

Chapter 8

Autodesk and AutoCAD

Autodesk as a company, has gone through several distinct phases of life. There were the “Early Years” which covers the time from when Autodesk was founded as a loose programmer-centric collaborative in early 1982 to the company’s initial public offering in 1985, the “Adolescent Years” during which the company grew rapidly but seemed to do so without any clear direction and the “Mature Years.” The beginning of the latter phase began when Carol Bartz became president and CEO in 1992 and continues to the current time. Even under Bartz, there were several well defined periods of growth as well as some fairly stagnant years.¹

Mike Riddle gets hooked on computers

Mike Riddle was born in California with computers in his veins. In junior high school, he built his first computer out of relays. It didn’t work very well, but it convinced him that computers were going to be an important part of his life.

After attending Arizona State University, Riddle went to work for a steel fabricator where he had his first exposure to CAD. The company had a \$250,000 Computervision system that, although capable of 3D work, was used strictly for 2D drafting. The company was engaged in doing steel detailing for the Palo Verde nuclear power plant in Arizona. Riddle felt that anything they were doing on this project with the Computervision system could be done on a microcomputer-based system. About the same time Riddle began working at a local Computerland store where they provided him with free computer time to do with as he wanted.

Meanwhile, out in California, John Walker, who had a BS in general engineering from Lehigh University, started a computer business in 1977, Marinchip Systems, which provided systems built around the TI 9900 microprocessor.. Dan Drake, who was to be a key player in this story, joined Walker at Marinchip in 1979. Previously he had been a consultant involved in computer-aided manufacturing. By this time, Riddle was a self-employed computer consultant. He produced some utility programs for Walker and Drake that they included with their early systems.

Starting in 1977, Riddle began working on a graphic program he called Interact. At the same time, he was working as a consultant for the Frank Lloyd Wright Foundation in Scottsdale, Arizona developing an accounting system for the foundation. In the process, he became the organization’s computer guru. This provided him an opportunity to observe their design process, and Interact began to be used for some actual architectural work.

¹ The early portion of this chapter is based upon an extensive interview with Mike Riddle on April 28, 2001, an article written by David Cohn in the February 2001 issue of *Engineering Automation Report*, *The Autodesk File* by John Walker as well as updates on Walker’s web site plus other historical material. The bulk of *The Autodesk File* consists of a series of “Information Letters” written by Walker or Dan Drake. These are often referred to by number.

Organizing a new type of software company

In late 1981, the 33-year old Walker and Drake who was 40, invited 14 friends to a meeting at Walker's home in Mill Valley, California where the seed was planted for organizing a new software company. The plan was to publish software programs developed by individuals who would be partners in the endeavor. Most of the people he invited to join the company were still employed by other firms and the concept was that they would develop new software in their spare time. Each principal was expected to kick in a minimum of \$3,000 to start the company, although physical items such as computer hardware used for software development could be counted against this commitment.

A total of 18 people, including Riddle, Walker and Drake, were involved in starting a company in early 1982 that was initially called Marin Software Partners. One person dropped out fairly soon leaving 17 principals. Between them, they put up \$59,000 to start the business, with much of the seed money coming from Walker's Marinchip Systems.² The small amount of startup capital was a far cry from the millions of dollars venture capitalists put into new companies today

Considerable discussion went into how the company should be organized. While Walker acknowledged that a corporation would be best, he was very concerned about the way software royalties would be treated for tax purposes in a corporation. In an early document, he went into some depth concerning the perceived advantages of a partnership versus a corporation.³ Therefore, for the first few weeks the business functioned as a partnership. Fairly soon, however, everyone became convinced that this was far too awkward and on April 26, 1982 the company was formally incorporated in the state of California as Autodesk.

It is interesting to note in these early 1982 documents the extent to which Walker seemed to be obsessed with tax issues. Eventually, he would move to Switzerland, in part to avoid U.S. taxes.

Approximately 59,000 shares of stock were issued to the original 13 California-based partners at \$1 per share. It turned out that there were some legal restrictions that prevented the European partners from being initial stockholders. By mid-2007, each of these original shares was worth the equivalent of about \$7,500. Since none of the founders were drawing salaries (they all had other jobs), this small amount of startup cash was sufficient to start the company. Autodesk's cash balance never dropped below \$25,953, a far cry from the nearly \$1 billion it has on hand today.

Interact emerges as lead product

In *Information Letter #1*,⁴ Walker listed 15 different programs that the founders were already working on or had the expertise to develop. The majority of these programs were what could best be described as system utilities, such as a filing program originally called Cardfile. Some exceptions included a program for lens design (LENS) and a PERT-like Executive Planning Aide. The most significant program out of the 15, however, was clearly Interact.

Riddle signed a non-exclusive licensing agreement with Autodesk for Interact in return for royalty payments. It is possible that Walker was willing to take on this software

² Today, Autodesk has a market capitalization of nearly \$10 billion.

³ Walker, John, *The Autodesk Files*, Pg. 28

⁴ Walker, John, *The Autodesk Files*, Pg. 28

on a non-exclusive basis because he underestimated its market potential. One concern he had was that it would require a hard disk or at least double-density double-sided 8-inch floppy disks, both of which were fairly expensive at the time. The terms of this agreement would eventually result in major disagreements between Riddle and Autodesk. More about that later.



Figure 8.1

Autodesk Founders

(From left to right: Rudolf Kunzli, Mike Ford, Dan Drake, Mauri Laitman, Greg Lutz, David Kalish, Lars Moureau, Richard Handyside, Kern Sibbald, Hal Royaltey, Duff Kurland, John Walker, Keith Marcelus)

The names keep changing

Shortly after starting the company, Marin Software changed the name of Interact to MicroCAD. At the same time, the filing program, Cardfile, was renamed Autodesk. On March 19, 1982 these two programs were shown at the 6th West Coast Computer Faire. The company paid \$1,200 for a booth at the Faire, probably the best marketing investment ever made by a company in the software industry. It was around this time that

Walker came to the conclusion that a partnership arrangement involved more problems than it was worth and that the company would be incorporated instead,

Walker and his partners spent a fair amount of time struggling to come up with a company name that would be acceptable to the California regulatory authorities. At the Faire they used the name Desktop Solutions. That name was rejected by the state as were several other alternatives submitted by the company. By April 9, 1982 the company gave up on finding a clever name and simply used Autodesk in the papers it filed for incorporation, with the expectation that they would find a permanent name at a later date. That never happened.

AutoCAD starts to gain traction

Riddle continued to develop both CP/M and IBM PC versions of the software independent of the work being done at Autodesk on what was now being called AutoCAD. In fact, after the license agreement was consummated, Riddle had little involvement with the Autodesk version of the software. One of the major tasks at this point in time was converting the original Interact software to the “C” programming language for the IBM PC. First pre-release shipments were in late August 1982.

Meanwhile, the other founders continued to work on a program they called Window (a screen editor that was subsequently called Autoscreen), a spreadsheet program called OptiCalc, a BASIC compiler, and several other programs. It was not yet clear that AutoCAD would eventually dominate Autodesk and the lives of everyone associated with the company.

The turning point came when the company participated in COMDEX in November 1982. The CAD software shown at that conference was AutoCAD-80, so named because it ran on machines powered by either the Zilog Z80 or Intel 8080 microprocessor. Another company had appropriated the MicroCAD name sometime after the West Coast Computer Faire and before COMDEX, necessitating another name change.

This early version of AutoCAD proved to be one of the hits of the show. Several other vendors (Sierra Data Systems, Sun Flex, and Victor demonstrated AutoCAD in their booths and the software was awarded “best of show.” For a while, the Victor 9000 version was the most popular, because the Victor had the highest resolution screen of any PC, 800 by 400, and dual, high-density (1.2MB) floppy drives were standard. Readers need to remember that this was the point in time when the PC industry was just starting to take off. New manufacturers were coming out of the woodwork, not unlike the dot com boom 18 years later. This initial version of AutoCAD consisted of approximately 12,000 lines of source code. The first revenue copy of AutoCAD was sold to Jamal Munshi, the president of MOMS Computing in Sausalito, California..

Sales continued to be fairly slow until a new Intel 8086 version, written in C and called AutoCAD-86, was released in January 1983. Both versions were priced at \$1,000. A dimensioning package was being developed that was to sell for an additional \$500. It would eventually be combined with other features and sold as ADE-1 (short for AutoCAD Drafting Extension). Sales during that first year ending January 31, 1983 were \$14,733 and the company lost \$9,465. This was a far cry from the nearly \$2 billion in annual revenue the company would generate several decades later.

