7	15.5	952	1.7%	1.4%	3.1%	2.5%
MacNeal-Schwendler	41.4	.0	39.7	0	1.5%	.0%	7.9%	.0%
Schlumberger	41.0	16.0	14.0	629	1.5%	1.0%	2.8%	1.7%
Intergraph	25.5	12.7	4.1	228	1.0%	.8%	.8%	.6%
Hitachi	25.0	12.0	10.5	2,076	.9%	.7%	2.1%	5.5%
Morsk Data	20.2	8.8	3.0	147	.8%	.5%	.6%	.4%
Toshiba--NO OEM	15.2	7.6	6.1	204	.6%	.5%	1.2%	.5%
Swanson Analysis	10.6	.0	10.6	0	.4%	.0%	2.1%	.0%
SDRC	10.5	.0	10.5	0	.4%	.0%	2.1%	.0%
Fides Industrielle Automation	9.8	1.1	8.8	43	.4%	.1%	1.7%	.1%
PDA Engineering	9.4	.0	9.4	0	.4%	.0%	1.9%	.0%
Exapt	9.0	4.4	3.1	104	.3%	.3%	.6%	.3%
Unisys	8.7	4.4	3.1	123	.3%	.3%	.6%	.3%
CADAM	8.5	.0	7.4	0	.3%	.0%	1.5%	.0%
MCS	7.0	.0	6.1	0	.3%	.0%	1.2%	.0%
Hewlett-Packard	6.3	5.3	.0	316	.2%	.3%	.0%	.8%
Mitsubishi Electric	6.1	2.9	1.8	90	.2%	.2%	.3%	.2%
MARC	4.6	.0	4.6	0	.2%	.0%	.9%	.0%
Cisigraph	4.3	1.6	1.4	86	.2%	.1%	.3%	.2%
Toyo Information Systems--NO OEM	4.1	2.2	1.3	24	.2%	.1%	.3%	.1%
Hitachi Zosen Info Systems	3.5	.0	.0	0	.1%	.0%	.0%	.0%
Sumitomo Denko Workstation	2.6	2.6	.0	120	.1%	.2%	.0%	.3%
Mechanical Dynamics	1.8	.0	1.6	0	.1%	.0%	.3%	.0%
Silicon Graphics	1.6	1.4	.0	31	.1%	.1%	.0%	.1%

(Continued)

TABLE NUMBER: 3 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Host/Server
 REGION: Worldwide
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Sharp System Products--NO OEM	1.4	.7	.7	6	.1%	.0%	.1%	.0%
Mutoh Industries--NO OEM	1.4	.6	.6	3	.1%	.0%	.1%	.0%
Century Research Center	1.3	.7	.5	7	.0%	.0%	.1%	.0%
Kewill Systems	1.3	.4	.7	13	.0%	.0%	.1%	.0%
Framasoft	1.1	.0	.7	0	.0%	.0%	.1%	.0%
Computational Mechanics	.9	.0	.9	0	.0%	.0%	.2%	.0%
Whesoe Computing Systems	.8	.0	.8	0	.0%	.0%	.2%	.0%
Kubota Computer	.7	.5	.2	65	.0%	.0%	.0%	.2%
FECS	.7	.0	.6	0	.0%	.0%	.1%	.0%
Olivetti	.3	.3	.0	7	.0%	.0%	.0%	.0%
debis Systemhaus	.3	.1	.2	6	.0%	.0%	.0%	.0%
FEA Limited	.3	.1	.1	5	.0%	.0%	.0%	.0%
Solbourne	.2	.2	.0	16	.0%	.0%	.0%	.0%
Georgia Tech Research Corp.	.2	.0	.2	0	.0%	.0%	.0%	.0%
Engineering Systems Corp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
CADKEY	.1	.1	.0	2	.0%	.0%	.0%	.0%
A/E Microsystems	.0	.0	.0	2	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
Other Companies	263.0	249.9	.0	10,392	9.8%	15.0%	.0%	27.7%
All Companies	2,672.8	1,663.2	504.6	37,541	100.0%	100.0%	100.0%	100.0%
All U.S.-Based Companies	2,237.5	1,444.0	357.8	32,213	83.7%	86.8%	70.9%	85.8%
All Asian-Based Companies	315.2	202.5	66.1	4,916	11.8%	12.2%	13.1%	13.1%
All European-Based Companies	120.1	16.7	80.8	412	4.5%	1.0%	16.0%	1.1%
All Hardware Companies	745.6	606.6	.0	13,418	27.9%	36.5%	.0%	35.7%
All Turnkey & SW Companies	1,927.2	1,056.6	504.6	24,124	72.1%	63.5%	100.0%	64.3%

Source: Dataquest
 June 1991

TABLE NUMBER: 4
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Personal Computer
 REGION: Worldwide
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Compaq	150.6	150.6	.0	25,088	12.5%	18.5%	.0%	17.1%
Apple Computer	89.6	78.8	.0	17,220	7.4%	9.7%	.0%	11.7%
IBM	81.4	77.3	.0	18,194	6.7%	9.5%	.0%	12.4%
Autodesk	81.3	.0	81.3	0	6.7%	.0%	24.5%	.0%
Hewlett-Packard	71.2	57.0	.0	10,930	5.9%	7.0%	.0%	7.5%
Hitachi	53.1	25.5	22.3	1,103	4.4%	3.1%	6.7%	.8%
NEC	49.7	42.0	3.7	3,739	4.1%	5.2%	1.1%	2.5%
CADAM	43.2	26.3	14.4	3,750	3.6%	3.2%	4.3%	2.6%
Hakuto	40.5	27.9	12.5	1,202	3.3%	3.4%	3.8%	.8%
Mutoh Industries--NO OEM	27.1	15.0	10.7	978	2.2%	1.8%	3.2%	.7%
Investronica SA	27.0	21.6	2.7	1,080	2.2%	2.7%	.8%	.7%
Fujitsu	25.9	16.1	7.3	855	2.1%	2.0%	2.2%	.6%
Vero International Software	19.2	.0	17.5	0	1.6%	.0%	5.3%	.0%
Toshiba--NO OEM	18.0	9.0	7.2	1,282	1.5%	1.1%	2.2%	.9%
CADKEY	15.1	.9	14.2	145	1.2%	.1%	4.3%	.1%
Wiechers Datentechnik	14.6	11.7	2.9	414	1.2%	1.4%	.9%	.3%
Computervision	14.1	.6	13.2	130	1.2%	.1%	4.0%	.1%
Design Automation	10.2	.0	10.2	0	.8%	.0%	3.1%	.0%
Tebis	8.4	1.3	5.9	42	.7%	.2%	1.8%	.0%
Caditron	7.8	3.9	3.1	120	.6%	.5%	.9%	.1%
Andor	7.8	1.9	5.5	70	.6%	.2%	1.7%	.0%
Dell Computer	7.6	7.6	.0	1,907	.6%	.9%	.0%	1.3%
Ziegler	7.4	.0	7.4	0	.6%	.0%	2.2%	.0%
Research Machines	6.9	6.9	.0	1,056	.6%	.8%	.0%	.7%
Wacom	6.5	1.3	4.5	109	.5%	.2%	1.3%	.1%
DAT Standard Information system	6.4	.0	6.1	0	.5%	.0%	1.8%	.0%
CNC Software	6.0	.0	6.0	0	.5%	.0%	1.8%	.0%
Intergraph	5.1	.0	4.8	0	.4%	.0%	1.4%	.0%
Cimatron	4.8	2.1	2.1	141	.4%	.3%	.6%	.1%
Everex Systems	4.3	4.3	.0	1,385	.4%	.5%	.0%	.9%
Mitsubishi Electric	4.2	2.8	1.5	372	.3%	.3%	.4%	.3%
Moda CAD	4.2	1.0	2.9	35	.3%	.1%	.9%	.0%
Algor Interactive Systems	4.2	.0	3.7	0	.3%	.0%	1.1%	.0%

(Continued)

TABLE NUMBER: 4
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Personal Computer
 REGION: Worldwide
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
ADRA Systems	4.1	.0	3.7	0	.3%	.0%	1.1%	.0%
MCS	4.1	.0	3.7	0	.3%	.0%	1.1%	.0%
Pathtrace	4.1	1.1	2.7	58	.3%	.1%	.8%	.0%
Anilam Electronics	3.2	1.0	1.9	40	.3%	.1%	.6%	.0%
Intercad	3.1	1.6	.9	151	.3%	.2%	.3%	.1%
Serbi	2.9	.0	2.9	0	.2%	.0%	.9%	.0%
Whesoe Computing Systems	2.8	.0	2.8	0	.2%	.0%	.8%	.0%
Clarix	2.8	.0	2.8	0	.2%	.0%	.8%	.0%
Superdraft	2.7	1.3	1.3	147	.2%	.2%	.4%	.1%
Engineering Mechanics	2.6	.9	1.5	223	.2%	.1%	.5%	.2%
Olivetti	2.5	2.2	.0	429	.2%	.3%	.0%	.3%
PAFEC	2.4	.0	2.4	0	.2%	.0%	.7%	.0%
Swanson Analysis	2.4	.0	2.4	0	.2%	.0%	.7%	.0%
Sharp System Products--NO OEM	2.2	1.2	1.1	28	.2%	.1%	.3%	.0%
Aries Technology	2.2	.0	2.0	0	.2%	.0%	.6%	.0%
rottring euroCAD	2.1	1.2	.9	51	.2%	.1%	.3%	.0%
Micro Engineering Solutions	2.1	.6	1.4	31	.2%	.1%	.4%	.0%
American Small Business Comp.	2.1	.0	2.1	0	.2%	.0%	.6%	.0%
Micrografx	2.0	.0	2.0	0	.2%	.0%	.6%	.0%
Mitsui Engineering	1.8	1.3	.4	12	.1%	.2%	.1%	.0%
Robocom	1.6	.0	1.6	0	.1%	.0%	.5%	.0%
Hahn & Kolb	1.5	.9	.5	30	.1%	.1%	.1%	.0%
Foresight Resources	1.4	.0	1.3	0	.1%	.0%	.4%	.0%
Schlumberger	1.4	.4	.5	9	.1%	.0%	.2%	.0%
ISICAD	1.4	.0	1.4	0	.1%	.0%	.4%	.0%
FEA Limited	1.3	.3	.3	25	.1%	.0%	.1%	.0%
Evolution Computing	1.2	.0	1.2	0	.1%	.0%	.4%	.0%
Marcus Computer Systeme	1.0	.5	.3	31	.1%	.1%	.1%	.0%
Point Control	.9	.0	.9	0	.1%	.0%	.3%	.0%
Vision 3D	.9	.5	.2	6	.1%	.1%	.1%	.0%
S.T.L.D. s.r.l.	.8	.0	.8	0	.1%	.0%	.3%	.0%
CAMTEK	.8	.0	.6	0	.1%	.0%	.2%	.0%
Rasna Corporation	.8	.0	.8	0	.1%	.0%	.2%	.0%

(Continued)

TABLE NUMBER:

4

TITLE: 1990 Final Market Share Estimates

APPLICATION: Mechanical

PLATFORM: Personal Computer

REGION: Worldwide

UNITS: Millions of Dollars/Actual Units

Company	Total Hardware		Software		Wkstns Shipped	Total Hardware		Software		Market Share	
	Revenue	Revenue	Revenue	Revenue		Revenue	Revenue	Revenue	Revenue	Revenue	Wkstns Shipped
Aura CAD/CAM Systems	.7	.0	.6	.6	0	.1%	.0%	.2%	.0%	.0%	.0%
Innovative Data Design	.7	.0	.7	.7	0	.1%	.0%	.2%	.0%	.0%	.0%
A.I. Systems	.7	.0	.7	.7	0	.1%	.0%	.2%	.0%	.0%	.0%
ACERI SA	.6	.1	.3	.3	3	.0%	.0%	.1%	.0%	.0%	.0%
GRAPHISOFT	.6	.0	.6	.6	0	.0%	.0%	.2%	.0%	.0%	.0%
Machinery Sales	.6	.0	.6	.6	0	.0%	.0%	.2%	.0%	.0%	.0%
Premise	.5	.0	.5	.5	0	.0%	.0%	.2%	.0%	.0%	.0%
Caroline Informatique	.5	.1	.3	.3	5	.0%	.0%	.1%	.0%	.0%	.0%
Engineering Software	.5	.0	.4	.4	13	.0%	.0%	.1%	.0%	.0%	.0%
CAD Lab	.4	.0	.4	.4	0	.0%	.0%	.1%	.0%	.0%	.0%
Cadtronic	.4	.2	.2	.2	13	.0%	.0%	.1%	.0%	.0%	.0%
Cascade Graphics	.4	.0	.4	.4	0	.0%	.0%	.1%	.0%	.0%	.0%
Norsk Data	.4	.2	.1	.1	7	.0%	.0%	.0%	.0%	.0%	.0%
MacNeal-Schwendler	.4	.0	.4	.4	0	.0%	.0%	.1%	.0%	.0%	.0%
Uniras	.4	.0	.4	.4	0	.0%	.0%	.1%	.0%	.0%	.0%
Ithaca Software	.4	.0	.4	.4	0	.0%	.0%	.1%	.0%	.0%	.0%
Pelton Engineering	.4	.0	.4	.4	0	.0%	.0%	.1%	.0%	.0%	.0%
Ashlar	.3	.0	.3	.3	0	.0%	.0%	.1%	.0%	.0%	.0%
debis Systemhaus	.3	.1	.2	.2	20	.0%	.0%	.1%	.0%	.0%	.0%
Mc2 Engineering Software	.3	.0	.3	.3	0	.0%	.0%	.1%	.0%	.0%	.0%
Synthesis	.3	.0	.3	.3	0	.0%	.0%	.1%	.0%	.0%	.0%
Engineering Systems Corp.	.3	.0	.2	.2	0	.0%	.0%	.1%	.0%	.0%	.0%
Mega CADD	.2	.0	.2	.2	0	.0%	.0%	.1%	.0%	.0%	.0%
ESDU International	.2	.0	.2	.2	0	.0%	.0%	.1%	.0%	.0%	.0%
CAD-Capture	.2	.0	.0	.0	0	.0%	.0%	.0%	.0%	.0%	.0%
Accugraph	.1	.0	.1	.1	0	.0%	.0%	.0%	.0%	.0%	.0%
Comshoppe	.1	.0	.1	.1	0	.0%	.0%	.0%	.0%	.0%	.0%
IGC Technology	.1	.0	.1	.1	0	.0%	.0%	.0%	.0%	.0%	.0%
Imagine That	.1	.0	.1	.1	0	.0%	.0%	.0%	.0%	.0%	.0%
Lamp Software	.1	.0	.0	.0	3	.0%	.0%	.0%	.0%	.0%	.0%
Radan Computational	.1	.0	.0	.0	4	.0%	.0%	.0%	.0%	.0%	.0%