The IBM PC version was what enabled the company to shift into high gear. The first mention of AutoCAD in an industry publication may well have been a brief article in the April 1983 issue of the *Anderson Report on Computer Graphics* which noted that the company had sold 400 copies of AutoCAD.⁵ During calendar 1983, Autodesk sold over 1,000 copies of AutoCAD and grossed more than \$1 million. With a winner in hand, development on the other Autodesk packages was put on the back burner.

Adding marketing to the mix

As the company shifted into high gear, it hired its first marketing person, Mike Ford, who had been working in a computer store in Sausalito. He joined Autodesk on June 1, 1982 although it appears that initially this was on a part-time basis. According to Riddle, Autodesk would never have succeeded without Ford's involvement. Walker had a reputation for being able to write software code quickly, but was not known as a good program architect. He was also not particularly easy for most people to work with. Walker's management style was to try to run the company by telephone rather than having face-to-face meetings with employees. This was not particularly conducive to being a market-centric executive, hence the need for someone like Ford.

An article written by Rik Jadrnicek in the January 1984 issue of *Byte* magazine particularly excited the company.⁶ Although the article did not emphasize AutoCAD, it did provide some credibility for micro-based CAD software. The most impressive illustration in the article was a view of the Golden Gate Bridge drawn in the summer of 1983 by a student, Malcolm McCullough, using an early version of AutoCAD. Perhaps it was no coincidence that Jadrnieck was a microcomputer consultant in Mill Valley, California.

Autodesk becomes a real company

The huge surge in business activity in 1983 did not come without some traumatic changes in running the company. Starting in late 1982 but picking up momentum in early 1983, Autodesk began to make the transition from being a rather loose collection of part-time software developers into a real company. Perhaps the most pressing problem was how the original partners could make the transition to being full-time employees.

Greg Lutz, who had been working full time on AutoCAD-86, was the first employee at a salary of \$1,000 per month starting in January, 1983. The company was still not sure that the business would be successful, so the agreement with Lutz was initially for just four months. Dan Drake and Duff Kurland also expressed an interest in working full time for the company. In addition, Mike Ford replaced Jack Stuppin on the board of directors. Stuppin had been the company's early financial advisor but felt that he had a conflict of interest in continuing on the board.

Autodesk was also getting more serious about the sales side of the business. In December 1982, Mike Ford agreed to work full time for a 10% commission up to a maximum of \$6,000 per month for the next three months with the commission rate dropping thereafter. For the most part, the company was looking at contacts Marinchip Systems and Walker already had to help the company move software. One of these, a

⁵ *The Anderson Report*, April 1983, Pg. 1

⁶ Jadrnicek, Rik, *Computer-Aided Design- Significant CAD power is coming for desktop minicomputers*, *Byte Magazine*, January, 1984

company named Sun-Flex, was expected to sell up to 300 copies of AutoCAD per month combined with Sun-Flex's Touch Pen hardware. By June 1983, Autodesk had shipped 370 copies of AutoCAD to Sun-Flex, although it is not clear how many of these were actually sold to end users.

In general, early marketing focused on finding hardware vendors who would OEM AutoCAD (for around \$450 per copy) and include it with the hardware they sold. As an example, the company was enthused about the prospect of Texas Instruments including AutoCAD with an IBM PC clone TI was planning to introduce. They thought this might result in the sale of 10,000 copies.

Several trade shows Autodesk attended early in the year (CADCON and CPM-83) made the firm aware that it needed some people who could effectively demonstrate AutoCAD. For the most part the company was staffed with programmers, none of whom except for Mike Riddle had any drafting experience, and Riddle was back in Arizona most of the time.

Three releases of AutoCAD were made during 1983 – 1.2 in April, 1.3 in August and 1.4 in October. By September the company was starting to talk about adding 3D capabilities to what up until then had been a 2D drafting package.

Establishing a business presence

By mid-1983 the company actually had an office. Until then, they had been operating out of their own homes or Marinchip Systems' facility. The first office was at 150 Shoreline, Building B, Room 20 in Mill Valley, California. At that point, the company hired its first customer support representative. The office was not big enough for all the company's activity, however. As an example, Mike Ford still handled sales out of his home. Ralph Grabowski recalled Lionel Johnston⁷ telling him about a visit there. He said Mike's living room was filled with Victor 9000 computers, and Mike was sticking in and pulling out diskettes as they made copies of AutoCAD.⁸

At this point, the company had made the transition from a software publishing business utilizing the efforts of multiple independent programmers into a classic small company with a single product – AutoCAD. By mid-1983, the drawings this software was capable of producing were starting to approach the real world needs of drafters.

During 1983, Autodesk started recognizing the need for more formal software development practices – simple things, like an organized bug reporting process. There was still no clear distinction between marketing and sales. At a June meeting, John Walker filled in for Mike Ford in providing a marketing report. It was strategy and deal centric. On the other hand, Richard Handyside, reporting on activity in England, spoke about specific numbers of product demonstrations and dealer contacts. Walker estimated that as of late June 1983, or a little less than 18 months after it was started with a capital infusion of \$59,000, the company had a value of about \$200,000.

June 1983 was a key inflection point for the company. It moved from a group of programmers, each working on projects of their choice, to a company with the kernel of a business plan, an organizational structure, and even budgets. For the typical free spirited programmers of the early 1980s, these were traumatic changes. Walker proposed that the company be split into three divisions: marketing under Mike Ford, operations under John

⁷ Johnston was the founder of *CADalyst*, a magazine that initially focused strictly on AutoCAD.

⁸ Personal discussion with Ralph Grabowski

Kern, and technical under Dan Drake. Proposed monthly budgets for these three groups were \$14,000, \$10,500 and \$10,500 respectively. A subsequent report written by Kern Sibbald in early July indicates that Drake did not take over the technical division and that position was still considered open.⁹

Two non-stockholders were hired on a half-time basis—Jane Kern and Kathy Marcelus, the wives of John Kern and Keith Marcelus. As the year progressed, additional stockholders gave up their day jobs and joined Autodesk on a full time basis. By early July four were on board: John Kern, Keith Marcelus, Greg Lutz and Duff Kurland. Jack O’Shea, who was not a stockholder, joined as the fifth full-time employee. Although Walker was exerting the original stockholders to work even harder and to consider a full time commitment at Autodesk, he and Dan Drake were still involved in running Marinchip Systems and would be until late 1984.

It was also at this point in time that Autodesk realized that it was not the only game in town. Other companies were starting to release PC CAD packages. One package that particularly concerned Walker was CADplan, especially since it appeared that Sun-Flex was working with the package’s developer, P-CAD. Sun-Flex was Autodesk’s major distributor for AutoCAD at this point, responsible for about half the current volume, and Walker envisioned that this relationship could change if CADplan proved to be better accepted in the marketplace than AutoCAD. P-CAD was eventually acquired by CalComp and renamed CADVANCE. It is interesting to note that there are only a few minor references to VersaCAD in *The Autodesk Files* even though VersaCAD probably was a more significant competitive threat at the time.

Spawning a publishing industry

Also in 1983, Lionel Johnston launched *CADalyst* magazine—the first magazine for AutoCAD users – from the kitchen of his home in Nelson, British Columbia. It began first as a newsletter for the AutoCAD User Group, then became the “journal” for AutoCAD users a year later. Autodesk helped fund the printing and distributed the magazine to all registered users until early 1986. Ad sales eventually enabled the magazine to become independent of Autodesk. In September 1987, David Cohn, who had been editing the Memphis User Group Newsletter, became editor of *CADalyst*.

In 1985, *Cadence* magazine was launched by David Baceski in Austin TX as the second AutoCAD magazine. It immediately became the arch-competitor to *CADalyst*, and subsequently launched a year-long legal battle during 1989-90 which ended in a draw when Baceski agreed to not pursue the lawsuit, and Johnston agreed to not counter-sue. In 1991, Johnston sold *CADalyst* to Aster Publishing for an estimated \$3 million. Subsequently Aster was sold to Advanstar Communications and in 2004 the company acquired *Cadence* and merged it with *CADalyst*.

1984 – Explosive growth continues

Fiscal 1984¹⁰ was the year many startup companies dream about and never have. From less than \$15,000 in revenues in fiscal 1983, Autodesk’s sales exploded to over \$1 million and the company had a profit of over \$100,000. With 1,000 copies of AutoCAD sold by the end of the fiscal year, it was well on its way to becoming the most popular

⁹ Walker, John, *The Autodesk Files*, Pg. 166

¹⁰ The company’s fiscal year ends on January 31st.

CAD package the industry has ever seen. One result of this fast growth was that the company split its still privately-held stock 10:1 in July, 1983.

Little did the world realize that this was the start of something huge, but they began to get an inkling when sales in fiscal 1984 exploded to 10,000 units. During that year, management spent a significant amount of time exploring several venture capital funding opportunities. None of them work out, however, and Autodesk continued to grow at a phenomenal rate using internally generated funds.

Perhaps the most significant management development in 1984 was the hiring of Alvar Green as chief financial officer. He would later become president and CEO as Walker relaxed his grip on the company. The company was still having problems achieving recognition from CAD industry professionals. Ed Forrest commented “To date: 4,895 systems installed. AutoCAD acts like real, grownup CAD. It isn’t; but its great to practice on.”¹¹

The company ran its first four-color ad in *Scientific American* in September 1984. It is interesting to note that there is much less material in *The Autodesk File* covering 1984 than there is for earlier or subsequent years.

Autodesk goes public

Autodesk shifted into an even higher gear in 1985 as sales of AutoCAD grew to about 25,000 units and gross revenues increased to \$27 million with profits of more than \$6 million. The financial results were sufficiently impressive that the company had little trouble going public in June 1985. Autodesk raised a little more than \$10 million by selling a million shares at \$11 per share (the difference was the underwriting fees).

For the original stockholders, this was a return of \$165 for each dollar they had invested. By the end of the year the stock was selling for \$21 resulting in a number of new millionaires in Marin County. Based on subsequent stock splits, the initial offering price was the equivalent to \$0.92 for today’s stock and the end-of-year price was the equivalent to \$1.75. Perhaps one of the most significant aspects of the company’s IPO was that the company was able to reach the point where it could go public without having used any external venture capital funding. It is unlikely that many companies would try to do that today.

Product development also accelerated in 1985. In May, the company released AutoCAD 2.1, which was the first version to include three-dimensional capabilities. Version 2.15 included an external programming language based on LISP that was first called the “Variables and Expressions” feature. It was renamed AutoLISP in Version 2.18. At this point, AutoCAD consisted of over 100,000 line of C code. Its list price had increased to \$2,000 plus \$500 each for ADE-1 and ADE-2. ADE-1 supported complex dimensions, fillets, crosshatching, and architectural units. ADE-2 required ADE-1 and supported object snap, shape dragging, isometrics, and attributes. Users really needed both to do any complex drafting. A bi-directional translator to and from Intergraph’s SIF format – called AutoLink – was also available from Autodesk for \$10,000.

AutoCAD was supported on 31 different PCs. At that time, PCs were not as standardized as they are today and software vendors needed to test and certify their packages on each machine. Texas Instruments was now a major AutoCAD player. It

¹¹ *A-E-C Automation Newsletter*, June 1984, Pg. 2

added AutoCAD to its own Professional Computer and sold the combined package for \$10,000.

In May 1985, Autodesk combined ADE-1 and ADE-2 into a single package that had a suggested retail price of \$1,000. At the same time, the company introduced ADE-3 that provided three dimensional visualization of wireframe and hidden line models, polylines (consisting of both line segments and arcs), interactive entity selection with highlighting and LISP enhancements. The suggested price for ADE-3 was \$500. By the end of the year, AutoCAD was available in six different languages including Japanese.

Autodesk aggressively promoted AutoCAD 2.1 at the SYSTEMS-85 conference in Anaheim, California in June 1985 in both its own booth and in the booths of a number of partners. The company also showed prototypes of UNIX versions of the software running on Sun Microsystems and Apollo workstations. Although Autodesk would eventually support several different UNIX platforms, this never became a major part of the company's business and UNIX support was dropped with Release 13.

Third party development – a key building block

AutoLISP would eventually become the primary tool for developing specialized applications. Up to this point, most CAD systems were sold by vendors who provided all the applications they perceived their users wanted. As an example, there were no independent electrical schematic packages offered by third party firms that worked with Intergraph's IGDS CAD software. If users wanted to do electrical schematics, they purchased the application Intergraph offered. Autodesk changed the dynamics of how CAD applications were developed and marketed. In Version 2.5, AutoLISP allowed access to the DWG database. AutoLISP was based on XLISP, a public domain version of LISP written by David Betz. Betz later complained that Autodesk had failed to acknowledge the source, which the company later did.

Autodesk encouraged third-parties, many of whom were also part of its growing dealer network, to create applications in areas where Autodesk itself had limited expertise. AutoLISP was the key development tool for these organizations and within a few years there would be literally thousands of such applications and AutoCAD add-ons for everything from spell checking to specialized symbol libraries. Some of these firms, such as Softdesk, would eventually become significant business enterprises themselves.

When John Walker initially proposed LISP as an external AutoCAD programming language, he thought that it would be the first of a series of such development tools. Other languages he mentioned in a February, 1985 memo included FORTRAN, compiled BASIC, C and Pascal. He thought this could be done over the next 12 months.¹² It did not happen and it would be a number of years before additional external development tools for AutoCAD would be available.

The first significant AutoCAD application marketed directly by Autodesk was AE/CADD (later renamed AutoCAD AEC Architectural), which greatly improved users productivity in creating and modifying architectural drawings. It had been developed by Archsoft and was licensed by Autodesk for sale through its distribution channel. The package had an end user price of \$1,000. This package began shipping in mid-1985.

The company also launched CAD/camera, a software package that would take a scanned raster image and convert it to an AutoCAD compatible vector file. At a time

¹² Walker, John, *The Autodesk Files*, Pg. 233

when most scanning solutions sold for as much as \$100,000, CAD/camera was priced at \$3,000 for the software alone. Users still needed to purchase a scanner or have the scanning performed by an outside service bureau. CAD/camera was never a particularly good or successful product. Eventually, Autodesk incorporated raster data directly into the AutoCAD data structure. At the launch of CAD/camera, Walker reportedly boasted that if the new product sold at least as many as copies as AutoCAD, they would become very rich. He possibly thought that CAD/camera would outsell AutoCAD.

Part of CAD/camera's failing was that it was primarily written by an outside organization that was not particularly responsive to Autodesk's requests for improvements. As a result of that experience, Autodesk took all crucial development in-house.

Riddle and Autodesk part ways

Within a few years, the relationship between Mike Riddle and Autodesk soured. According to Riddle, the non-exclusive terms of the original agreement were actually Walker's idea. Walker liked contractual simplicity and used as an example the page and a half contract Colgate Palmolive had for marketing Listerine. As mentioned earlier, Walker initially felt that Interact had fairly limited prospects. He most likely never expected the program to take off the way it did.

The original agreement was for a 10% royalty fee. What were nominal royalty amounts when just a few thousand copies of AutoCAD were sold annually became a fairly substantial amount of money as the volume increased. In the year ending January 1985, the royalty payments to Riddle amounted to nearly \$600,000. One step Autodesk took to minimize the royalties owed Riddle was to consider many AutoCAD enhancements to be separate products. That was one of the primary reasons behind packages such as ADE-1 and ADE-2.

Autodesk tried to stop Riddle from marketing new versions of his software, called EasyCAD, which first became available in 1985. The new package was modeled after the Apple Macintosh and was intended to be very easy to install and learn – no classes and no consultants to support it. Legal actions initiated by Autodesk slowed the commercial momentum of EasyCAD and enabled under-\$100 CAD products such as AutoSketch (written by Walker) and Generic CAD (later purchased and then killed off by Autodesk) to gain market share.

For several years, Autodesk reluctantly paid Riddle over \$1 million per year in royalties. After an extended period of confrontation including a lawsuit filed by Riddle and his wife in August 1991, Riddle and Autodesk resolved the dispute in early 1992. In return for a payment of \$11.9 million dollars, Riddle waived all future royalty payments. Considering that by that time there was only a minuscule amount of the original Interact code still in AutoCAD, this was probably a reasonable resolution for both parties.

Autodesk continues rapid growth

By early 1986, Autodesk was on a roll. One major reason for the company's early success was its reliance on a dealer network to sell AutoCAD on a worldwide basis. The company did not restrict the number of resellers in a given geographic area and as a consequence, there was substantial price competition between dealers to the point that many sold the software for little more than what they paid Autodesk. The expectation

was that they would make their profit on hardware, training (there were 40 authorized AutoCAD training centers by late 1985) and post-sale support.

Many of the early dealers were users who liked the software and felt that they could make some incremental profit by acting as a reseller. In the process, they were able to acquire licenses for their own use at a substantial discount. For many years this model worked for both Autodesk and the dealers. In the early years, a key element of the reseller channel was also more than 1,000 computer stores, mostly ComputerLand and Entre locations. A number of computer manufacturers including Digital Equipment, Tandy, Texas Instruments and Wang Laboratories distributed AutoCAD although by fiscal 1986 this amounted to less than ten percent of the company's revenue.

AutoCAD was beginning to attract significant attention as it quickly became the low-cost standard. According to David Cohn, who was the editor of the Memphis User Group Newsletter at the time: "It has become the de facto standard much the same way dBase is the standard for database programs and Lotus 1-2-3 is the standard for spreadsheet programs."¹³ There were over 50 local user groups in North America, many of which published newsletters or maintained on-line bulletin boards.