(Continued)

TABLE NUMBER: 4 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Personal Computer
 REGION: Worldwide
 UNITS: Millions of Dollars/Actual Units

Company =====					----- Market Share -----			
	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====
Masta Corporation	.1	.0	.0	1	.0%	.0%	.0%	.0%
Number One Systems	.0	.0	.0	1	.0%	.0%	.0%	.0%
A/E Microsystems	.0	.0	.0	2	.0%	.0%	.0%	.0%
Other Companies	204.8	204.8	.0	53,949	17.0%	25.2%	.0%	36.8%
All Companies	1,208.3	813.9	332.2	146,636	100.0%	100.0%	100.0%	100.0%
All U.S.-Based Companies	821.9	611.2	175.5	133,010	68.0%	75.1%	52.8%	90.7%
All Asian-Based Companies	246.9	144.0	86.8	9,749	20.4%	17.7%	26.1%	6.6%
All European-Based Companies	139.5	58.7	69.9	3,877	11.5%	7.2%	21.0%	2.6%
All Hardware Companies	638.3	608.9	.0	132,851	52.8%	74.8%	.0%	90.6%
All Turnkey & SW Companies	570.0	205.0	332.2	13,785	47.2%	25.2%	100.0%	9.4%

Source: Dataquest
 June 1991

TABLE NUMBER: 5
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: North America
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
IBM	384.4	239.5	78.9	10,264	17.2%	18.4%	14.6%	11.2%
Digital	233.0	170.1	.0	1,610	10.4%	13.1%	.0%	1.8%
Computervision	189.1	48.8	50.7	1,244	8.5%	3.8%	9.4%	1.4%
McDonnell Douglas	143.3	74.1	46.3	1,733	6.4%	5.7%	8.6%	1.9%
Hewlett-Packard	133.7	99.3	11.5	8,275	6.0%	7.6%	2.1%	9.1%
Sun	109.4	94.6	.0	5,693	4.9%	7.3%	.0%	6.2%
Intergraph	87.9	47.0	17.5	915	3.9%	3.6%	3.2%	1.0%
Compaq	70.8	70.8	.0	11,791	3.2%	5.4%	.0%	12.9%
Control Data	67.3	37.2	9.2	864	3.0%	2.9%	1.7%	.9%
Schlumberger	56.3	20.0	20.6	590	2.5%	1.5%	3.8%	.6%
Apple Computer	54.6	48.1	.0	10,504	2.4%	3.7%	.0%	11.5%
Silicon Graphics	49.0	43.1	.0	1,319	2.2%	3.3%	.0%	1.4%
Autodesk	47.9	.0	47.9	0	2.1%	.0%	8.9%	.0%
SDRC	33.0	.0	33.0	0	1.5%	.0%	6.1%	.0%
MacNeal-Schwendler	26.2	.0	25.1	0	1.2%	.0%	4.7%	.0%
Unisys	23.2	11.8	8.1	354	1.0%	.9%	1.5%	.4%
Auto-Trol	21.5	8.6	7.5	253	1.0%	.7%	1.4%	.3%
PDA Engineering	18.5	.0	18.5	0	.8%	.0%	3.4%	.0%
CADAM	18.0	7.9	8.7	1,125	.8%	.6%	1.6%	1.2%
Cimlinc	17.7	3.5	10.6	338	.8%	.3%	2.0%	.4%
Gerber Systems	16.2	8.0	5.4	210	.7%	.6%	1.0%	.2%
MCS	15.9	.0	14.1	0	.7%	.0%	2.6%	.0%
Parametric Technology	15.9	.0	14.6	0	.7%	.0%	2.7%	.0%
Swanson Analysis	15.3	.0	15.3	0	.7%	.0%	2.8%	.0%
Alias Research	14.8	.0	14.8	0	.7%	.0%	2.7%	.0%
CADKEY	13.0	.0	13.0	0	.6%	.0%	2.4%	.0%
ADRA Systems	11.7	4.1	6.5	208	.5%	.3%	1.2%	.2%
Cisigraph	10.4	3.6	3.6	96	.5%	.3%	.7%	.1%
Matra Datavision	10.3	4.7	4.1	113	.5%	.4%	.8%	.1%
Aries Technology	8.8	.0	7.9	0	.4%	.0%	1.5%	.0%
ICAD	7.9	.0	6.3	0	.4%	.0%	1.2%	.0%
Dell Computer	6.5	6.5	.0	1,621	.3%	.5%	.0%	1.8%
Everex Systems	4.2	4.2	.0	1,288	.2%	.3%	.0%	1.4%

(Continued)

TABLE NUMBER: 5
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: North America
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
CNC Software	3.6	.0	3.6	0	.2%	.0%	.7%	.0%
Algor Interactive Systems	3.5	.0	3.1	0	.2%	.0%	.6%	.0%
Engineering Mechanics	3.2	1.1	1.8	250	.1%	.1%	.3%	.3%
Mechanical Dynamics	3.0	.0	2.7	0	.1%	.0%	.5%	.0%
Micro Engineering Solutions	2.8	.8	1.8	35	.1%	.1%	.3%	.0%
Moda CAD	2.7	.7	1.9	22	.1%	.1%	.3%	.0%
Mentor Graphics	2.6	.7	1.1	25	.1%	.1%	.2%	.0%
Cimatron	2.4	1.1	1.1	71	.1%	.1%	.2%	.1%
Wisdom Systems	2.3	.0	1.7	0	.1%	.0%	.3%	.0%
American Small Business Comp.	1.8	.0	1.8	0	.1%	.0%	.3%	.0%
MARC	1.8	.0	1.8	0	.1%	.0%	.3%	.0%
Ontologic	1.8	.0	1.8	0	.1%	.0%	.3%	.0%
Claris	1.8	.0	1.8	0	.1%	.0%	.3%	.0%
Micrografx	1.3	.0	1.3	0	.1%	.0%	.2%	.0%
Delcam International	1.3	.5	.7	22	.1%	.0%	.1%	.0%
Accugraph	1.2	.5	.6	32	.1%	.0%	.1%	.0%
Investronica SA	1.1	.9	.1	43	.0%	.1%	.0%	.0%
Evolution Computing	1.1	.0	1.1	0	.0%	.0%	.2%	.0%
Foresight Resources	1.0	.0	.9	0	.0%	.0%	.2%	.0%
Pathtrace	.8	.2	.5	10	.0%	.0%	.1%	.0%
Computational Mechanics	.7	.0	.7	0	.0%	.0%	.1%	.0%
Innovative Data Design	.6	.0	.6	0	.0%	.0%	.1%	.0%
Point Control	.6	.0	.6	0	.0%	.0%	.1%	.0%
Aura CAD/CAM Systems	.6	.0	.5	0	.0%	.0%	.1%	.0%
A.I. Systems	.6	.0	.6	0	.0%	.0%	.1%	.0%
GRAPHISOFT	.6	.0	.6	0	.0%	.0%	.1%	.0%
Machinery Sales	.6	.0	.6	0	.0%	.0%	.1%	.0%
Engineering Software	.5	.0	.4	13	.0%	.0%	.1%	.0%
Premise	.4	.0	.4	0	.0%	.0%	.1%	.0%
Object Design	.4	.0	.4	0	.0%	.0%	.1%	.0%
Objectivity	.4	.0	.4	0	.0%	.0%	.1%	.0%
Uniras	.4	.0	.4	0	.0%	.0%	.1%	.0%

(Continued)

TABLE NUMBER: 5 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: North America
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Pelton Engineering	.4	.0	.4	0	.0%	.0%	.1%	.0%
Ashlar	.3	.0	.3	0	.0%	.0%	.1%	.0%
Ithaca Software	.3	.0	.3	0	.0%	.0%	.1%	.0%
Solbourne	.3	.3	.0	24	.0%	.0%	.0%	.0%
Cascade Graphics	.3	.0	.3	0	.0%	.0%	.1%	.0%
A/E Microsystems	.3	.2	.0	25	.0%	.0%	.0%	.0%
Engineering Systems Corp.	.3	.0	.2	0	.0%	.0%	.0%	.0%
FEGS	.3	.0	.2	0	.0%	.0%	.0%	.0%
Rasna Corporation	.3	.0	.3	0	.0%	.0%	.0%	.0%
Georgia Tech Research Corp.	.3	.0	.3	0	.0%	.0%	.0%	.0%
Mc2 Engineering Software	.2	.0	.2	0	.0%	.0%	.0%	.0%
Mega CADD	.2	.0	.2	0	.0%	.0%	.0%	.0%
Synthesis	.1	.0	.1	0	.0%	.0%	.0%	.0%
Vision 3D	.1	.0	.0	0	.0%	.0%	.0%	.0%
Technische Computer Systeme	.1	.0	.1	3	.0%	.0%	.0%	.0%
IGC Technology	.1	.0	.1	0	.0%	.0%	.0%	.0%
Comshoppe	.1	.0	.1	0	.0%	.0%	.0%	.0%
Imagine That	.1	.0	.1	0	.0%	.0%	.0%	.0%
Zuken	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	243.7	236.1	.0	30,262	10.9%	18.2%	.0%	33.2%
All Companies	2,230.3	1,298.4	539.9	91,246	100.0%	100.0%	100.0%	100.0%
All U.S.-Based Companies	2,181.9	1,287.5	510.9	90,888	97.8%	99.2%	94.6%	99.6%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	48.4	11.0	28.9	358	2.2%	.8%	5.4%	.4%
All Hardware Companies	896.3	779.3	.0	77,816	40.2%	60.0%	.0%	85.3%
All Turnkey & SW Companies	1,334.1	519.1	539.9	13,430	59.8%	40.0%	100.0%	14.7%

Source: Dataquest
 June 1991

TABLE NUMBER: 6
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Technical Workstation
 REGION: North America
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Computervision	164.0	43.8	39.9	1,059	16.9%	9.4%	13.6%	5.7%
McDonnell Douglas	116.1	60.2	37.3	1,315	11.9%	12.9%	12.8%	7.1%
Hewlett-Packard	106.2	77.1	11.5	4,317	10.9%	16.5%	3.9%	23.2%
Sun	76.6	67.4	.0	4,410	7.9%	14.4%	.0%	23.7%
Intergraph	72.0	40.4	13.0	797	7.4%	8.6%	4.4%	4.3%
Digital	48.3	35.2	.0	1,610	5.0%	7.5%	.0%	8.6%
Silicon Graphics	48.1	42.3	.0	1,299	4.9%	9.0%	.0%	7.0%
IBM	39.6	24.0	8.4	999	4.1%	5.1%	2.9%	5.4%
Schlumberger	39.4	13.5	14.8	336	4.1%	2.9%	5.1%	1.8%
SDRC	28.7	.0	28.7	0	3.0%	.0%	9.8%	.0%
Control Data	27.3	18.6	4.6	644	2.8%	4.0%	1.6%	3.5%
Auto-Trol	21.5	8.6	7.5	253	2.2%	1.8%	2.6%	1.4%
Unisys	17.9	9.1	6.3	279	1.8%	1.9%	2.1%	1.5%
Cimline	17.7	3.5	10.6	338	1.8%	.8%	3.6%	1.8%
Gerber Systems	16.2	8.0	5.4	210	1.7%	1.7%	1.8%	1.1%
Parametric Technology	15.9	.0	14.6	0	1.6%	.0%	5.0%	.0%
Alias Research	14.8	.0	14.8	0	1.5%	.0%	5.1%	.0%
PDA Engineering	12.4	.0	12.4	0	1.3%	.0%	4.2%	.0%
Matra Datavision	10.3	4.7	4.1	113	1.1%	1.0%	1.4%	.6%
Cisigraph	9.3	3.3	3.3	75	1.0%	.7%	1.1%	.4%
ADRA Systems	9.0	4.1	4.1	208	.9%	.9%	1.4%	1.1%
ICAD	7.9	.0	6.3	0	.8%	.0%	2.2%	.0%
MCS	7.3	.0	6.5	0	.8%	.0%	2.2%	.0%
Swanson Analysis	7.2	.0	7.2	0	.7%	.0%	2.5%	.0%
Aries Technology	7.0	.0	6.3	0	.7%	.0%	2.2%	.0%
MacNeal-Schwendler	5.2	.0	5.0	0	.5%	.0%	1.7%	.0%
Autodesk	4.8	.0	4.8	0	.5%	.0%	1.6%	.0%
Mentor Graphics	2.6	.7	1.1	25	.3%	.2%	.4%	.1%
CADAM	2.5	.0	2.2	0	.3%	.0%	.7%	.0%
Wisdom Systems	2.3	.0	1.7	0	.2%	.0%	.6%	.0%
Mechanical Dynamics	2.1	.0	1.9	0	.2%	.0%	.6%	.0%
Engineering Mechanics	1.8	.6	1.0	139	.2%	.1%	.4%	.7%

(Continued)