Mike Ford left the company in early 1986. With more than 200 employees, the company was beginning to show the signs of becoming a serious player in the computer software industry. It had four foreign subsidiaries in Switzerland, Sweden, England and Japan. Company officers at this point in time were:

- John Walker – president
- Dan Drake – vice president and secretary
- Al Green – vice president and CFO
- Keith Marcelius – vice president of research and development
- Richard Handyside – vice president of marketing and sales

Software Engineering was under Fred Hopperstead. Duff Kurland, one of the founders, handled most of the software documentation. Quality assurance was under another founder, Mauri Laitenen, although this was considered to be one of the company's problem areas. Product management was under Eric Lyons who had previously been at Auto-trol Technology.

David Kalish, also a founder, was responsible for coordinating third party software development. There were perhaps 200 third-party application programs available at the time. As the number of third party applications increased, Autodesk began publishing a catalog of them in April 1985.

Autodesk always pushed hard to have customers take problems to the dealer from whom they purchased the software. Bill Menser was in charge of product support taking on "the ultimate responsibility." Sandra Boulton headed up the company's marketing department while Bud Runnels was director of Autodesk's sales department and was handling major accounts while Richard Cuneo was director of dealer/distribution sales.¹⁴

Autodesk released AutoCAD 2.5 at A/E/C SYSTEMS in June 1986 with over 70 companies displaying AutoCAD-related products in their booths. The *Memphis Newsletter* was duly impressed.

¹³ Cohn, David, *Memphis User Group Newsletter*, March 1986

¹⁴ Cohn, David, *Memphis User Group Newsletter*, May 1986

“We are stating right here, categorically, that AutoCAD Version 2.5 is the new standard by which all other CAD packages will be judged.”¹⁵

Autodesk showed AutoCAD running on Apollo, Sun and IBM (RT) workstations and they demonstrated 3D capabilities in the “Futures” portion of its booth. The company demonstrated AutoSHADE, which was capable of generating shaded images of two and a half dimensional models with availability expected in late 1986 at a price of \$500. Autodesk also announced that it had placed its device driver development software (ADI) in the public domain. List price for AutoCAD with ADE-3 was \$2,850.

The UNDO command was extended to undo just about anything one could do with AutoCAD including recapturing erased items. There was also a REDO command added to this release. With Version 2.5, colors and line types were now independent. Other enhancements included support of IGES 2.0, tracking of the time spent working on a given drawing, a DIVIDE command that enabled the user to divide an object into equal length parts, and the ability to explode a block into its basic elements for editing. Another new command was MEASURE. Overall, this release had 70 new commands.

The 1986 A/E/C SYSTEMS conference also saw the first National AutoCAD User Group meeting presided over by Sandra Boulton. David Cohn was one of three individuals representing user groups at the initial session attended by 120 users.

Debate over hardware locks

Version 2.5 was the first release of AutoCAD distributed in the United States and Canada that had a hardware lock. It was about the size of a pack of cigarettes and went on the COM1 port. This caused a storm of complaints from users especially since most other PC software companies were moving away from hardware locks at the same time Autodesk was introducing the technology. Some companies even began offering software that enabled users to run AutoCAD without the hardware lock installed. Their promotional material was very carefully worded to imply that the software should only be used for legally licensed software. Part of the problem was that some users were having problems running legal copies of AutoCAD due to configuration issues.

Before 1986 was over, Autodesk removed the hardware lock requirement for copies of AutoCAD sold in North America and distributed to all registered users a copy of AutoCAD 2.52 which did not require the lock. In the announcement concerning removal of the lock, Green was particularly upset over the negative reaction among users when, according to him, all Autodesk was doing was protecting its intellectual property. He stated that he was surprised users looked at the hardware lock as being an assault on their moral integrity and he pointed out that all the vendors of 32-bit engineering workstations incorporated some form of software protection. My analysis is that Autodesk was simply tired of the hassle and that it was probably starting to cost the company some business. A byproduct of this episode was that Autodesk became one of the strongest backers of the Business Software Alliance and its anti piracy campaigns. Autodesk has not been shy in suing companies who use illegal copies of its software and publicizing those cases.

Changes in management and direction

¹⁵ *Memphis Newsletter*, July 1986

Fiscal 1987 saw the company's revenue increase by nearly 78 percent to over \$54 million while earnings grew by a similar amount to \$11.6 million. During the following year the pace continued with revenues increasing to over \$79 million and earnings to \$20.6 million. Autodesk's stock continued to do well and the company initiated a three for one split in March 1987 and sold an additional 2,500,000 shares in June 1987 with net proceeds to the company of \$57.4 million. In mid-1987 Autodesk was named the fastest growing small company for the second year in a row by *Business Week*.

In November 1986, Al Green became CEO, replacing John Walker who remained chairman of the board until June 1988. At that point, Green became chairman of the company although Walker remained a company employee, working on new software out of his home in Muir Beach, California rather than at Autodesk. At the time, there does not seem to have been much concern that a financial executive was taking over the reins of a high tech software firm, especially one with a very independent minded development staff. One other key management change was the hiring of Malcolm Davies in January 1988 as vice president of marketing and sales, a position similar to the one he had previously held at Calma. Version 2.6 began shipping in April 1987 with support for SUN, Digital Equipment and Apollo workstations as well as IBM compatible PCs running MS-DOS.

During 1987, several significant product and business developments occurred at Autodesk. Around mid-year, the company announced that it was working on a solids modeling enhancement to AutoCAD based on software the company had obtained when it acquired Cadetron several months earlier. Initially this software was called The Engineer Works but that name was subsequently changed to AutoSolid. Initial plans were to release the software on UNIX platforms first (probably because of performance issues) and then later on PCs. AutoSolid was a stand-alone product that initially sold for \$5,000. Data could be transferred to AutoCAD for the production of detailed drawings.

Other new products were AutoCAD AEC Mechanical which facilitated designing plumbing and HVAC elements of buildings and AutoShade for full color rendering. AEC Mechanical was released in August 1987 while AutoShade was released a month later. Both sold for \$500 per copy. Later that year the company introduced AutoFlix, a \$35 enhancement to AutoShade that enabled users to create animated sequences of shaded models. The company also announced around mid-year that it had established a Federal Accounts Group.

Probably the most unusual development during this period was the company's \$225,000 investment in External Tanks Corporation, located in Boulder, Colorado. This company, which was 80 percent owned by the 57-member University Consortium for Atmospheric Research, planned to reuse Space Shuttle external fuel tanks for orbiting research purposes or experiments utilizing the tanks upon reentry. The expectation was that this would be far less expensive than alternative facilities such as the International Space Station that was in the early stages of design. Autodesk thought this would be a good way of obtaining some publicity for the company and to possibly create a presence in the space program. Other than some detailed plans, nothing ever came of this initiative.

Autodesk introduced AutoCAD Release 9 in September 1987 with a new user interface that included pull down menus. The company's marketing people decided that this was really the ninth release of AutoCAD and decided to go to a whole number nomenclature rather than call it Release 2.7 or something similar. Data files were now

fully portable between DOS and UNIX versions of AutoCAD, eliminating the need to use DXF transfers.

The MS-DOS version of Release 9 also required a floating point coprocessor. The new user interface could only be used with newer graphics cards such as CGA, EGA, VGA or Hercules. Meanwhile, Autodesk increased its focus on policing sellers of illegal copies of AutoCAD. Custom agents raided the Golden Shopping Center in Hong Kong and seized 200 illegal copies of AutoCAD.

By the end of 1987, Autodesk had sold nearly 150,000 copies of AutoCAD and there were more than 400 third party vendor products in the company's Applications Catalog. By this point there were over 1,300 resellers of AutoCAD including various computer stores in the United States and 150 dealers and distributors in foreign countries. There were also more than 200 authorized training centers worldwide. By April 1988, there were 48 books available describing various aspects of using AutoCAD. One of the more significant AutoCAD books was *Inside AutoCAD*, published by New Riders Publishing in 1985. By Mid-1989 more than 250,000 copies had been sold.¹⁶

In late 1987, Autodesk put together a plan to create a new product for the Apple Macintosh computer. The initial thinking was that it would not be possible to simply port AutoCAD to the Macintosh. The planned project was expected to take about a year and would have resulted in a two-dimension version of AutoSketch, but with many additional features. In early February 1988, John Walker personally began working on porting AutoCAD to the Macintosh II. Within two weeks, he had a demonstrable version working. The project to create a new program was soon dropped and a version of AutoCAD 10 ported to the Apple platform with some Macintosh-specific extensions was soon released.

Autodesk was different than most other software firms, perhaps because of its location in Sausalito. Employees frequently brought pets to work and it was an unpretentious operation. According to Sandra Boulton, director of marketing: "We still have folding chairs and used furniture. We still hold our beer busts on Friday nights. This doesn't look like a \$50 million company."¹⁷ For the first time, however, there were starting to be comments about AutoCAD's high price, at least as compared to other PC CAD software, and the fact that the software was falling behind technically. There were two areas where the latter was particularly true, three-dimensional modeling and the user interface.

In December 1987 the company promoted Chris Record, who had been general counsel and corporate secretary to the new position of vice president for corporate and business development. With \$100 million in cash and short term investments, the company was getting ready to expand via acquisitions.

Autodesk invests in Xanadu

The first significant diversification away from AutoCAD and its related applications came in 1988 when Autodesk acquired an 80 percent interest in Xanadu Operating Company. Xanadu¹⁸ was the dream of Theodor Holm Nelson, a software architect who had coined the term "hypertext" in the mid 1960s. Ted Nelson set out at the

¹⁶ Today, there are nearly 1,800 books about AutoCAD listed on Amazon.com.

¹⁷ Freiburger, Paul and McNeill, Dan, "Autodesk's Lucky Strike," *PC World*, December 1987

¹⁸ Xanadu was the elaborate palace in *Kubla Kahn*, a poem by Samuel Taylor Coleridge.

time to create a universal library and a worldwide hypertext publishing tool that would be accessible by anyone.

For the next 25 plus years, Nelson struggled to get someone to fund his grandiose ideas. For the most part, work on Xanadu was done by a small coterie of young hackers who fervently believed in Nelson's vision of changing how the world dealt with the growing flood of computerized information. Among these disciples were Roger Gregory, Michael McClary and Mark Miller. To quote Gary Wolf writing in *Wired Magazine*, "Xanadu was supposed to save the world."¹⁹

Nelson achieved a degree of fame among the more esoteric elements of the 1970's computer movement with his publishing of a 300,000 word treatise on the digital revolution called *Computer Lib/Dream Machines*. For the next decade, Xanadu's devotees attempted to actually implement Nelson's ideas without much success. They frequently had small parts of Xanadu's core software demonstrable, but anyone who delved into what they were doing soon became aware that managing the volume of data they envisioned was well beyond any computer systems then available or soon expected.

During these years, Nelson supported himself going between jobs in industry and teaching assignments. In 1981 he published a book, *Literary Machines*, that was a rambling discourse on the hypertext concept. He revised this book in 1987. About the same time, Gregory participated in a series of annual hackers conferences that were inspired by Steven Levy's book, *Hackers*. One of the other attendees at the 1987 conference was John Walker. He had heard of Xanadu and was well aware that it had never had the benefit of any serious software management.

After extended discussions with Gregory and Nelson, Walker saw Xanadu as a solution for managing engineering design data and agreed to have Autodesk invest in the company. With some foresight, he realized that Nelson was a creator of ideas but not someone to be involved in the actual development of the software and gave him a job in Sausalito as an Autodesk Distinguished Fellow while the Xanadu programming staff was set up 50 miles away in Palo Alto.

It seems that Walker and other Autodesk executives believed that the Xanadu programmers were farther along in creating a workable prototype than they actually were and when they announced the investment in Xanadu in April 1988, the statement was made that they would bring an initial system to market in 18 months. This was wildly optimistic and when Autodesk ceased funding Xanadu in 1992, there still was no functioning software. Someday, the World Wide Web and search engines such as Google may expand sufficiently to encompass many of the hypertext concepts Nelson expounded on for so many years.

Autodesk without Walker at the helm

There is no question but that John Walker was the driving force behind Autodesk's early success. He managed the company's money well, did not let the founders and early employees who were now millionaires loose sight of the fact that the company was vulnerable to competition by much larger firms including IBM and, for the most part, he kept everyone focused on AutoCAD, the company's crown jewel. The company he left behind probably needed someone at the helm with a better feel for the

¹⁹ Wolf, Gary, "The Curse of Xanadu," http://www.wired.com/wired/archive/3.06/xanadu_pr.html

intricacies of running a large software firm than Al Green. This did not become obvious for some period of time.

Several management changes in mid-1988 were the promotion of David Kalish, one of the founders, to be director of strategic marketing and Cliff Gauntlett, formerly with Auto-trol Technology, to be manager of AEC technology. The company then acquired a majority interest in American Information Exchange Company (AMIX), a developer of software for information exchange between organizations. This was an unsuccessful forerunner of the Web-based exchanges that would pop up during the dot com boom of the late 1990s. AMIX also attempted to act as an intermediary for consultants who wanted to market their services.

AutoCAD Release 10 began shipping in October 1988. The older ADE-1, ADE-2 and ADE-3 options were no longer part of the company's product line. These capabilities were incorporated into AutoCAD itself, which now had a list price of \$3,000. The upgrade cost from Release 9 was a moderate \$250. Release 10 had substantially more effective three dimensional capabilities than earlier versions of AutoCAD.

Perhaps the key feature of Release 10 was the software's ability to display multiple non-overlapping views of a single three-dimensional model or different portions of a large drawing. Only one viewport could be active at a time and the user had to specify which view that was. AutoSolid Release 3 followed in early 1989 with enhanced capabilities for generating finite element meshes.

Indicative of the company's growing focus on three dimensional modeling and the mechanical CAD market in particular, Autodesk hired Ron McElhaney in October 1988. In February 1989 he became vice president of software development, replacing Keith Marcellus. McElhaney had previously been with Unacad, Graftek and Auto-trol Technology. He was president of Unacad from 1983 to 1987. Only three founders were still corporate officers – Dan Drake (who was executive vice president), Richard Handyside and Greg Lutz.

In 1988 the company changed how it sold AutoCAD to large accounts. Autodesk set up several sales offices in the United States and staffed them with major account sales people. Working with local dealers, the Autodesk account managers were able to offer Fortune 500 companies volume discounts, on-site training and applicable support. By the end of 1988, AutoCAD was being sold in more than 60 countries including a Russian language version in the Soviet Union. That made a total of 12 different language versions of the software. The number of third party software application now exceeded 700.

In April 1989, Autodesk announced plans to acquire one of its low-cost competitors, Generic Software, located in Bothell, Washington for approximately \$7.6 million. This acquisition was completed the following month. The company's software products, sold as Generic CADD, were typically priced under \$400.

Life starts getting more complicated

With Release 10, AutoCAD had become a significantly more complex computer program. With earlier versions of the software, users had been able to obtain a disk with patches from their local dealer or download the changes from CompuServe. Individual versions of the software started sporting nomenclature such as R10 c2a. With R10 c7, which fixed a large number of bugs and included an improved IGES translator, the process was nearly equivalent to an actual update from one release to another. The user

had to return the serialized disk #1 for the version currently being used through an authorized dealer and then wait for a new set of diskettes (AutoCAD was not yet available on a CD-ROM) to be shipped from Autodesk. This whole process could take several weeks.

The suggested list price of AutoSolid was reduced from \$5,000 to just \$500 when Autodesk made public the fact that it was working on new solids modeling technology that would be incorporated directly in AutoCAD with Release 11 in second half of 1990.

The company indicated a growing interest in the multimedia market with the release of Autodesk Animator, a stand-alone package with paint and image processing tools. It was only available on PCs and sold for \$395 per copy. At about the same time, Autodesk set up a new division to pursue this market called Autodesk Multimedia.

Animator was followed by a substantially more comprehensive program, Autodesk 3D Studio, which could be used to create three-dimensional models and render and animate these models. 3D Studio, which was developed by Gary Yost and the Yost Group and marketed by Autodesk, had far more sophisticated surface modeling than AutoCAD. It initially sold for \$2,995. Libraries of clip art were available for sale that could be used with the multimedia packages. A separate dealer network was set up to handle these products. A new version of Autodesk Animator, Animator Pro, with higher screen resolution and enhanced imaging and animation capabilities was planned for release in mid-1992.

The company also began working on virtual reality research by funding an effort called the Cyberspace Project. This work in the company's Multimedia Division was managed by Randal Walser, who subsequently founded Spacetime Arts, a developer of virtual reality worlds. Walker was an important supporter of this activity in that he saw Autodesk software being used to create cyberspace environments. The company did release a Cyberspace Developers Toolkit but the project never resulted in products.