TABLE NUMBER: 6 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Technical Workstation
 REGION: North America
 UNITS: Millions of Dollars/Actual Units

Company =====					----- Market Share -----			
	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====
Ontologic	1.8	.0	1.8	0	.2%	.0%	.6%	.0%
Cimatron	1.7	.8	.8	50	.2%	.2%	.3%	.3%
Delcam International	1.3	.5	.7	22	.1%	.1%	.2%	.1%
Micro Engineering Solutions	1.1	.3	.7	10	.1%	.1%	.2%	.1%
Accugraph	1.1	.5	.5	30	.1%	.1%	.2%	.2%
MARC	.9	.0	.9	0	.1%	.0%	.3%	.0%
Object Design	.4	.0	.4	0	.0%	.0%	.1%	.0%
Objectivity	.4	.0	.4	0	.0%	.0%	.1%	.0%
Everex Systems	.3	.3	.0	41	.0%	.1%	.0%	.2%
A/E Microsystems	.2	.2	.0	21	.0%	.0%	.0%	.1%
Computational Mechanics	.2	.0	.2	0	.0%	.0%	.1%	.0%
Solbourne	.2	.2	.0	15	.0%	.0%	.0%	.1%
Ithaca Software	.2	.0	.2	0	.0%	.0%	.1%	.0%
FECS	.1	.0	.1	0	.0%	.0%	.0%	.0%
Algor Interactive Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
Technische Computer Systeme	.1	.0	.1	3	.0%	.0%	.0%	.0%
Georgia Tech Research Corp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
Point Control	.1	.0	.1	0	.0%	.0%	.0%	.0%
Zuken	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	972.2	467.7	292.2	18,618	100.0%	100.0%	100.0%	100.0%
All U.S.-Based Companies	942.3	458.6	277.2	18,356	96.9%	98.0%	94.9%	98.6%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	29.8	9.1	14.9	262	3.1%	2.0%	5.1%	1.4%
All Hardware Companies	229.7	192.7	.0	10,491	23.6%	41.2%	.0%	56.3%
All Turnkey & SW Companies	742.6	275.0	292.2	8,128	76.4%	58.8%	100.0%	43.7%

Source: Dataquest
 June 1991

TABLE NUMBER: 7
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Host/Server
 REGION: North America
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
IBM	320.4	192.3	70.5	3,807	37.1%	34.7%	48.8%	30.6%
Digital	184.8	134.9	.0	0	21.4%	24.3%	.0%	.0%
Control Data	40.0	18.7	4.6	219	4.6%	3.4%	3.1%	1.8%
Sun	32.8	27.2	.0	1,283	3.8%	4.9%	.0%	10.3%
McDonnell Douglas	27.2	13.9	9.0	419	3.2%	2.5%	6.2%	3.4%
MacNeal-Schwendler	20.7	.0	19.8	0	2.4%	.0%	13.7%	.0%
Computervision	18.2	4.7	4.4	117	2.1%	.8%	3.0%	.9%
Schlumberger	16.3	6.4	5.6	250	1.9%	1.1%	3.8%	2.0%
Intergraph	13.2	6.6	2.1	118	1.5%	1.2%	1.5%	.9%
Swanson Analysis	6.6	.0	6.6	0	.8%	.0%	4.6%	.0%
PDA Engineering	6.1	.0	6.1	0	.7%	.0%	4.2%	.0%
MCS	5.4	.0	4.7	0	.6%	.0%	3.3%	.0%
Unisys	5.3	2.7	1.9	75	.6%	.5%	1.3%	.6%
SDRC	4.3	.0	4.3	0	.5%	.0%	3.0%	.0%
Hewlett-Packard	2.6	2.2	.0	133	.3%	.4%	.0%	1.1%
CADAM	2.5	.0	2.2	0	.3%	.0%	1.5%	.0%
Cisigraph	1.0	.4	.3	21	.1%	.1%	.2%	.2%
Silicon Graphics	1.0	.8	.0	20	.1%	.1%	.0%	.2%
MARC	.9	.0	.9	0	.1%	.0%	.6%	.0%
Mechanical Dynamics	.9	.0	.8	0	.1%	.0%	.6%	.0%
Computational Mechanics	.5	.0	.5	0	.1%	.0%	.3%	.0%
Georgia Tech Research Corp.	.2	.0	.2	0	.0%	.0%	.1%	.0%
FEQS	.1	.0	.1	0	.0%	.0%	.1%	.0%
Solbourne	.1	.1	.0	9	.0%	.0%	.0%	.1%
Engineering Systems Corp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
A/E Microsystems	.0	.0	.0	2	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%

(Continued)

TABLE NUMBER: 7 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Host/Server
 REGION: North America
 UNITS: Millions of Dollars/Actual Units

Company *****					----- Market Share -----			
	Total Revenue *****	Hardware Revenue *****	Software Revenue *****	Wkstns Shipped *****	Total Revenue *****	Hardware Revenue *****	Software Revenue *****	Wkstns Shipped *****
Other Companies	151.5	143.9	.0	5,985	17.6%	25.9%	.0%	48.0%
All Companies	862.8	554.8	144.5	12,459	100.0%	100.0%	100.0%	100.0%
All U.S.-Based Companies	847.0	554.4	131.5	12,438	98.2%	99.9%	91.0%	99.8%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	15.9	.4	13.0	21	1.8%	.1%	9.0%	.2%
All Hardware Companies	381.5	314.2	.0	7,477	44.2%	56.6%	.0%	60.0%
All Turnkey & SW Companies	481.4	240.6	144.5	4,982	55.8%	43.4%	100.0%	40.0%

Source: Dataquest
 June 1991

TABLE NUMBER: 8
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Personal Computer
 REGION: North America
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Compaq	70.8	70.8	.0	11,791	17.9%	25.6%	.0%	19.6%
Apple Computer	54.6	48.1	.0	10,504	13.8%	17.4%	.0%	17.5%
Autodesk	43.1	.0	43.1	0	10.9%	.0%	41.8%	.0%
Hewlett-Packard	24.9	20.0	.0	3,825	6.3%	7.2%	.0%	6.4%
IBM	24.4	23.2	.0	5,458	6.2%	8.4%	.0%	9.1%
CADAM	13.0	7.9	4.3	1,125	3.3%	2.9%	4.2%	1.9%
CADKEY	13.0	.0	13.0	0	3.3%	.0%	12.6%	.0%
Computervision	6.9	.3	6.4	69	1.7%	.1%	6.2%	.1%
Dell Computer	6.5	6.5	.0	1,621	1.6%	2.3%	.0%	2.7%
Everex Systems	3.9	3.9	.0	1,246	1.0%	1.4%	.0%	2.1%
CNC Software	3.6	.0	3.6	0	.9%	.0%	3.5%	.0%
Algor Interactive Systems	3.4	.0	3.0	0	.9%	.0%	2.9%	.0%
MCS	3.2	.0	2.8	0	.8%	.0%	2.8%	.0%
ADRA Systems	2.7	.0	2.4	0	.7%	.0%	2.3%	.0%
Moda CAD	2.7	.7	1.9	22	.7%	.2%	1.8%	.0%
Intergraph	2.6	.0	2.5	0	.7%	.0%	2.4%	.0%
American Small Business Comp.	1.8	.0	1.8	0	.5%	.0%	1.8%	.0%
Claris	1.8	.0	1.8	0	.5%	.0%	1.7%	.0%
Aries Technology	1.8	.0	1.6	0	.4%	.0%	1.5%	.0%
Micro Engineering Solutions	1.7	.5	1.1	25	.4%	.2%	1.0%	.0%
Swanson Analysis	1.5	.0	1.5	0	.4%	.0%	1.4%	.0%
Micrografx	1.3	.0	1.3	0	.3%	.0%	1.3%	.0%
Engineering Mechanics	1.3	.5	.8	111	.3%	.2%	.7%	.2%
Investronica SA	1.1	.9	.1	43	.3%	.3%	.1%	.1%
Evolution Computing	1.1	.0	1.1	0	.3%	.0%	1.0%	.0%
Foresight Resources	1.0	.0	.9	0	.2%	.0%	.8%	.0%
Pathtrace	.8	.2	.5	10	.2%	.1%	.5%	.0%
Cimatron	.7	.3	.3	21	.2%	.1%	.3%	.0%
Innovative Data Design	.6	.0	.6	0	.2%	.0%	.6%	.0%
Aura CAD/CAM Systems	.6	.0	.5	0	.1%	.0%	.5%	.0%
Schlumberger	.6	.2	.2	4	.1%	.1%	.2%	.0%
A.I. Systems	.6	.0	.6	0	.1%	.0%	.5%	.0%
GRAPHISOFT	.6	.0	.6	0	.1%	.0%	.5%	.0%

(Continued)

TABLE NUMBER: 8
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Personal Computer
 REGION: North America
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Machinery Sales	.6	.0	.6	0	.1%	.0%	.5%	.0%
Point Control	.5	.0	.5	0	.1%	.0%	.5%	.0%
Engineering Software	.5	.0	.4	13	.1%	.0%	.4%	.0%
Premise	.4	.0	.4	0	.1%	.0%	.4%	.0%
Uniras	.4	.0	.4	0	.1%	.0%	.3%	.0%
Pelton Engineering	.4	.0	.4	0	.1%	.0%	.3%	.0%
Ashlar	.3	.0	.3	0	.1%	.0%	.3%	.0%
Cascade Graphics	.3	.0	.3	0	.1%	.0%	.3%	.0%
MacNeal-Schwendler	.3	.0	.3	0	.1%	.0%	.2%	.0%
Rasna Corporation	.3	.0	.3	0	.1%	.0%	.3%	.0%
Mc2 Engineering Software	.2	.0	.2	0	.1%	.0%	.2%	.0%
Engineering Systems Corp.	.2	.0	.2	0	.1%	.0%	.2%	.0%
Ithaca Software	.2	.0	.2	0	.0%	.0%	.2%	.0%
Mega CADD	.2	.0	.2	0	.0%	.0%	.2%	.0%
Synthesis	.1	.0	.1	0	.0%	.0%	.1%	.0%
Accugraph	.1	.0	.1	0	.0%	.0%	.1%	.0%
Vision 3D	.1	.0	.0	0	.0%	.0%	.0%	.0%
IGC Technology	.1	.0	.1	0	.0%	.0%	.1%	.0%
Comshoppe	.1	.0	.1	0	.0%	.0%	.1%	.0%
Imagine That	.1	.0	.1	0	.0%	.0%	.1%	.0%
A/E Microsystems	.0	.0	.0	2	.0%	.0%	.0%	.0%

(Continued)

TABLE NUMBER: 8 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Personal Computer
 REGION: North America
 UNITS: Millions of Dollars/Actual Units

Company =====					----- Market Share -----			
	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====
Other Companies	92.2	92.2	.0	24,277	23.3%	33.4%	.0%	40.3%
All Companies	395.3	275.9	103.2	60,169	100.0%	100.0%	100.0%	100.0%
All U.S.-Based Companies	392.6	274.5	102.2	60,094	99.3%	99.5%	99.1%	99.9%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	2.7	1.4	1.0	75	.7%	.5%	.9%	.1%
All Hardware Companies	285.2	272.4	.0	59,848	72.1%	98.7%	.0%	99.5%
All Turnkey & SW Companies	110.1	3.5	103.2	321	27.9%	1.3%	100.0%	.5%

Source: Dataquest
 June 1991

TABLE NUMBER: 9
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: Europe
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
IBM	515.3	321.1	105.7	14,326	17.9%	20.2%	14.1%	16.5%
Computervision	505.8	214.8	126.0	5,208	17.5%	13.5%	16.8%	6.0%
Hewlett-Packard	263.4	186.0	32.2	13,286	9.1%	11.7%	4.3%	15.3%
Digital	194.2	141.8	.0	1,342	6.7%	8.9%	.0%	1.5%
McDonnell Douglas	87.7	45.1	33.9	1,331	3.0%	2.8%	4.5%	1.5%
Control Data	85.9	47.5	11.7	1,103	3.0%	3.0%	1.6%	1.3%
Schlumberger	77.8	27.7	28.5	816	2.7%	1.7%	3.8%	.9%
Sun	70.9	61.3	.0	2,879	2.5%	3.9%	.0%	3.3%
Compaq	70.8	70.8	.0	11,791	2.5%	4.5%	.0%	13.6%
Matra Datavision	68.1	30.7	27.3	743	2.4%	1.9%	3.6%	.9%
Intergraph	62.6	33.5	12.5	652	2.2%	2.1%	1.7%	.8%
Siemens	52.4	26.2	18.4	696	1.8%	1.7%	2.4%	.8%
Norsk Data	38.0	19.2	6.6	372	1.3%	1.2%	.9%	.4%
Silicon Graphics	31.7	27.9	.0	710	1.1%	1.8%	.0%	.8%
Cisgraph	31.1	10.9	10.8	288	1.1%	.7%	1.4%	.3%
Autodesk	30.7	.0	30.7	0	1.1%	.0%	4.1%	.0%
STI-Straessle	28.8	6.6	15.8	269	1.0%	.4%	2.1%	.3%
Investronica SA	25.5	20.4	2.6	1,018	.9%	1.3%	.3%	1.2%
Apple Computer	24.2	21.3	.0	4,649	.8%	1.3%	.0%	5.4%
SDRC	24.1	.0	24.1	0	.8%	.0%	3.2%	.0%
Ferranti	21.8	8.1	10.0	201	.8%	.5%	1.3%	.2%
Wiechers Datentechnik	20.3	16.2	4.1	494	.7%	1.0%	.5%	.6%
Vero International Software	18.2	.0	16.6	0	.6%	.0%	2.2%	.0%
PAFEC	15.8	.0	15.8	0	.5%	.0%	2.1%	.0%
MacNeal-Schwendler	15.8	.0	15.1	0	.5%	.0%	2.0%	.0%
Mannesmann PROCAD	15.7	8.0	4.4	218	.5%	.5%	.6%	.3%
Hahn & Kolb	15.4	9.3	4.6	220	.5%	.6%	.6%	.3%
ISICAD	15.4	7.3	5.6	143	.5%	.5%	.7%	.2%
ISYKON Software	15.4	7.7	5.4	220	.5%	.5%	.7%	.3%
Delcam International	13.1	4.6	6.6	218	.5%	.3%	.9%	.3%
Kewill Systems	12.5	3.8	6.9	250	.4%	.2%	.9%	.3%
Gerber Systems	12.4	6.1	4.1	178	.4%	.4%	.5%	.2%
Exapt	12.3	6.0	4.2	211	.4%	.4%	.6%	.2%

(Continued)

TABLE NUMBER: 9
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: Europe
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
CADAM	12.0	5.3	5.8	750	.4%	.3%	.8%	.9%
Cimatron	11.6	5.2	5.2	344	.4%	.3%	.7%	.4%
CAD Lab	11.5	.0	9.2	0	.4%	.0%	1.2%	.0%
ItalCad	10.8	5.1	2.6	101	.4%	.3%	.3%	.1%
Cimlinc	10.3	2.1	6.2	197	.4%	.1%	.8%	.2%
Fides Industrielle Automation	10.0	1.2	9.0	75	.3%	.1%	1.2%	.1%
Unisys	9.9	5.0	3.5	151	.3%	.3%	.5%	.2%
PDA Engineering	8.8	.0	8.8	0	.3%	.0%	1.2%	.0%
ICL	8.7	5.1	3.0	239	.3%	.3%	.4%	.3%
Framasoft	8.4	.0	5.1	0	.3%	.0%	.7%	.0%
Tebis	8.4	1.3	5.9	42	.3%	.1%	.8%	.0%
Auto-Trol	8.4	3.4	2.9	99	.3%	.2%	.4%	.1%
Caditron	7.8	3.9	3.1	120	.3%	.2%	.4%	.1%
Radan Computational	7.5	2.6	3.8	255	.3%	.2%	.5%	.3%
Albert Nestler	7.4	2.4	3.2	95	.3%	.2%	.4%	.1%
Ziegler	7.4	.0	7.4	0	.3%	.0%	1.0%	.0%
Research Machines	6.9	6.9	.0	1,056	.2%	.4%	.0%	1.2%
Swanson Analysis	6.5	.0	6.5	0	.2%	.0%	.9%	.0%
DAT Standard Information system	6.4	.0	6.1	0	.2%	.0%	.8%	.0%
Alias Research	5.7	.0	5.7	0	.2%	.0%	.8%	.0%
rotring euroCAD	5.5	3.4	2.0	147	.2%	.2%	.3%	.2%
Technische Computer Systeme	5.4	1.1	4.3	137	.2%	.1%	.6%	.2%
Parametric Technology	5.3	.0	4.9	0	.2%	.0%	.6%	.0%
Marcus Computer Systeme	4.4	2.3	1.5	137	.2%	.1%	.2%	.2%
MCS	3.3	.0	2.9	0	.1%	.0%	.4%	.0%
Pathtrace	3.3	.9	2.2	46	.1%	.1%	.3%	.1%
Intercad	3.1	1.6	.9	151	.1%	.1%	.1%	.2%
Serbi	3.1	.0	3.1	0	.1%	.0%	.4%	.0%
Whesoe Computing Systems	3.1	.0	3.1	0	.1%	.0%	.4%	.0%
XAO Industrie	3.0	1.1	1.8	108	.1%	.1%	.2%	.1%
Olivetti	2.9	2.4	.0	436	.1%	.2%	.0%	.5%
MARC	2.7	.0	2.7	0	.1%	.0%	.4%	.0%
debis Systemhaus	2.6	.7	1.5	90	.1%	.0%	.2%	.1%

(Continued)

TABLE NUMBER: 9.
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: Europe
 UNITS: Millions of Dollars/Actual Units

Company					Market Share			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
CAMTEK	2.5	.0	2.1	0	.1%	.0%	.3%	.0%
FEA Limited	2.5	.6	.6	48	.1%	.0%	.1%	.1%
ADRA Systems	2.5	.9	1.4	45	.1%	.1%	.2%	.1%
Caroline Informatique	2.3	.5	1.6	30	.1%	.0%	.2%	.0%
Superdraft	2.3	1.1	1.1	123	.1%	.1%	.2%	.1%
Anilam Electronics	2.2	.7	1.3	28	.1%	.0%	.2%	.0%
Catalpa	2.2	.8	1.1	18	.1%	.0%	.1%	.0%
ICAD	2.1	.0	1.7	0	.1%	.0%	.2%	.0%
ISKA	2.0	.9	.8	37	.1%	.1%	.1%	.0%
Robocom	1.6	.0	1.6	0	.1%	.0%	.2%	.0%
CADKEY	1.5	1.0	.5	150	.1%	.1%	.1%	.2%
CAD Centre	1.5	.0	.8	0	.1%	.0%	.1%	.0%
CNC Software	1.2	.0	1.2	0	.0%	.0%	.2%	.0%
Mentor Graphics	1.2	.4	.5	12	.0%	.0%	.1%	.0%
Dell Computer	1.1	1.1	.0	286	.0%	.1%	.0%	.3%
FECS	1.1	.0	.9	0	.0%	.0%	.1%	.0%
Noda CAD	1.1	.3	.7	9	.0%	.0%	.1%	.0%
Mechanical Dynamics	1.0	.0	.9	0	.0%	.0%	.1%	.0%
Aries Technology	.9	.0	.8	0	.0%	.0%	.1%	.0%
S.T.L.D. s.r.l.	.8	.0	.8	0	.0%	.0%	.1%	.0%
Vision 3D	.7	.4	.2	6	.0%	.0%	.0%	.0%
Micrografx	.7	.0	.7	0	.0%	.0%	.1%	.0%
Computational Mechanics	.7	.0	.7	0	.0%	.0%	.1%	.0%
Algor Interactive Systems	.7	.0	.6	0	.0%	.0%	.1%	.0%
ACERI SA	.6	.1	.3	3	.0%	.0%	.0%	.0%
Mutoh Industries--NO OEM	.5	.2	.2	11	.0%	.0%	.0%	.0%
Wisdom Systems	.5	.0	.3	0	.0%	.0%	.0%	.0%
Cadtronic	.4	.2	.2	13	.0%	.0%	.0%	.0%
Foresight Resources	.4	.0	.4	0	.0%	.0%	.1%	.0%
Everex Systems	.4	.4	.0	114	.0%	.0%	.0%	.1%
Micro Engineering Solutions	.4	.1	.2	4	.0%	.0%	.0%	.0%
Spectrum Graphics	.3	.1	.2	3	.0%	.0%	.0%	.0%

(Continued)

TABLE NUMBER: 9
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: Europe
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Rasna Corporation	.3	.0	.3	0	.0%	.0%	.0%	.0%
Point Control	.2	.0	.2	0	.0%	.0%	.0%	.0%
Evolution Computing	.2	.0	.2	0	.0%	.0%	.0%	.0%
ESDU International	.2	.0	.2	0	.0%	.0%	.0%	.0%
CAD-Capture	.2	.0	.0	0	.0%	.0%	.0%	.0%
Synthesis	.2	.0	.2	0	.0%	.0%	.0%	.0%
American Small Business Comp.	.1	.0	.1	0	.0%	.0%	.0%	.0%
DAPCO	.1	.0	.1	0	.0%	.0%	.0%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.1	1	.0%	.0%	.0%	.0%
A.I. Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
Ontologic	.1	.0	.1	0	.0%	.0%	.0%	.0%
Solbourne	.1	.1	.0	7	.0%	.0%	.0%	.0%
Lamp Software	.1	.0	.1	4	.0%	.0%	.0%	.0%
Cascade Graphics	.1	.0	.1	0	.0%	.0%	.0%	.0%
Accugraph	.1	.0	.0	2	.0%	.0%	.0%	.0%
Objectivity	.1	.0	.1	0	.0%	.0%	.0%	.0%
Mega CADD	.1	.0	.1	0	.0%	.0%	.0%	.0%
Premise	.1	.0	.1	0	.0%	.0%	.0%	.0%
Comshoppe	.0	.0	.0	0	.0%	.0%	.0%	.0%
Number One Systems	.0	.0	.0	1	.0%	.0%	.0%	.0%
Object Design	.0	.0	.0	0	.0%	.0%	.0%	.0%
Imagine That	.0	.0	.0	0	.0%	.0%	.0%	.0%
Zuken	.0	.0	.0	0	.0%	.0%	.0%	.0%

(Continued)

TABLE NUMBER: 9 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: Europe
 UNITS: Millions of Dollars/Actual Units

Company =====					----- Market Share -----			
	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====
Other Companies	127.5	123.9	.0	17,145	4.4%	7.8%	.0%	19.8%
All Companies	2,885.0	1,586.1	750.3	86,707	100.0%	100.0%	100.0%	100.0%
All U.S.-Based Companies	2,243.6	1,355.7	438.1	77,383	77.8%	85.5%	58.4%	89.2%
All Asian-Based Companies	.5	.2	.2	11	.0%	.0%	.0%	.0%
All European-Based Companies	641.0	230.1	312.1	9,313	22.2%	14.5%	41.6%	10.7%
All Hardware Companies	687.6	588.6	.0	57,158	23.8%	37.1%	.0%	65.9%
All Turnkey & SW Companies	2,197.4	997.5	750.3	29,549	76.2%	62.9%	100.0%	34.1%

Source: Dataquest
 June 1991

TABLE NUMBER: 10
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Technical Workstation
 REGION: Europe
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
Computervision	444.4	190.7	107.5	3,561	28.3%	24.9%	23.0%	14.2%
Hewlett-Packard	221.6	152.4	32.2	7,142	14.1%	19.9%	6.9%	28.5%
McDonnell Douglas	73.6	37.9	28.4	851	4.7%	4.9%	6.1%	3.4%
Matra Datavision	68.1	30.7	27.3	743	4.3%	4.0%	5.8%	3.0%
Schlumberger	54.5	18.7	20.5	465	3.5%	2.4%	4.4%	1.9%
IBM	53.1	32.4	11.1	1,377	3.4%	4.2%	2.4%	5.5%
Siemens	52.4	26.2	18.4	696	3.3%	3.4%	3.9%	2.8%
Intergraph	51.3	28.8	9.2	568	3.3%	3.8%	2.0%	2.3%
Sun	49.6	43.6	.0	2,221	3.2%	5.7%	.0%	8.9%
Digital	40.2	29.3	.0	1,342	2.6%	3.8%	.0%	5.4%
Control Data	34.9	23.7	5.9	808	2.2%	3.1%	1.3%	3.2%
Silicon Graphics	31.1	27.4	.0	699	2.0%	3.6%	.0%	2.8%
STI-Straessle	28.8	6.6	15.8	269	1.8%	.9%	3.4%	1.1%
Cisigraph	28.0	9.8	9.8	226	1.8%	1.3%	2.1%	.9%
Ferranti	21.8	8.1	10.0	201	1.4%	1.1%	2.1%	.8%
SDRC	21.0	.0	21.0	0	1.3%	.0%	4.5%	.0%
Morsk Data	17.5	10.1	3.5	218	1.1%	1.3%	.7%	.9%
Mannesmann PROCAD	15.7	8.0	4.4	218	1.0%	1.0%	.9%	.9%
ISYKON Software	15.4	7.7	5.4	220	1.0%	1.0%	1.2%	.9%
ISICAD	14.0	7.3	4.2	143	.9%	1.0%	.9%	.6%
Hahn & Kolb	13.9	8.3	4.2	190	.9%	1.1%	.9%	.8%
PAFEC	13.4	.0	13.4	0	.9%	.0%	2.9%	.0%
Delcam International	13.1	4.6	6.6	218	.8%	.6%	1.4%	.9%
Gerber Systems	12.4	6.1	4.1	178	.8%	.8%	.9%	.7%
Kewill Systems	11.3	3.4	6.2	237	.7%	.4%	1.3%	.9%
CAD Lab	11.0	.0	8.8	0	.7%	.0%	1.9%	.0%
ItalCad	10.8	5.1	2.6	101	.7%	.7%	.6%	.4%
Cimlinc	10.3	2.1	6.2	197	.7%	.3%	1.3%	.8%
ICL	8.7	5.1	3.0	239	.6%	.7%	.6%	1.0%
Auto-Trol	8.4	3.4	2.9	99	.5%	.4%	.6%	.4%
Cimatron	8.2	3.7	3.7	241	.5%	.5%	.8%	1.0%
Unisys	7.6	3.9	2.7	119	.5%	.5%	.6%	.5%
Framasoft	7.6	.0	4.6	0	.5%	.0%	1.0%	.0%

(Continued)