In another diversification away from AutoCAD, Autodesk introduced CA Lab (Cellular Automata Laboratory), a \$60 package that could be used for tasks ranging from modeling fluid flow to simulating chemical reactions. It was programmed by John Walker with the help of one other programmer. A second scientific product was CHAOS: The Software, which was based on James Gleick's book *CHAOS – Making A New Science*. Apparently this package, which also sold for \$60, was intended to help teach chaos theory. It seemed as if the company was beginning to worry that the market for AutoCAD was becoming saturated and that it had to look for new markets if it was to continue to grow. This would be a recurring theme for the next few years although it is hard to understand how anyone expected either of these programs to be a large revenue producer.

On the other hand, a agreement with Hypercube, Inc. for exclusive worldwide distribution rights to their molecular modeling software showed promise of being a significant endeavor. Computers were beginning to reach a level of performance where desktop molecular modeling for genetic engineering, drug and chemical research was a practical technology.

The key product was called HyperChem. It was a graphical front end and modeler. Other packages, HyperNewton and HyperNDO were used to make various molecular calculations. If marketed effectively, this software had the potential to generate substantial revenue in future years although not in the same league with AutoCAD.

Autodesk thought enough of this opportunity that the company acquired an equity interest in Hypercube.

In early 1990 Autodesk began shipping a version of AutoCAD Release 10 specifically tuned for use on 80386 machines equipped with Phar Lap's 386/DOS Extender. List price for this combination of software products that eliminated time-consuming program overlays was \$3,300. Benchmark tests performed by Autodesk indicated a 30 percent to 62 percent improvement in performance.

With more and more users interested in producing shaded images of models they were creating, third party graphics accelerators were becoming increasingly important. For example, Nth Engine offered its Series 350 display processor for \$3,395 with 1024 by 768 resolution and \$3,995 for 1280 by 1024 resolution. Both graphics cards supported 16 colors.

Autodesk starts a new decade

By the end of fiscal 1990 the numbers describing Autodesk were becoming impressive – more than 900 employees, close to 300,000 copies of AutoCAD sold, 4,000 authorized dealers, 700 third party applications and 350 independent training centers worldwide. None of the company's founders were officers of the company at this point although Dan Drake and Greg Lutz were still on the board of directors. The company was doing so well financially, revenues of \$179 million and earnings of \$46.4 million, that it declared a special \$1.50 per share dividend. When subsequently asked "Don't you have something better to do with your cash," Green's response was "Well, no we didn't."²⁰

Autodesk announced in January 1990 that it would cease marketing AutoCAD AEC Mechanical and that the original developer, Archsoft Group (ASG), would assume responsibility for the package. In April, the company made a similar announcement regarding AutoCAD AEC Architectural although, in this case, the company's U.K. subsidiary continued distributing a metric version of the software.

Also in April 1990, Autodesk licensed the ACIS geometric modeling kernel from Spatial Technology. The company signed several other licenses in 1990 for advanced technology including NURBS surface geometry from Applied Geometry Corporation, graphics software from Ithaca Software and constraint management software from D-CUBED, Ltd. At the time, it was not clear the extent these software components would be incorporated into future releases of AutoCAD or if they would be used for a new product(s).

On October 18, 1990, Autodesk began shipping AutoCAD Release 11 priced at \$3,500. The marketing manager for this release was Greg Milliken, who, after stops at several other companies, eventually became CEO of Alibre as discussed in Chapter 21. Release 11 incorporated a new AutoCAD Development System (ADS), multi-view plotting, network support, Advanced Modeling Extension (AME) which was sold as a \$495 option, a new drawing recovery command and reference drawings (Externally Referenced Blocks or Xrefs) as well as improvements in the user interface.

AME was based on the PADL-2 solids modeling software developed at the University of Rochester. See Chapter 2. It used both constructive solid geometry (CSG) and boundary representation techniques. Release 11 also introduced the terms Model

²⁰ Zachary, G. Pascal, "'Theocracy of Hackers' Rules Autodesk, Inc., A Strangely Run Company," *Wall Street Journal*, May 28, 1992

Space and Paper Space for composing drawings and plots. Extensive enhancements to AutoLISP and the AutoCAD Development System (ADS) were included in the release with the expectation that these tools would enable third party developers to create more sophisticated AutoCAD applications. Overall, it was a substantial update but to many observers, including John Walker, it was simply an unsuccessful attempt to catch up to the more powerful systems being sold by the traditional turnkey vendors. The company planned to support all current platforms with some exceptions regarding ADS and AME.

Dr. Joel Orr, who had been appointed an Autodesk Distinguished Fellow, was the keynote speaker at the first North American AutoCAD User Group (NAAUG) meeting held in August 1990 in San Jose, California. When Autodesk started establishing NAAUG earlier in the year, John McQuary was selected as its first president. The meeting attracted 634 attendees who approved the organization's bylaws and elected Phil Kreiger to represent local user groups and Jay Reinhardt as the president elect.

Prior to this event, the only way AutoCAD users could communicate with Autodesk to express their grievances or to make product suggestions was through their dealers or via a CompuServe bulletin board. This organization would have a significant impact on Autodesk's product direction in coming years. John Forbes led off the day and a half meeting with an introduction to Release 11 followed by a demonstration of the new software by Tom Kopinski, the software's product manager. The NAAUG meeting was followed by the annual CAD Camp held for dealers.

Release 11 began shipping in October 1990, two years after Release 10. It would be another two years before users saw another release of AutoCAD. One significant change Autodesk made with Release 11 was that it established a Strategic Developers Program and provided these partners with pre-release versions of the software. That enabled them to release products such as DCA Software's civil engineering package in parallel with the shipment of Release 11. In April 1991, DCA would change its name to Softdesk.

Equally important was that graphics hardware manufacturers such as Nth Graphics were able to ship driver upgrades in a timely manner. High performance graphics cards were becoming increasingly important to users who were doing more and more visualization. Nth Graphics was offering the Nth Engine/150 with 1280 by 1024 resolution for just \$2,000.

Information Letter #14

Fiscal 1991 saw revenues increase by 33 percent to \$238 million with net income of \$56.8 million. AutoCAD represented 88 percent of the company's revenue. Autodesk now had nearly \$150 million in cash and marketable securities. With results such as this, it was hard to believe that this was actually a company in trouble.

In January 1991, Autodesk released AutoShadeVersion 2 which included RenderMan for enhanced rendering of AutoCAD images, priced at \$1,000 per copy. Autodesk licensed RenderMan software from Pixar Animation Studios. A version without the RenderMan software was available for \$500.

In November 1990 Walker took a few months off to relax, read and think about the future of Autodesk. The result was Information Letter #14. An early version was circulated to several senior managers at the company, one of whom, unfortunately, allowed it to gain wider than intended distribution. Walker quickly finalized the

document and Information Letter #14 was delivered to the company's senior management on April 1, 1991.

Walker's primary concern was that Autodesk had been so successful that it had become complacent. His concern was:

“...most companies that attain great value then lose it do so by *failing* to adapt when technological progress or the market demand they change.”

He went on to apply this thought to Autodesk.

“When a company ceases to change at the rate demanded by the industry it exists within, it finds itself rapidly left behind. Before long, its customers discover products of competitors that better meet their needs. As market share slips, sales fall, and earnings decline, the management of the standstill company asks, ‘What's happening? We're still doing all the things we used to do.’..... Autodesk possesses all the prerequisites to lead the next generation of the PC industry, yet it seems to have become stuck in the past, mired in bureaucracy, paralysed (sic) by unwarranted caution, and to have lost the edge of rapid and responsive product development and aggressive marketing and promotion on which the success of AutoCAD was founded. Not only has Autodesk failed to bring the new products it needs to the market, it is allowing AutoCAD, our flagship product and the source of essentially all our revenue, to become dangerously antiquated and under-marketed to an extent that is virtually unique for a product generating sales in excess of \$200 million a year.”²¹

Walker explicitly stated that he did not want what he was writing to imply that he wanted the company's current management removed nor did he want to resume a full-time management roll. Rather, he was writing this document in an attempt to get them to act decisively in regard the issue he felt were key. Information letter #14 was a 44 page treatise. Space allows just some of its highlights to be listed.

- AutoCAD was the company's key product but was not receiving sufficient development and marketing attention or resources.
- While Autodesk focused on AutoCAD's basic capabilities it was ignoring ancillary capabilities that Walker believed customer expected given the price the company was charging.
- AutoCAD's user interface was not keeping up with the state-of-the-art.
- AutoCAD was expensive compared to other PC software products.
- Computer stores were going out of business leaving dealers as the company's primary distribution channel. Walker questioned whether these dealers could prosper selling AutoCAD at a nominal markup and if Autodesk should move to a mass marketing model.
- Microsoft's Windows operating system (3.0 was the current version) was a “Big Event” and Autodesk was not paying sufficient attention.