TABLE NUMBER: 10
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Technical Workstation
 REGION: Europe
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Radan Computational	7.5	2.6	3.7	251	.5%	.3%	.8%	1.0%
Albert Nestler	7.4	2.4	3.2	95	.5%	.3%	.7%	.4%
PDA Engineering	5.9	.0	5.9	0	.4%	.0%	1.3%	.0%
Alias Research	5.7	.0	5.7	0	.4%	.0%	1.2%	.0%
Wiechers Datentechnik	5.7	4.5	1.1	80	.4%	.6%	.2%	.3%
Technische Computer Systeme	5.4	1.1	4.3	137	.3%	.1%	.9%	.5%
Parametric Technology	5.3	.0	4.9	0	.3%	.0%	1.0%	.0%
MacNeal-Schwendler	4.0	.0	3.8	0	.3%	.0%	.8%	.0%
Marcus Computer Systeme	3.4	1.8	1.1	105	.2%	.2%	.2%	.4%
rotring euroCAD	3.3	2.2	1.1	96	.2%	.3%	.2%	.4%
Exapt	3.3	1.6	1.1	107	.2%	.2%	.2%	.4%
Autodesk	3.1	.0	3.1	0	.2%	.0%	.7%	.0%
Swanson Analysis	3.0	.0	3.0	0	.2%	.0%	.7%	.0%
XAO Industrie	3.0	1.1	1.8	108	.2%	.1%	.4%	.4%
Catalpa	2.2	.8	1.1	18	.1%	.1%	.2%	.1%
ICAD	2.1	.0	1.7	0	.1%	.0%	.4%	.0%
ISKA	2.0	.9	.8	37	.1%	.1%	.2%	.1%
Fides Industrielle Automation	2.0	.2	1.8	32	.1%	.0%	.4%	.1%
debis Systemhaus	2.0	.5	1.2	64	.1%	.1%	.3%	.3%
ADRA Systems	1.9	.9	.9	45	.1%	.1%	.2%	.2%
Caroline Informatique	1.8	.4	1.3	25	.1%	.0%	.3%	.1%
CAMTEK	1.8	.0	1.5	0	.1%	.0%	.3%	.0%
CADAM	1.7	.0	1.4	0	.1%	.0%	.3%	.0%
NCS	1.5	.0	1.4	0	.1%	.0%	.3%	.0%
CAD Centre	1.5	.0	.8	0	.1%	.0%	.2%	.0%
MARC	1.4	.0	1.4	0	.1%	.0%	.3%	.0%
Mentor Graphics	1.2	.4	.5	12	.1%	.0%	.1%	.0%
FEA Limited	1.0	.3	.3	19	.1%	.0%	.1%	.1%
Mechanical Dynamics	.7	.0	.6	0	.0%	.0%	.1%	.0%
Aries Technology	.7	.0	.6	0	.0%	.0%	.1%	.0%
FEES	.6	.0	.5	0	.0%	.0%	.1%	.0%
Wisdom Systems	.5	.0	.3	0	.0%	.0%	.1%	.0%

(Continued)

TABLE NUMBER: 10 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Technical Workstation
 REGION: Europe
 UNITS: Millions of Dollars/Actual Units

Company =====					----- Market Share -----			
	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====
Spectrum Graphics	.3	.1	.2	3	.0%	.0%	.0%	.0%
Whesoe Computing Systems	.3	.0	.3	0	.0%	.0%	.1%	.0%
Computational Mechanics	.2	.0	.2	0	.0%	.0%	.0%	.0%
Serbi	.2	.0	.2	0	.0%	.0%	.0%	.0%
Mutoh Industries--NO OEM	.2	.1	.1	2	.0%	.0%	.0%	.0%
Micro Engineering Solutions	.1	.0	.1	1	.0%	.0%	.0%	.0%
DAPCO	.1	.0	.1	0	.0%	.0%	.0%	.0%
Ontologic	.1	.0	.1	0	.0%	.0%	.0%	.0%
CADKEY	.1	.0	.0	3	.0%	.0%	.0%	.0%
Objectivity	.1	.0	.1	0	.0%	.0%	.0%	.0%
Accugraph	.1	.0	.0	2	.0%	.0%	.0%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.0	0	.0%	.0%	.0%	.0%
Lamp Software	.0	.0	.0	2	.0%	.0%	.0%	.0%
Object Design	.0	.0	.0	0	.0%	.0%	.0%	.0%
Algor Interactive Systems	.0	.0	.0	0	.0%	.0%	.0%	.0%
Point Control	.0	.0	.0	0	.0%	.0%	.0%	.0%
Solbourne	.0	.0	.0	1	.0%	.0%	.0%	.0%
Zuken	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	1,568.2	766.9	466.9	25,036	100.0%	100.0%	100.0%	100.0%
All U.S.-Based Companies	1,147.2	608.9	274.5	19,837	73.2%	79.4%	58.8%	79.2%
All Asian-Based Companies	.2	.1	.1	2	.0%	.0%	.0%	.0%
All European-Based Companies	420.9	157.9	192.3	5,197	26.8%	20.6%	41.2%	20.8%
All Hardware Companies	194.2	162.0	.0	7,835	12.4%	21.1%	.0%	31.3%
All Turnkey & SW Companies	1,374.1	604.9	466.9	17,201	87.6%	78.9%	100.0%	68.7%

Source: Dataquest
 June 1991

TABLE NUMBER: 11
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Host/Server
 REGION: Europe
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
IBM	429.7	257.8	94.5	5,671	47.4%	47.2%	55.7%	45.0%
Digital	154.0	112.4	.0	0	17.0%	20.6%	.0%	.0%
Computervision	54.9	23.8	12.4	1,586	6.1%	4.4%	7.3%	12.6%
Control Data	51.1	23.8	5.8	294	5.6%	4.4%	3.4%	2.3%
Schlumberger	22.6	8.8	7.7	346	2.5%	1.6%	4.5%	2.7%
Sun	21.3	17.6	.0	658	2.3%	3.2%	.0%	5.2%
Norsk Data	20.2	8.8	3.0	147	2.2%	1.6%	1.8%	1.2%
McDonnell Douglas	14.0	7.1	5.5	479	1.5%	1.3%	3.2%	3.8%
MacNeal-Schwendler	11.8	.0	11.3	0	1.3%	.0%	6.7%	.0%
Intergraph	9.4	4.7	1.5	84	1.0%	.9%	.9%	.7%
Exapt	9.0	4.4	3.1	104	1.0%	.8%	1.8%	.8%
Fides Industrielle Automation	8.0	.9	7.2	43	.9%	.2%	4.2%	.3%
SDRC	3.1	.0	3.1	0	.3%	.0%	1.8%	.0%
Cisigraph	3.1	1.1	1.0	62	.3%	.2%	.6%	.5%
PDA Engineering	2.9	.0	2.9	0	.3%	.0%	1.7%	.0%
Swanson Analysis	2.8	.0	2.8	0	.3%	.0%	1.6%	.0%
Hewlett-Packard	2.6	2.2	.0	133	.3%	.4%	.0%	1.1%
Unisys	2.3	1.1	.8	32	.3%	.2%	.5%	.3%
CADAM	1.7	.0	1.5	0	.2%	.0%	.9%	.0%
MARC	1.4	.0	1.4	0	.2%	.0%	.8%	.0%
Kewill Systems	1.3	.4	.7	13	.1%	.1%	.4%	.1%
MCS	1.1	.0	1.0	0	.1%	.0%	.6%	.0%
Framasoft	.9	.0	.5	0	.1%	.0%	.3%	.0%
Silicon Graphics	.6	.5	.0	10	.1%	.1%	.0%	.1%
Whesloe Computing Systems	.6	.0	.6	0	.1%	.0%	.4%	.0%
FEGS	.5	.0	.4	0	.1%	.0%	.3%	.0%
Computational Mechanics	.5	.0	.5	0	.1%	.0%	.3%	.0%
Olivetti	.3	.3	.0	7	.0%	.0%	.0%	.1%
debis Systemhaus	.3	.1	.2	6	.0%	.0%	.1%	.1%
Mechanical Dynamics	.3	.0	.3	0	.0%	.0%	.2%	.0%
FEA Limited	.3	.1	.1	5	.0%	.0%	.0%	.0%
CADKEY	.1	.1	.0	2	.0%	.0%	.0%	.0%

(Continued)

TABLE NUMBER: 11 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Host/Server
 REGION: Europe
 UNITS: Millions of Dollars/Actual Units

Company =====					----- Market Share -----			
	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====
Solbourne	.1	.1	.0	6	.0%	.0%	.0%	.0%
Mutoh Industries--NO OEM	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	73.5	69.8	.0	2,902	8.1%	12.8%	.0%	23.0%
All Companies	906.0	546.0	169.8	12,591	100.0%	100.0%	100.0%	100.0%
All U.S.-Based Companies	818.4	530.0	116.2	12,204	90.3%	97.1%	68.4%	96.9%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	87.6	16.1	53.7	387	9.7%	2.9%	31.6%	3.1%
All Hardware Companies	263.5	209.4	.0	3,775	29.1%	38.3%	.0%	30.0%
All Turnkey & SW Companies	642.6	336.7	169.8	8,817	70.9%	61.7%	100.0%	70.0%

Source: Dataquest
 June 1991

TABLE NUMBER: 12
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Personal Computer
 REGION: Europe
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Compaq	70.8	70.8	.0	11,791	17.2%	25.9%	.0%	24.0%
Hewlett-Packard	39.2	31.4	.0	6,011	9.5%	11.5%	.0%	12.2%
IBM	32.6	30.9	.0	7,278	7.9%	11.3%	.0%	14.8%
Autodesk	27.7	.0	27.7	0	6.7%	.0%	24.3%	.0%
Investronica SA	25.5	20.4	2.6	1,018	6.2%	7.5%	2.2%	2.1%
Apple Computer	24.2	21.3	.0	4,649	5.9%	7.8%	.0%	9.5%
Vero International Software	18.2	.0	16.6	0	4.4%	.0%	14.6%	.0%
Wiechers Datentechnik	14.6	11.7	2.9	414	3.6%	4.3%	2.6%	.8%
CADAM	8.6	5.3	2.9	750	2.1%	1.9%	2.5%	1.5%
Tebis	8.4	1.3	5.9	42	2.0%	.5%	5.2%	.1%
Caditron	7.8	3.9	3.1	120	1.9%	1.4%	2.7%	.2%
Ziegler	7.4	.0	7.4	0	1.8%	.0%	6.5%	.0%
Research Machines	6.9	6.9	.0	1,056	1.7%	2.5%	.0%	2.2%
Computervision	6.5	.3	6.1	61	1.6%	.1%	5.3%	.1%
DAT Standard Information system	6.4	.0	6.1	0	1.6%	.0%	5.4%	.0%
Cimatron	3.5	1.6	1.6	103	.8%	.6%	1.4%	.2%
Pathtrace	3.3	.9	2.2	46	.8%	.3%	1.9%	.1%
Intercad	3.1	1.6	.9	151	.8%	.6%	.8%	.3%
Serbi	2.9	.0	2.9	0	.7%	.0%	2.6%	.0%
Olivetti	2.5	2.2	.0	429	.6%	.8%	.0%	.9%
PAFEC	2.4	.0	2.4	0	.6%	.0%	2.1%	.0%
Supdraft	2.3	1.1	1.1	123	.6%	.4%	1.0%	.3%
Anilem Electronics	2.2	.7	1.3	28	.5%	.2%	1.2%	.1%
Whesoe Computing Systems	2.2	.0	2.2	0	.5%	.0%	1.9%	.0%
rotring euroCAD	2.1	1.2	.9	51	.5%	.4%	.8%	.1%
Intergraph	1.9	.0	1.8	0	.5%	.0%	1.6%	.0%
Robocom	1.6	.0	1.6	0	.4%	.0%	1.4%	.0%
Hahn & Kolb	1.5	.9	.5	30	.4%	.3%	.4%	.1%
ISICAD	1.4	.0	1.4	0	.3%	.0%	1.2%	.0%
CADKEY	1.4	.9	.4	145	.3%	.3%	.4%	.3%
FEA Limited	1.3	.3	.3	24	.3%	.1%	.3%	.0%
CNC Software	1.2	.0	1.2	0	.3%	.0%	1.1%	.0%
Dell Computer	1.1	1.1	.0	286	.3%	.4%	.0%	.6%

(Continued)

TABLE NUMBER: 12
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Personal Computer
 REGION: Europe
 UNITS: Millions of Dollars/Actual Units

Company					Market Share			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Moda CAD	1.1	.3	.7	9	.3%	.1%	.6%	.0%
Marcus Computer Systeme	1.0	.5	.3	31	.2%	.2%	.3%	.1%
S.T.L.D. s.r.l.	.8	.0	.8	0	.2%	.0%	.7%	.0%
CAMTEK	.8	.0	.6	0	.2%	.0%	.6%	.0%
Schlumberger	.8	.2	.3	5	.2%	.1%	.2%	.0%
Vision 3D	.7	.4	.2	6	.2%	.1%	.2%	.0%
Micrografx	.7	.0	.7	0	.2%	.0%	.6%	.0%
MCS	.7	.0	.6	0	.2%	.0%	.5%	.0%
Algor Interactive Systems	.6	.0	.6	0	.2%	.0%	.5%	.0%
Swanson Analysis	.6	.0	.6	0	.2%	.0%	.6%	.0%
ADRA Systems	.6	.0	.5	0	.1%	.0%	.5%	.0%
ACERI SA	.6	.1	.3	3	.1%	.0%	.3%	.0%
Caroline Informatique	.5	.1	.3	5	.1%	.0%	.3%	.0%
CAD Lab	.4	.0	.4	0	.1%	.0%	.4%	.0%
Cadtronic	.4	.2	.2	13	.1%	.1%	.2%	.0%
Foresight Resources	.4	.0	.4	0	.1%	.0%	.3%	.0%
Norsk Data	.4	.2	.1	7	.1%	.1%	.1%	.0%
Everex Systems	.4	.4	.0	111	.1%	.1%	.0%	.2%
debis Systemhaus	.3	.1	.2	20	.1%	.0%	.2%	.0%
Mutoh Industries--NO OEM	.3	.2	.1	10	.1%	.1%	.1%	.0%
Rasna Corporation	.3	.0	.3	0	.1%	.0%	.2%	.0%
Micro Engineering Solutions	.2	.1	.1	3	.1%	.0%	.1%	.0%
Aries Technology	.2	.0	.2	0	.0%	.0%	.1%	.0%
Evolution Computing	.2	.0	.2	0	.0%	.0%	.2%	.0%
Point Control	.2	.0	.2	0	.0%	.0%	.2%	.0%
ESDU International	.2	.0	.2	0	.0%	.0%	.1%	.0%
CAD-Capture	.2	.0	.0	0	.0%	.0%	.0%	.0%
Synthesis	.2	.0	.2	0	.0%	.0%	.1%	.0%
American Small Business Comp.	.1	.0	.1	0	.0%	.0%	.1%	.0%
A.I. Systems	.1	.0	.1	0	.0%	.0%	.1%	.0%
Cascade Graphics	.1	.0	.1	0	.0%	.0%	.1%	.0%
Radan Computational	.1	.0	.0	4	.0%	.0%	.0%	.0%

(Continued)

TABLE NUMBER: 12 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Personal Computer
 REGION: Europe
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
*****	*****	*****	*****	*****	*****	*****	*****	*****
Ithaca Software	.1	.0	.1	0	.0%	.0%	.1%	.0%
Lamp Software	.1	.0	.0	3	.0%	.0%	.0%	.0%
Masta Corporation	.1	.0	.0	1	.0%	.0%	.0%	.0%
Mega CADD	.1	.0	.1	0	.0%	.0%	.0%	.0%
Premise	.1	.0	.1	0	.0%	.0%	.0%	.0%
Comshoppe	.0	.0	.0	0	.0%	.0%	.0%	.0%
Number One Systems	.0	.0	.0	1	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	0	.0%	.0%	.0%	.0%
Imagine That	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	54.1	54.1	.0	14,243	13.2%	19.8%	.0%	29.0%
All Companies	410.7	273.2	113.6	49,080	100.0%	100.0%	100.0%	100.0%
All U.S.-Based Companies	278.0	216.9	47.4	45,342	67.7%	79.4%	41.7%	92.4%
All Asian-Based Companies	.3	.2	.1	10	.1%	.1%	.1%	.0%
All European-Based Companies	132.5	56.2	66.2	3,728	32.3%	20.6%	58.2%	7.6%
All Hardware Companies	230.0	217.3	.0	45,548	56.0%	79.5%	.0%	92.8%
All Turnkey & SW Companies	180.7	55.9	113.6	3,532	44.0%	20.5%	100.0%	7.2%

Source: Dataquest
 June 1991

TABLE NUMBER: 13
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: Asia
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
IBM	470.9	290.1	98.6	10,334	21.4%	21.3%	17.3%	15.2%
NEC	198.6	138.1	44.6	8,598	9.0%	10.2%	7.8%	12.6%
Nihon Unisys	183.5	122.9	23.9	1,670	8.3%	9.0%	4.2%	2.5%
Fujitsu	162.1	100.5	45.4	3,599	7.4%	7.4%	7.9%	5.3%
Hitachi	156.2	75.0	65.6	4,800	7.1%	5.5%	11.5%	7.0%
Hewlett-Packard	97.6	65.2	15.8	3,742	4.4%	4.8%	2.8%	5.5%
Computervision	79.2	36.7	37.4	859	3.6%	2.7%	6.6%	1.3%
Toshiba--NO OEM	69.1	34.5	27.6	1,801	3.1%	2.5%	4.8%	2.6%
Silicon Graphics	58.8	55.9	.0	1,242	2.7%	4.1%	.0%	1.8%
Hitachi Zosen Info Systems	58.8	46.9	.6	595	2.7%	3.5%	.1%	.9%
Mutoh Industries--NO OEM	44.8	23.5	16.7	1,138	2.0%	1.7%	2.9%	1.7%
Digital	43.7	31.9	.0	302	2.0%	2.3%	.0%	.4%
Sun	42.9	37.1	.0	2,605	2.0%	2.7%	.0%	3.8%
Hakuto	41.7	28.8	12.9	1,220	1.9%	2.1%	2.3%	1.8%
Mitsubishi Electric	38.4	30.3	5.1	741	1.7%	2.2%	.9%	1.1%
Tokyo Electron--NO OEM	33.5	11.1	16.1	122	1.5%	.8%	2.8%	.2%
CADAM	30.1	13.1	14.5	1,875	1.4%	1.0%	2.5%	2.8%
Sumitomo Denko Workstation	28.4	28.4	.0	2,075	1.3%	2.1%	.0%	3.0%
Sharp System Products--NO OEM	27.8	14.5	13.4	184	1.3%	1.1%	2.3%	.3%
SDRC	21.7	.0	21.7	0	1.0%	.0%	3.8%	.0%
Mitsui Engineering	19.8	13.9	4.0	129	.9%	1.0%	.7%	.2%
Toyo Information Systems--NO OEM	16.9	10.2	4.9	176	.8%	.8%	.9%	.3%
Graphtec Engineering	13.9	7.0	6.3	300	.6%	.5%	1.1%	.4%
Control Data	11.8	6.6	1.6	152	.5%	.5%	.3%	.2%
McDonnell Douglas	11.6	6.0	3.7	165	.5%	.4%	.7%	.2%
Autodesk	10.8	.0	10.8	0	.5%	.0%	1.9%	.0%
MacNeal-Schwendler	10.3	.0	9.9	0	.5%	.0%	1.7%	.0%
Design Automation	10.2	.0	10.2	0	.5%	.0%	1.8%	.0%
Apple Computer	9.9	8.7	.0	1,894	.4%	.6%	.0%	2.8%
Omron	9.1	8.1	.9	261	.4%	.6%	.2%	.4%
Wacom	7.8	1.6	5.5	123	.4%	.1%	1.0%	.2%
Andor	7.8	1.9	5.5	70	.4%	.1%	1.0%	.1%
Schlumberger	7.5	2.7	2.7	78	.3%	.2%	.5%	.1%

(Continued)

TABLE NUMBER: 13
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: Asia
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Intergraph	7.2	3.8	1.4	74	.3%	.3%	.3%	.1%
Sony	6.7	5.9	.0	390	.3%	.4%	.0%	.6%
Parametric Technology	5.3	.0	4.9	0	.2%	.0%	.9%	.0%
MARC	4.6	.0	4.6	0	.2%	.0%	.8%	.0%
Unisys	4.6	2.3	1.6	70	.2%	.2%	.3%	.1%
Compaq	4.5	4.5	.0	753	.2%	.3%	.0%	1.1%
Matra Datavision	4.1	1.9	1.7	45	.2%	.1%	.3%	.1%
ADRA Systems	3.8	1.3	2.1	67	.2%	.1%	.4%	.1%
Swanson Analysis	2.9	.0	2.9	0	.1%	.0%	.5%	.0%
CADIX	2.7	1.1	1.4	20	.1%	.1%	.2%	.0%
Century Research Center	2.7	1.4	1.0	15	.1%	.1%	.2%	.0%
Delcam International	2.4	.9	1.2	41	.1%	.1%	.2%	.1%
Alias Research	2.3	.0	2.3	0	.1%	.0%	.4%	.0%
Fides Industrielle Automation	2.2	.3	2.0	0	.1%	.0%	.3%	.0%
Framasoft	2.1	.0	1.2	0	.1%	.0%	.2%	.0%
Mechanical Dynamics	2.0	.0	1.8	0	.1%	.0%	.3%	.0%
Siemens	1.9	1.0	.7	25	.1%	.1%	.1%	.0%
Cimatron	1.9	.9	.9	57	.1%	.1%	.2%	.1%
Ricoh--NO OEM	1.8	.0	1.5	0	.1%	.0%	.3%	.0%
Cisigraph	1.7	.6	.6	16	.1%	.0%	.1%	.0%
Auto-Trol	1.6	.7	.6	19	.1%	.0%	.1%	.0%
Kubota Computer	1.5	1.0	.5	208	.1%	.1%	.1%	.3%
Cimline	1.5	.3	.9	28	.1%	.0%	.2%	.0%
MCS	1.5	.0	1.3	0	.1%	.0%	.2%	.0%
Aries Technology	1.3	.0	1.2	0	.1%	.0%	.2%	.0%
PDA Engineering	1.1	.0	1.1	0	.1%	.0%	.2%	.0%
Mentor Graphics	1.0	.3	.4	10	.0%	.0%	.1%	.0%
Anilam Electronics	1.0	.3	.6	12	.0%	.0%	.1%	.0%
Gerber Systems	.9	.4	.3	11	.0%	.0%	.1%	.0%
CADKEY	.8	.0	.8	0	.0%	.0%	.1%	.0%
Zuken	.7	.3	.4	5	.0%	.0%	.1%	.0%
Whessoe Computing Systems	.6	.0	.6	0	.0%	.0%	.1%	.0%
ICAD	.5	.0	.4	0	.0%	.0%	.1%	.0%

(Continued)

TABLE NUMBER: 13
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: Asia
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
CNC Software	.5	.0	.5	0	.0%	.0%	.1%	.0%
Moda CAD	.4	.1	.3	4	.0%	.0%	.1%	.0%
Micro Engineering Solutions	.4	.1	.2	4	.0%	.0%	.0%	.0%
PAFEC	.3	.0	.3	0	.0%	.0%	.1%	.0%
Wisdom Systems	.3	.0	.2	0	.0%	.0%	.0%	.0%
Technische Computer Systeme	.3	.1	.2	7	.0%	.0%	.0%	.0%
Investronica SA	.3	.2	.0	11	.0%	.0%	.0%	.0%
Rasna Corporation	.3	.0	.3	0	.0%	.0%	.0%	.0%
Superdraft	.2	.1	.1	12	.0%	.0%	.0%	.0%
Point Control	.2	.0	.2	0	.0%	.0%	.0%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.0%	.0%
Everex Systems	.1	.1	.0	29	.0%	.0%	.0%	.0%
Object Design	.1	.0	.1	0	.0%	.0%	.0%	.0%
Algor Interactive Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
Premise	.1	.0	.1	0	.0%	.0%	.0%	.0%
American Small Business Comp.	.0	.0	.0	0	.0%	.0%	.0%	.0%
Foresight Resources	.0	.0	.0	0	.0%	.0%	.0%	.0%
Pathtrace	.0	.0	.0	1	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
Mega CADD	.0	.0	.0	0	.0%	.0%	.0%	.0%
Objectivity	.0	.0	.0	0	.0%	.0%	.0%	.0%
Lamp Software	.0	.0	.0	1	.0%	.0%	.0%	.0%

(Continued)

TABLE NUMBER: 13 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: Asia
 UNITS: Millions of Dollars/Actual Units

Company *****					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
	*****	*****	*****	*****	*****	*****	*****	*****
Other Companies	79.7	78.4	.0	15,348	3.6%	5.8%	.0%	22.5%
All Companies	2,199.4	1,359.0	571.2	68,133	100.0%	100.0%	100.0%	100.0%
 All U.S.-Based Companies	 1,016.2	 646.2	 230.4	 39,666	 46.2%	 47.5%	 40.3%	 58.2%
All Asian-Based Companies	1,144.2	706.8	313.7	28,240	52.0%	52.0%	54.9%	41.4%
All European-Based Companies	39.0	6.1	27.1	227	1.8%	.4%	4.7%	.3%
All Hardware Companies	303.8	274.4	.0	30,928	13.8%	20.2%	.0%	45.4%
All Turnkey & SW Companies	1,895.6	1,084.6	571.2	37,205	86.2%	79.8%	100.0%	54.6%

Source: Dataquest
 June 1991

TABLE NUMBER: 14
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Technical Workstation
 REGION: Asia
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Hewlett-Packard	90.3	59.3	15.8	2,718	9.2%	10.0%	5.6%	12.1%
NEC	89.4	50.1	32.2	4,697	9.1%	8.5%	11.4%	20.9%
Hitachi	78.1	37.5	32.8	1,622	8.0%	6.3%	11.7%	7.2%
Computervision	68.2	29.8	35.0	709	6.9%	5.0%	12.4%	3.2%
Fujitsu	66.5	41.2	18.6	1,565	6.8%	7.0%	6.6%	7.0%
Silicon Graphics	58.8	55.9	.0	1,242	6.0%	9.4%	.0%	5.5%
Nihon Unisys	58.7	39.3	7.6	691	6.0%	6.6%	2.7%	3.1%
Hitachi Zosen Info Systems	55.2	46.9	.6	595	5.6%	7.9%	.2%	2.7%
IBM	49.6	30.2	10.4	1,126	5.0%	5.1%	3.7%	5.0%
Toshiba--NO OEM	35.9	18.0	14.4	315	3.7%	3.0%	5.1%	1.4%
Tokyo Electron--NO OEM	33.5	11.1	16.1	122	3.4%	1.9%	5.7%	.5%
Sun	30.0	26.4	.0	2,030	3.1%	4.5%	.0%	9.1%
Mitsubishi Electric	28.0	24.5	1.9	279	2.9%	4.1%	.7%	1.2%
Sumitomo Denko Workstation	25.8	25.8	.0	1,955	2.6%	4.4%	.0%	8.7%
Sharp System Products--NO OEM	24.2	12.6	11.6	150	2.5%	2.1%	4.1%	.7%
SDRC	18.9	.0	18.9	0	1.9%	.0%	6.7%	.0%
Mitsui Engineering	18.0	12.6	3.6	118	1.8%	2.1%	1.3%	.5%
Mutoh Industries--NO OEM	16.6	8.0	5.6	167	1.7%	1.4%	2.0%	.7%
Graphtec Engineering	13.9	7.0	6.3	300	1.4%	1.2%	2.2%	1.3%
Toyo Information Systems--NO OEM	12.8	8.0	3.7	152	1.3%	1.4%	1.3%	.7%
McDonnell Douglas	9.4	4.9	3.0	125	1.0%	.8%	1.1%	.6%
Omron	9.1	8.1	.9	261	.9%	1.4%	.3%	1.2%
Digital	9.0	6.6	.0	302	.9%	1.1%	.0%	1.3%
Sony	6.7	5.9	.0	390	.7%	1.0%	.0%	1.7%
Intergraph	5.9	3.3	1.0	65	.6%	.6%	.4%	.3%
Parametric Technology	5.3	.0	4.9	0	.5%	.0%	1.7%	.0%
Schlumberger	5.2	1.8	2.0	45	.5%	.3%	.7%	.2%
Control Data	4.8	3.3	.8	113	.5%	.6%	.3%	.5%
CADAM	4.2	.0	3.6	0	.4%	.0%	1.3%	.0%
Matra Datavision	4.1	1.9	1.7	45	.4%	.3%	.6%	.2%
Unisys	3.5	1.8	1.2	55	.4%	.3%	.4%	.2%
ADRA Systems	2.9	1.3	1.3	67	.3%	.2%	.5%	.3%
CADIX	2.7	1.1	1.4	20	.3%	.2%	.5%	.1%