²¹ Walker, John, “Information Letter #14”

- Walker stated: “I believe that a CAD product with these characteristics: big, cheap, widely available, tightly integrated with its host system, and promoted and marketed in an aggressive manner could, in relatively short order, displace AutoCAD from its current dominance of the CAD market.” Autodesk could either produce this product or watch someone else do it.
- Release schedules were being dictated by financial concerns.
- Once a new product was introduced, Autodesk spent an inadequate amount of money marketing it. Walker was particularly incensed by the low key way the company launched AME, the solid modeling extension introduced with Release 11.
- What the company needed was a better balance between imagination and caution.

A key section of this document was what Walker called The Nightmare Scenario. In it he fictionalized how Bill Gates would become enamored with the money Autodesk was making off AutoCAD and would launch “Windows Engineer”, an \$895 CAD package built predominately with component technology and launched with a massive advertising campaign. Since Microsoft probably saw this memorandum shortly after it was distributed internally at Autodesk, one has to wonder why Gates didn’t take Walker up on his suggestion. Like any good manager, Walker did not simply itemize what was wrong with Autodesk. He concluded this document with a list of specific recommendations, most of which make sense looking back more than 15 years later.

- Appoint strong project managers for each Autodesk product and have them report to the president (I agree with the first but question whether someone responsible for a low-volume product such CA Lab should work directly for the CEO).
- Implement product-level profit and loss accounting.
- Help the dealers be successful (This is an issue that would plague Autodesk for years to come).
- Reduce product prices, especially for AutoCAD in order to grow volume.
- Treat industry opinion leaders better including providing them free software products.
- Incorporate AME into AutoCAD and promote solids modeling aggressively.
- Jump on the Windows bandwagon.
- Upgrade AutoCAD documentation.
- Let customers contact Autodesk directly for support rather than requiring them go through a dealer.
- Assign more personnel to product development.
- Aggressively go after the raster (multimedia) market.
- Start work on an entirely new CAD system to eventually replace AutoCAD.

Reading Information Letter #14 is like participating in a case study at a well-respected business school. Walker comes through as a much more multi-dimensional individual than he appeared to be earlier in his career. As idiosyncratic as he might be, no one can deny that this guy was bright, perhaps even brilliant. A month after the letter was distributed, Walker moved to Marin, in the canton of Neuchâtel, Switzerland to join Kern Sibbald, another company founder, in establishing Autodesk's European Technology Centre.

Reaction to Information Letter #14

Although Information Letter #14 was intended for "senior management" and was considered company proprietary, within hours everyone in the company had heard about it and copies were in the hands of people outside the company. In spite of his statement that he did not intend to rejoin the company's management team the reaction of many employees was that "Walker is back."

Ron McElhaney left Autodesk in September 1990 and was replaced as vice president of research and development in early 1991 by Marc Stiegler who had been general manager of Xanadu for several years. Stiegler had had a successful software career, retired early, became a science fiction writer and then joined Xanadu in 1988 to try and bring some semblance of order to the organization. Interestingly, Stiegler rather than Al Green became the architect of a new Autodesk organizational structure in June 1991, or at least the one who publicized it. In fact, Green seemed to be all but invisible while the debate over Autodesk's future was going on.

The corporate reorganization in June 1991 was intended to separate the company's activities into product development and marketing on one hand and service and corporate-wide activities on the other hand. Products were tentatively separated into several different groups – AutoCAD, Multimedia, Retail, Molecular Modeling and Information – with a general manager responsible for each product family and a product manager responsible for each specific product. In some cases, the general manager could also be a product manager. Stiegler distributed these ideas in a memo titled "The New Autodesk."

Walker's reaction was that this structure was better than what existed previously even if it was overly detailed but that it had a critical flaw in that sales did not report to the general manager of a product family. His concern was that emerging products would not get adequate sales attention since it was much easier for the sales force to simply promote AutoCAD. The other flaw he saw in this structure was that AutoCAD represented nearly 90 percent of the company's revenue. It would be hard to treat the product manager for AutoSketch the same as the product manager for AutoCAD.

Walker was also upset that this reorganization appeared to be the company's entire response to Information Letter #14. In fact he points out on his web site that the number of programmers assigned to AutoCAD actually dropped after the letter was published. On June 18th and 19th he responded to Stiegler in two emails as only John Walker could.

"I think there's a risk that the reorganisation (sic) plan will be viewed by many as exalting minute details of management structure over directly addressing the genuine problems of the company and its products. I share

this worry myself. First, when the IL14 bomb burst, I believe and I said at the time that management missed a truly golden opportunity to turn around the morale of the company. I think that by appearing defensive and reactive rather than aggressively seizing the initiative, the perception of the very problems I outlined in the letter was reinforced.”

He went on to say that Green had to step up to the plate and tell the company’s employees what Autodesk’s strategy and vision was and if Green was unwilling to do it then Malcolm Davies, as executive vice president, should do it. Walker went on to tell Stiegler that the reorganization was only one part of what he wanted to see happen and that improving internal morale and allocating development resources more effectively were equally important. He ended the second email with:

“Whether you have in me an enthusiastic contributor or the worst nightmare a corporate management can have: an articulate, wealthy, major shareholder acting in the interests of the other shareholders and in keeping with the goals for which he founded the company, asking of management in public simple questions for which they have no answers, will be decided in the near future.”

One positive result of the reorganization was that about 60 people, half of them programmers, were added to the AutoCAD team. It is interesting to note that on June 18, 1991 Autodesk’s stock hit \$61 per share. Eight months later, as the company tried to find direction, the price dropped to \$23.50.²²

The struggle to find direction

Walker, whose official position was simply that of a programmer in the company’s European Technical Center, was becoming more and more frustrated with the direction Autodesk was taking. He felt that the company had to more aggressively develop and promote AutoCAD while at the same time create new products that would continue and even accelerate Autodesk’s rapid growth. He did not see this happening and came to the conclusion that it was caused by a lack of effective executive management. It was clear that he felt Al Green had to go but he also was fairly negative in his comments about Malcolm Davies.

On September 26, 1991, Walker distributed a memo to “... a very short list of people whose discretion and judgement(sic) I trusted entirely.”²³ One can probably assume that this included some of Autodesk’s original founders who still worked for the company. In the memo, Walker flatly stated that there had to be a change at the top. He simply felt that the current management did not have either the vision or the ability to lead the company in the future.

Walker went to describe a meeting that he had held earlier in 1991 with Dr. Joel Orr who wrote the foreword to this book and was a consultant to Autodesk at the time.

“I don't think Autodesk's executives know very much about the CAD business. Frankly I don't think they're very interested in it. Joel Orr put it

²² The stock has subsequently split three times and one share in 1991 is now the equivalent to eight shares.

²³ Walker, John, *The Autodesk File* – online version

like this, as best as I can recall, when I met with him recently, ‘When I talk to the people in Sausalito about what's going on in the industry, it's as if they're hearing these things from me for the first time.’ It was abundantly clear from our discussion that this situation is unique to Autodesk, at least among companies he deems successful. Joel does not encounter this ignorance within the management teams of the many other CAD and computer graphics firms with whom he meets in the course of his consulting practice.”

Although Walker is adamant that he did not initiate it, shortly after the memo recommending a change at the top was distributed, Green contacted him and said that he intended to retire and planned to initiate a search for a new CEO. This decision was announced on October 10, 1991. Green’s plan was to have a new CEO in place during the first half of 1992 and that he would remain CEO until that occurred and then would become chairman of the board. In spite of what he may have thought about Green’s vision and leadership, Walker distributed an email to the entire Autodesk staff graciously complimenting Green on what he had accomplished during his time as CEO.

The last quarter of fiscal 1991, ending January 30, 1991, had resulted in earnings that were barely ahead of the same quarter a year earlier, causing the company’s stock to plunge 22 percent. Many people tried to shake it off due to external events including the war in the Middle East. Walker’s concern, as discussed above, was that the company was cutting back on product development and marketing in order to make its numbers during the first three quarters of the subsequent fiscal year. For the first three quarters of fiscal 1992, the financial side of the business seemed to be going according to plan. This was not to continue however.

In January 1992, Walker returned to Sausalito for three months as “manager of technology.” Since moving to Switzerland, if he returned for a longer period of time he would have been subject to increased U.S. Taxes. Shortly after arriving he was informed that the fourth quarter of fiscal 1992 was going to be a financial disaster with earnings down to a level not seen in three years. On January 30th the company held a meeting for major shareholders and security analysts in New York at which time Walker made two presentations. The first was a history of the company and the second, a description of products the company would release during the next 12 months including AutoCAD Release 11 for Windows during the first quarter.

Walker’s two presentations were sandwiched around a financial presentation made by Green. The New York meeting was followed by a similar meeting in Boston the next day. While revenue for the quarter was estimated to be between \$64 and \$66 million or up slightly from the year before, earnings were down 39 percent to about \$8 million. This was about half what some analysts were expecting.