(Continued)

TABLE NUMBER: 14
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Technical Workstation
 REGION: Asia
 UNITS: Millions of Dollars/Actual Units

Company					Market Share			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
Delcam International	2.4	.9	1.2	41	.2%	.1%	.4%	.2%
Alias Research	2.3	.0	2.3	0	.2%	.0%	.8%	.0%
MARC	2.3	.0	2.3	0	.2%	.0%	.8%	.0%
MacNeal-Schwendler	2.1	.0	2.0	0	.2%	.0%	.7%	.0%
Siemens	1.9	1.0	.7	25	.2%	.2%	.2%	.1%
Framasoft	1.9	.0	1.1	0	.2%	.0%	.4%	.0%
Ricoh--NO OEM	1.8	.0	1.5	0	.2%	.0%	.5%	.0%
Auto-Trol	1.6	.7	.6	19	.2%	.1%	.2%	.1%
Cisigraph	1.6	.6	.6	13	.2%	.1%	.2%	.1%
Cimline	1.5	.3	.9	28	.1%	.0%	.3%	.1%
Century Research Center	1.4	.7	.5	8	.1%	.1%	.2%	.0%
Mechanical Dynamics	1.4	.0	1.2	0	.1%	.0%	.4%	.0%
Swanson Analysis	1.4	.0	1.4	0	.1%	.0%	.5%	.0%
Cimatron	1.3	.6	.6	40	.1%	.1%	.2%	.2%
Wacom	1.3	.3	1.0	13	.1%	.1%	.4%	.1%
Hakuto	1.3	.9	.4	18	.1%	.1%	.1%	.1%
Autodesk	1.1	.0	1.1	0	.1%	.0%	.4%	.0%
Aries Technology	1.1	.0	1.0	0	.1%	.0%	.3%	.0%
Mentor Graphics	1.0	.3	.4	10	.1%	.0%	.1%	.0%
Gerber Systems	.9	.4	.3	11	.1%	.1%	.1%	.1%
Kubota Computer	.8	.6	.3	143	.1%	.1%	.1%	.6%
PDA Engineering	.8	.0	.8	0	.1%	.0%	.3%	.0%
Zuken	.7	.3	.4	5	.1%	.1%	.1%	.0%
MCS	.7	.0	.6	0	.1%	.0%	.2%	.0%
ICAD	.5	.0	.4	0	.1%	.0%	.1%	.0%
Fides Industrielle Automation	.4	.1	.4	0	.0%	.0%	.1%	.0%
Wisdom Systems	.3	.0	.2	0	.0%	.0%	.1%	.0%
Technische Computer Systeme	.3	.1	.2	7	.0%	.0%	.1%	.0%
PAFEC	.3	.0	.3	0	.0%	.0%	.1%	.0%
Micro Engineering Solutions	.1	.0	.1	1	.0%	.0%	.0%	.0%
Object Design	.1	.0	.1	0	.0%	.0%	.0%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.0%	.0%

(Continued)

TABLE NUMBER: 14 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Technical Workstation
 REGION: Asia
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Whessoe Computing Systems	.1	.0	.1	0	.0%	.0%	.0%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
Objectivity	.0	.0	.0	0	.0%	.0%	.0%	.0%
Point Control	.0	.0	.0	0	.0%	.0%	.0%	.0%
Everex Systems	.0	.0	.0	1	.0%	.0%	.0%	.0%
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	981.9	591.7	281.4	22,424	100.0%	100.0%	100.0%	100.0%
All U.S.-Based Companies	378.8	226.3	108.1	8,669	38.6%	38.2%	38.4%	38.7%
All Asian-Based Companies	582.4	360.5	161.1	13,584	59.3%	60.9%	57.2%	60.6%
All European-Based Companies	20.7	4.9	12.2	171	2.1%	.8%	4.3%	.8%
All Hardware Companies	119.9	107.6	.0	4,874	12.2%	18.2%	.0%	21.7%
All Turnkey & SW Companies	862.0	484.1	281.4	17,549	87.8%	81.8%	100.0%	78.3%

Source: Dataquest
 June 1991

TABLE NUMBER: 15
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Host/Server
 REGION: Asia
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
IBM	401.0	240.6	88.2	4,659	47.9%	46.5%	48.9%	40.6%
Nihon Unisys	124.8	83.6	16.2	979	14.9%	16.2%	9.0%	8.5%
Fujitsu	69.7	43.2	19.5	1,179	8.3%	8.4%	10.8%	10.3%
NEC	59.6	46.0	8.8	162	7.1%	8.9%	4.9%	1.4%
Digital	34.6	25.3	.0	0	4.1%	4.9%	.0%	.0%
Hitachi	25.0	12.0	10.5	2,076	3.0%	2.3%	5.8%	18.1%
Toshiba--NO OEM	15.2	7.6	6.1	204	1.8%	1.5%	3.4%	1.8%
Sun	12.9	10.7	.0	575	1.5%	2.1%	.0%	5.0%
Computervision	10.7	6.9	2.2	150	1.3%	1.3%	1.2%	1.3%
MacNeal-Schwendler	8.1	.0	7.8	0	1.0%	.0%	4.3%	.0%
Control Data	7.0	3.3	.8	39	.8%	.6%	.4%	.3%
Mitsubishi Electric	6.1	2.9	1.8	90	.7%	.6%	1.0%	.8%
CADAM	4.2	.0	3.7	0	.5%	.0%	2.0%	.0%
Toyo Information Systems--NO OEM	4.1	2.2	1.3	24	.5%	.4%	.7%	.2%
Hitachi Zosen Info Systems	3.5	.0	.0	0	.4%	.0%	.0%	.0%
SDRC	2.8	.0	2.8	0	.3%	.0%	1.6%	.0%
Sumitomo Denko Workstation	2.6	2.6	.0	120	.3%	.5%	.0%	1.0%
MARC	2.3	.0	2.3	0	.3%	.0%	1.3%	.0%
McDonnell Douglas	2.2	1.1	.7	40	.3%	.2%	.4%	.3%
Schlumberger	2.2	.8	.7	33	.3%	.2%	.4%	.3%
Fides Industrielle Automation	1.8	.2	1.6	0	.2%	.0%	.9%	.0%
Sharp System Products--NO OEM	1.4	.7	.7	6	.2%	.1%	.4%	.1%
Mutoh Industries--NO OEM	1.3	.5	.5	3	.2%	.1%	.3%	.0%
Century Research Center	1.3	.7	.5	7	.2%	.1%	.3%	.1%
Swanson Analysis	1.2	.0	1.2	0	.1%	.0%	.7%	.0%
Intergraph	1.1	.5	.2	10	.1%	.1%	.1%	.1%
Unisys	1.1	.5	.4	15	.1%	.1%	.2%	.1%
Hewlett-Packard	.8	.7	.0	41	.1%	.1%	.0%	.4%
Kubota Computer	.7	.5	.2	65	.1%	.1%	.1%	.6%
Mechanical Dynamics	.6	.0	.5	0	.1%	.0%	.3%	.0%
NCS	.5	.0	.4	0	.1%	.0%	.2%	.0%
PDA Engineering	.4	.0	.4	0	.0%	.0%	.2%	.0%

(Continued)

TABLE NUMBER: 15 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Host/Server
 REGION: Asia
 UNITS: Millions of Dollars/Actual Units

Company =====					----- Market Share -----			
	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====
Framasoft	.2	.0	.1	0	.0%	.0%	.1%	.0%
Cisigraph	.2	.1	.1	3	.0%	.0%	.0%	.0%
Whesoe Computing Systems	.1	.0	.1	0	.0%	.0%	.1%	.0%
Other Companies	25.2	24.0	.0	997	3.0%	4.6%	.0%	8.7%
All Companies	836.4	517.2	180.3	11,477	100.0%	100.0%	100.0%	100.0%
All U.S.-Based Companies	505.4	314.4	100.8	6,558	60.4%	60.8%	55.9%	57.1%
All Asian-Based Companies	315.2	202.5	66.0	4,916	37.7%	39.2%	36.6%	42.8%
All European-Based Companies	15.8	.3	13.4	3	1.9%	.1%	7.4%	.0%
All Hardware Companies	75.1	61.5	.0	1,621	9.0%	11.9%	.0%	14.1%
All Turnkey & SW Companies	761.3	455.7	180.3	9,857	91.0%	88.1%	100.0%	85.9%

Source: Dataquest
 June 1991

TABLE NUMBER: 16
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Personal Computer
 REGION: Asia
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Hitachi	53.1	25.5	22.3	1,103	13.9%	10.2%	20.4%	3.2%
NEC	49.7	42.0	3.7	3,739	13.0%	16.8%	3.3%	10.9%
Hakuto	40.5	27.9	12.5	1,202	10.6%	11.2%	11.4%	3.5%
Mutoh Industries--NO OEM	26.9	14.9	10.6	969	7.0%	6.0%	9.7%	2.8%
Fujitsu	25.9	16.1	7.3	855	6.8%	6.4%	6.6%	2.5%
CADAM	21.6	13.1	7.2	1,875	5.7%	5.2%	6.6%	5.5%
IBM	20.3	19.3	.0	4,548	5.3%	7.7%	.0%	13.3%
Toshiba--NO OEM	18.0	9.0	7.2	1,282	4.7%	3.6%	6.5%	3.7%
Design Automation	10.2	.0	10.2	0	2.7%	.0%	9.3%	.0%
Apple Computer	9.9	8.7	.0	1,894	2.6%	3.5%	.0%	5.5%
Autodesk	9.8	.0	9.8	0	2.6%	.0%	8.9%	.0%
Andor	7.8	1.9	5.5	70	2.0%	.8%	5.0%	.2%
Wacom	6.5	1.3	4.5	109	1.7%	.5%	4.1%	.3%
Hewlett-Packard	6.4	5.2	.0	984	1.7%	2.1%	.0%	2.9%
Compaq	4.5	4.5	.0	753	1.2%	1.8%	.0%	2.2%
Mitsubishi Electric	4.2	2.8	1.5	372	1.1%	1.1%	1.4%	1.1%
Sharp System Products--NO OEM	2.2	1.2	1.1	28	.6%	.5%	1.0%	.1%
Mitsui Engineering	1.8	1.3	.4	12	.5%	.5%	.3%	.0%
Anilam Electronics	1.0	.3	.6	12	.3%	.1%	.5%	.0%
ADRA Systems	.9	.0	.8	0	.2%	.0%	.7%	.0%
CADKEY	.8	.0	.8	0	.2%	.0%	.7%	.0%
Cimatron	.6	.3	.3	17	.1%	.1%	.2%	.0%
CNC Software	.5	.0	.5	0	.1%	.0%	.4%	.0%
Moda CAD	.4	.1	.3	4	.1%	.0%	.3%	.0%
Whessoe Computing Systems	.4	.0	.4	0	.1%	.0%	.4%	.0%
MCS	.3	.0	.3	0	.1%	.0%	.2%	.0%
Computervision	.3	.0	.3	0	.1%	.0%	.2%	.0%
Swanson Analysis	.3	.0	.3	0	.1%	.0%	.3%	.0%
Investronica SA	.3	.2	.0	11	.1%	.1%	.0%	.0%
Aries Technology	.3	.0	.2	0	.1%	.0%	.2%	.0%
Rasna Corporation	.3	.0	.3	0	.1%	.0%	.2%	.0%
Intergraph	.2	.0	.2	0	.1%	.0%	.2%	.0%

(Continued)

TABLE NUMBER: 16 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Personal Computer
 REGION: Asia
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
-----	-----	-----	-----	-----	-----	-----	-----	-----
Micro Engineering Solutions	.2	.1	.1	3	.1%	.0%	.1%	.0%
Superdraft	.2	.1	.1	12	.1%	.0%	.1%	.0%
Point Control	.2	.0	.2	0	.0%	.0%	.2%	.0%
MacNeal-Schwendler	.1	.0	.1	0	.0%	.0%	.1%	.0%
Everex Systems	.1	.1	.0	28	.0%	.0%	.0%	.1%
Algor Interactive Systems	.1	.0	.1	0	.0%	.0%	.1%	.0%
Schlumberger	.1	.0	.0	0	.0%	.0%	.0%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.1%	.0%
PAFEC	.1	.0	.1	0	.0%	.0%	.0%	.0%
Premise	.1	.0	.1	0	.0%	.0%	.0%	.0%
American Small Business Comp.	.0	.0	.0	0	.0%	.0%	.0%	.0%
Foresight Resources	.0	.0	.0	0	.0%	.0%	.0%	.0%
Pathtrace	.0	.0	.0	1	.0%	.0%	.0%	.0%
Mega CADD	.0	.0	.0	0	.0%	.0%	.0%	.0%
Lamp Software	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	54.5	54.5	.0	14,350	14.3%	21.8%	.0%	41.9%
All Companies	381.1	250.2	109.6	34,231	100.0%	100.0%	100.0%	100.0%
All U.S.-Based Companies	132.0	105.5	21.5	24,439	34.6%	42.2%	19.6%	71.4%
All Asian-Based Companies	246.6	143.8	86.7	9,740	64.7%	57.5%	79.0%	28.5%
All European-Based Companies	2.5	.9	1.5	52	.7%	.3%	1.3%	.2%
All Hardware Companies	108.8	105.4	.0	24,432	28.5%	42.1%	.0%	71.4%
All Turnkey & SW Companies	272.3	144.8	109.6	9,799	71.5%	57.9%	100.0%	28.6%

Source: Dataquest
 June 1991

TABLE NUMBER: 17
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: Rest of World
 UNITS: Millions of Dollars/Actual Units

Company =====					----- Market Share -----			
	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====
IBM	44.1	27.9	8.8	1,444	32.8%	33.3%	32.6%	27.7%
Digital	14.6	10.6	.0	101	10.8%	12.7%	.0%	1.9%
Intergraph	12.1	6.4	2.4	126	9.0%	7.7%	9.0%	2.4%
Hewlett-Packard	9.2	6.4	1.2	442	6.9%	7.7%	4.5%	8.5%
Computervision	8.1	2.1	2.3	50	6.1%	2.4%	8.5%	1.0%
McDonnell Douglas	4.9	2.6	1.6	60	3.7%	3.0%	6.0%	1.1%
Compaq	4.5	4.5	.0	753	3.4%	5.4%	.0%	14.5%
Control Data	3.3	1.8	.5	42	2.5%	2.2%	1.7%	.8%
Engineering Mechanics	3.2	1.1	1.8	250	2.3%	1.3%	6.7%	4.8%
Sun	2.1	1.8	.0	111	1.6%	2.2%	.0%	2.1%
Delcam International	1.9	.7	.9	31	1.4%	.8%	3.5%	.6%
SDRC	1.6	.0	1.6	0	1.2%	.0%	6.0%	.0%
MacNeal-Schwendler	1.0	.0	1.0	0	.8%	.0%	3.7%	.0%
Clarix	1.0	.0	1.0	0	.7%	.0%	3.6%	.0%
Vero International Software	1.0	.0	.9	0	.7%	.0%	3.2%	.0%
Apple Computer	.9	.8	.0	172	.7%	.9%	.0%	3.3%
Autodesk	.9	.0	.9	0	.7%	.0%	3.4%	.0%
CNC Software	.7	.0	.7	0	.5%	.0%	2.7%	.0%
Siemens	.4	.2	.1	5	.3%	.2%	.5%	.1%
Unisys	.4	.2	.1	6	.3%	.2%	.5%	.1%
Whesoe Computing Systems	.3	.0	.3	0	.2%	.0%	1.2%	.0%
Superdraft	.2	.1	.1	12	.2%	.1%	.4%	.2%
Investronica SA	.2	.2	.0	8	.1%	.2%	.1%	.1%
FEA Limited	.1	.0	.0	3	.1%	.0%	.1%	.0%
Aura CAD/CAM Systems	.1	.0	.1	0	.1%	.0%	.3%	.0%
Engineering Systems Corp.	.1	.0	.1	0	.1%	.0%	.2%	.0%
American Small Business Comp.	.1	.0	.1	0	.0%	.0%	.2%	.0%
Ithaca Software	.1	.0	.1	0	.0%	.0%	.2%	.0%
Mc2 Engineering Software	.1	.0	.1	0	.0%	.0%	.2%	.0%
Georgia Tech Research Corp.	.1	.0	.1	0	.0%	.0%	.2%	.0%
Accugraph	.0	.0	.0	1	.0%	.0%	.0%	.0%
Algor Interactive Systems	.0	.0	.0	0	.0%	.0%	.1%	.0%

(Continued)

TABLE NUMBER: 17 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: All Platforms
 REGION: Rest of World
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
Moda CAD	.0	.0	.0	0	.0%	.0%	.1%	.0%
Pathtrace	.0	.0	.0	1	.0%	.0%	.1%	.0%
Ziegler	.0	.0	.0	0	.0%	.0%	.1%	.0%
Innovative Data Design	.0	.0	.0	0	.0%	.0%	.1%	.0%
Solbourne	.0	.0	.0	2	.0%	.0%	.0%	.0%
Fides Industrielle Automation	.0	.0	.0	0	.0%	.0%	.0%	.0%
Vision 3D	.0	.0	.0	0	.0%	.0%	.0%	.0%
ESDU International	.0	.0	.0	0	.0%	.0%	.0%	.0%
Foresight Resources	.0	.0	.0	0	.0%	.0%	.0%	.0%
Other Companies	16.9	16.3	.0	1,586	12.6%	19.5%	.0%	30.5%
All Companies	134.3	83.7	26.8	5,204	100.0%	100.0%	100.0%	100.0%
All U.S.-Based Companies	129.1	82.6	23.4	5,145	96.1%	98.7%	87.4%	98.9%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	5.2	1.1	3.4	59	3.9%	1.3%	12.6%	1.1%
All Hardware Companies	47.2	41.2	.0	3,943	35.1%	49.2%	.0%	75.8%
All Turnkey & SW Companies	87.2	42.5	26.8	1,260	64.9%	50.8%	100.0%	24.2%

Source: Dataquest
 June 1991

TABLE NUMBER: 18
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Technical Workstation
 REGION: Rest of World
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Intergraph	9.9	5.5	1.8	109	21.7%	23.2%	16.0%	10.6%
Hewlett-Packard	8.3	5.7	1.2	323	18.2%	23.9%	10.9%	31.2%
Computervision	7.0	1.9	1.7	45	15.2%	7.7%	15.2%	4.3%
IBM	4.4	2.7	.9	111	9.6%	11.2%	8.3%	10.7%
McDonnell Douglas	4.0	2.1	1.3	45	8.7%	8.7%	11.6%	4.4%
Digital	3.0	2.2	.0	101	6.6%	9.2%	.0%	9.7%
Delcam International	1.9	.7	.9	31	4.1%	2.8%	8.5%	3.0%
Engineering Mechanics	1.8	.6	1.0	139	4.0%	2.6%	9.4%	13.4%
Sun	1.5	1.3	.0	86	3.3%	5.5%	.0%	8.3%
SDRC	1.4	.0	1.4	0	3.1%	.0%	12.6%	.0%
Control Data	1.3	.9	.2	32	2.9%	3.8%	2.1%	3.0%
Siemens	.4	.2	.1	5	.8%	.8%	1.3%	.5%
Unisys	.3	.2	.1	5	.6%	.6%	1.0%	.4%
MacNeal-Schwendler	.2	.0	.2	0	.5%	.0%	1.8%	.0%
Autodesk	.1	.0	.1	0	.2%	.0%	.8%	.0%
FEA Limited	.1	.0	.0	1	.1%	.0%	.1%	.1%
Accugraph	.0	.0	.0	1	.1%	.0%	.1%	.1%
Whesoe Computing Systems	.0	.0	.0	0	.1%	.0%	.3%	.0%
Georgia Tech Research Corp.	.0	.0	.0	0	.0%	.0%	.2%	.0%
Solbourne	.0	.0	.0	1	.0%	.1%	.0%	.1%

(Continued)

TABLE NUMBER: 18 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Technical Workstation
 REGION: Rest of World
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
-----	-----	-----	-----	-----	-----	-----	-----	-----
Other Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All Companies	45.6	23.9	11.1	1,034	100.0%	100.0%	100.0%	100.0%
All U.S.-Based Companies	43.0	23.1	9.7	997	94.1%	96.4%	87.3%	96.4%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	2.7	.9	1.4	37	5.9%	3.6%	12.7%	3.6%
All Hardware Companies	7.3	5.8	.0	376	15.9%	24.3%	.0%	36.3%
All Turnkey & SW Companies	38.4	18.1	11.1	659	84.1%	75.7%	100.0%	63.7%

Source: Dataquest
 June 1991

TABLE NUMBER: 19
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Host/Server
 REGION: Rest of World
 UNITS: Millions of Dollars/Actual Units

Company =====					----- Market Share -----			
	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====
IBM	35.6	21.4	7.8	423	52.7%	47.2%	78.5%	41.7%
Digital	11.6	8.4	.0	0	17.1%	18.7%	.0%	.0%
Control Data	2.0	.9	.2	11	2.9%	2.0%	2.3%	1.1%
Intergraph	1.8	.9	.3	16	2.7%	2.0%	2.9%	1.6%
McDonnell Douglas	.9	.5	.3	14	1.4%	1.1%	3.1%	1.4%
MacNeal-Schwendler	.8	.0	.8	0	1.2%	.0%	7.8%	.0%
Computervision	.8	.2	.2	5	1.1%	.4%	1.8%	.5%
Sun	.6	.5	.0	25	.9%	1.2%	.0%	2.5%
SDRC	.2	.0	.2	0	.3%	.0%	2.1%	.0%
Hewlett-Packard	.2	.2	.0	9	.3%	.3%	.0%	.9%
Unisys	.1	.0	.0	1	.1%	.1%	.3%	.1%
Whessoe Computing Systems	.1	.0	.1	0	.1%	.0%	.6%	.0%
Georgia Tech Research Corp.	.0	.0	.0	0	.0%	.0%	.3%	.0%
Engineering Systems Corp.	.0	.0	.0	0	.0%	.0%	.1%	.0%
Fides Industrielle Automation	.0	.0	.0	0	.0%	.0%	.1%	.0%
FEA Limited	.0	.0	.0	0	.0%	.0%	.0%	.0%
Solbourne	.0	.0	.0	1	.0%	.0%	.0%	.1%
Other Companies	12.8	12.2	.0	507	19.0%	27.0%	.0%	50.1%
All Companies	67.6	45.2	10.0	1,013	100.0%	100.0%	100.0%	100.0%
All U.S.-Based Companies	66.8	45.2	9.3	1,013	98.8%	100.0%	93.2%	100.0%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	.8	.0	.7	0	1.2%	.0%	6.8%	.0%
All Hardware Companies	25.6	21.5	.0	545	37.9%	47.7%	.0%	53.7%
All Turnkey & SW Companies	41.9	23.7	10.0	469	62.1%	52.3%	100.0%	46.3%

Source: Dataquest
 June 1991

TABLE NUMBER: 20
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Personal Computer
 REGION: Rest of World
 UNITS: Millions of Dollars/Actual Units

Company					----- Market Share -----			
	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped	Total Revenue	Hardware Revenue	Software Revenue	Wkstns Shipped
=====	=====	=====	=====	=====	=====	=====	=====	=====
Compaq	4.5	4.5	.0	753	21.4%	31.0%	.0%	23.8%
IBM	4.1	3.9	.0	910	19.3%	26.5%	.0%	28.8%
Engineering Mechanics	1.3	.5	.8	111	6.3%	3.1%	13.1%	3.5%
Clarix	1.0	.0	1.0	0	4.6%	.0%	16.9%	.0%
Vero International Software	1.0	.0	.9	0	4.5%	.0%	15.2%	.0%
Apple Computer	.9	.8	.0	172	4.3%	5.4%	.0%	5.5%
Autodesk	.8	.0	.8	0	3.8%	.0%	14.1%	.0%
CNC Software	.7	.0	.7	0	3.4%	.0%	12.6%	.0%
Hewlett-Packard	.7	.6	.0	109	3.4%	3.9%	.0%	3.5%
Computervision	.4	.0	.4	0	2.0%	.0%	7.2%	.0%
Intergraph	.4	.0	.3	0	1.7%	.0%	5.9%	.0%
Whesoe Computing Systems	.2	.0	.2	0	1.0%	.0%	3.8%	.0%
Superdraft	.2	.1	.1	12	1.0%	.6%	1.7%	.4%
Investronica SA	.2	.2	.0	8	.9%	1.0%	.3%	.2%
Aura CAD/CAM Systems	.1	.0	.1	0	.5%	.0%	1.6%	.0%
FEA Limited	.1	.0	.0	1	.3%	.1%	.2%	.0%
American Small Business Comp.	.1	.0	.1	0	.3%	.0%	1.0%	.0%
Ithaca Software	.1	.0	.1	0	.3%	.0%	1.0%	.0%
McZ Engineering Software	.1	.0	.1	0	.3%	.0%	1.0%	.0%
Engineering Systems Corp.	.1	.0	.0	0	.2%	.0%	.7%	.0%
Algor Interactive Systems	.0	.0	.0	0	.2%	.0%	.7%	.0%
Mode CAD	.0	.0	.0	0	.2%	.1%	.5%	.0%
Pathtrace	.0	.0	.0	1	.2%	.1%	.5%	.0%
Ziegler	.0	.0	.0	0	.2%	.0%	.7%	.0%
Innovative Data Design	.0	.0	.0	0	.1%	.0%	.5%	.0%
Vision 3D	.0	.0	.0	0	.1%	.1%	.0%	.0%
ESDU International	.0	.0	.0	0	.0%	.0%	.2%	.0%
Foresight Resources	.0	.0	.0	0	.0%	.0%	.2%	.0%
MacNeal-Schwendler	.0	.0	.0	0	.0%	.0%	.2%	.0%

(Continued)

TABLE NUMBER: 20 (Continued)
 TITLE: 1990 Final Market Share Estimates
 APPLICATION: Mechanical
 PLATFORM: Personal Computer
 REGION: Rest of World
 UNITS: Millions of Dollars/Actual Units

Company =====					----- Market Share -----			
	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====	Total Revenue =====	Hardware Revenue =====	Software Revenue =====	Wkstns Shipped =====
Other Companies	4.1	4.1	.0	1,079	19.4%	28.1%	.0%	34.2%
All Companies	21.1	14.6	5.7	3,156	100.0%	100.0%	100.0%	100.0%
 All U.S.-Based Companies	 19.4	 14.3	 4.4	 3,135	 91.7%	 98.1%	 77.3%	 99.3%
All Asian-Based Companies	.0	.0	.0	0	.0%	.0%	.0%	.0%
All European-Based Companies	1.8	.3	1.3	21	8.3%	1.9%	22.7%	.7%
All Hardware Companies	14.3	13.9	.0	3,023	67.7%	95.0%	.0%	95.8%
All Turnkey & SW Companies	6.8	.7	5.7	133	32.3%	5.0%	100.0%	4.2%

Source: Dataquest
 June 1991

Dataquest

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