The stock market’s reaction was nearly as negative as it had been a year before. This time the stock dropped 18 percent to \$28.25 per share or less than half what it had been six months earlier. Two days later Walker and Green repeated the talk on a Saturday afternoon for nearly 700 Sausalito employees. With Walker taking such an active role in these two meetings, it would not be hard to see where many employees hoped that he would return as CEO. It was not to happen.

One positive development was the launch in March 1992 of AutoCAD Extension for Windows. For \$99 per copy AutoCAD users could upgrade their current Release 11 licenses to run under Windows. For the next several years there would be a constant debate between the proponents of the DOS version of AutoCAD and the Windows believers. The two major issues were existing familiarity with DOS and relative performance as the DOS versions tended to be faster for some period of time.

At this point in time, management of the AutoCAD product line was being shared by Ruth Connolly who was the AutoCAD general manager and John Lynch, a bright, thoughtful software professional, who was the AutoCAD chief technical officer. Lynch had joined Autodesk in 1986 as a programmer. Shortly after shipping AutoCAD Extension for Windows, Autodesk began shipping HyperChem.

In an interview with Mary Eisenhart of *Micro Times*, Walker summed up Autodesk's position and market philosophy very well:

“That's what really happened with Autodesk in competing with the major mainframe CAD vendors for the drafting market. We didn't really take seats away from them--most of the companies that had those mainframe systems still have them, in fact have more of them. What happened was, we created an entirely new market for CAD that was the other 98% of the business they weren't selling to, and that's where the growth came from.....In the *really* long term there isn't going to be drafting. But I think getting rid of it is going to take a lot longer than a lot of people believe.”²⁴

At some point in early 1992 Green relinquished day-to-day operations of the company and Volker Kleinn had temporarily taken on the responsibilities of chief operating officer. The company officers just before the new CEO took over were:

- Al Green – chairman of the board, president and CEO
- Malcolm Davies – senior vice president, the Americas
- Volker Kleinn – senior vice president, Europe
- Richard Cuneo – vice president, U.S. sales
- Carolyn Aver – vice president and CFO
- Sandra Marin – vice president, secretary and general counsel

The Bartz era begins

Carol Bartz is the pro-typical computer industry executive. With a degree in computer science from the University of Wisconsin in 1971, she initially worked for Digital Equipment Corporation and 3M Corporation before joining Sun Microsystems in 1983 in a relatively minor marketing role. Within a year, she was vice president of marketing and then built a successful government systems operation. In 1990, she was named vice president for world-wide operations with over 6,000 people reporting to her. At the time, she was one of the most senior woman executives in the computer industry.

²⁴ Walker, John, *The Autodesk File*

With a relatively young Scott McNealy running the company, there was little chance that her desire to run a major business enterprise would be met by staying at Sun.

Bartz was the first woman to become CEO of a major computer company that she had not founded. On April 14, 1992 she became president, chairman of the board and CEO at Autodesk. Al Green's plan to stay on as a non-executive chairman was shelved as part of the negotiations with Bartz concerning her responsibilities. Walker gave a short talk at an employee meeting introducing Bartz and said she had his full support. Two days later he headed back to Switzerland and fundamentally let her run the company without his interference. He left the company permanently with minimal fanfare in 1994.



Figure 8.2
Carol Bartz circa 1996

At A/E/C SYSTEMS '92, held in Dallas that June, Bartz stated that among the reasons for taking the job at Autodesk was her belief that the future of the computer industry would revolve around software rather than hardware. She felt that Microsoft was not the only successful business model, that Autodesk was well placed to succeed, was well financed (almost \$200 million in the bank) and that she liked the informality of the company's day-to-day operation. At several meetings with the media she described plans to broaden the functional capabilities of AutoCAD as well as improve its performance.

It was clear that third-party software vendors who added functional capabilities to AutoCAD would gradually see those functions added to the basic AutoCAD product while vendors of more complex applications such as process plant or highway design probably did not have to be concerned that Autodesk would end up as their primary competitor in the near future. In particular, she indicated a strong interest in moving more aggressively in the mechanical CAD area.

Bartz started having an impact on the Autodesk organization almost at once. Malcolm Davies, who had contended for the CEO job left the company shortly after she took over. In a personal conversation she indicated to me that she was not at all unhappy to see him go. New people were arriving at a rapid pace. Len Rand, who had been with Intergraph until 1990, came on board as vice president of the AutoCAD division. Eric Herr, who had worked for Bartz at Sun, was hired to be vice president and CFO.

A few days after the conference, Autodesk announced that Bartz was suffering from breast cancer. My two older sisters were losing that battle at the time and I was very understanding as she successfully battled back from the disease while effectively running the company.

The Wall Street Journal article

On May 28, 1992, just six weeks after Bartz took over, *The Wall Street Journal* printed an article about Autodesk on its front page. Written by G. Pascal Zachary, its title, “Tech Shop ‘Theocracy of Hackers’ Rules Autodesk Inc., A Strangely Run Company – Can the Latest CEO Survive a Cabal of Programmers Who Send ‘Flame Mail’?” clearly indicated at the start that this was going to be a very unflattering article. Zachary’s main points were that Autodesk was run by a group of programmers called the “Core,” that there was constant conflict between these programmers and management, Green was ill-suited to run the company and that Walker was pulling the strings. The article was particularly harsh in regards to Walker.

Zachary had started work on this article months earlier and after interviewing Green by telephone, requested an in-person interview with Walker. Walker was not happy with earlier work of Zachary’s that he had seen and set some strange requirements for the interview to which Zachary agreed. Among these was that the interview would be videotaped and that Autodesk held the copyright to the interview which was held on February 10, 1992. There were six other Autodesk people in the room along with Walker, but he handled most of the interview.

It is obvious from the interview transcript that Zachary had not done his homework and was unfamiliar with many aspects of the company. For example, he did not realize that Walker had not been on the company’s board of directors for nearly four years. On the other hand, Walker was argumentative throughout the interview and was less than candid in discussing the intent of Information Letter #14 or its impact on the company. The entire interview transcript is posted on Walker’s web site.²⁵

What surprised me the most about the interview were some of the statements Walker made concerning Autodesk’s technical position in the CAD industry. In one case when discussing the work he had done on AME in mid-1989 he stated: “Nobody else had ever, essentially, included solid modeling as an integral part of a CAD system.” Hadn’t he heard about a company called Parametric Technology that had begun shipping Pro/ENGINEER a year earlier? At another point when discussing automated manufacturing he said: “I don’t see anybody else even working on it right now.”

In a subsequent entry on his web site Walker responded to Zachary’s famous statement about the cabal of programmers who ran the company. According to Zachary:

“But the real power still rested with Mr. Walker, Autodesk's biggest shareholder, and an elite group of programmers called “Core,” who had either helped Mr. Walker found the company in 1982 or led its most important projects.

Core members are contentious, eccentric, free-thinkers who have had a way of devouring professional managers.”²⁶

²⁵ <http://www.fourmilab.ch/autofile>

²⁶ Zachary, G. Pascal, “Tech Shop” – *The Wall Street Journal*, May 28, 1992, Pg. 1

Walker was adamant that there was no group of programmers at Autodesk called “Core.” He figured that what Zachary was referring was the small group of about ten programmers who work on the central components of AutoCAD rather than device drivers, applications or documentation. While this group included three founders: Duff Kurland, Dan Drake, and Greg Lutz, it had been managed since 1985 by professional technical managers hired from the outside. Walker was also upset that Zachary described Mike Riddle as an “outside programmer” rather than as a founder.

In reality, Bartz had her hands full gaining control over an unruly group of programmers, especially in regards to meeting deadlines. When she took over, work on Release 13 was already underway. The issue the new CEO faced was balancing the functionality of this next release with the need to get something out on schedule.

No one likes to have their feet held to the fire, especially by a new boss who they did not really know. Walker was one of them. Bartz came from a hardware company and how could she understand what programmers go through creating great functionality then to have it shelved in order to meet what they felt was an artificial delivery deadline. It took several years, but eventually she did gain the upper hand.

Release 12 fills some gaps

Autodesk used the A/E/C SYSTEM '92 Conference to showcase AutoCAD Release 12. Some of its key features included a new user interface with pull-down menus and dialog boxes, improved performance when executing pan and zoom operations, a much faster hidden line process, identification points on entities called “grips” that enabled the size, location or shape of these entities to be changed in a single operation and direct image shading in AutoCAD. To AutoCAD users these enhancement (there were 174 in all) were significant and Release 12 was enthusiastically received.

The reality was that AutoCAD still lagged behind many competitive CAD solutions on a functional and performance basis. Release 12 was an effort to catch up, but coming nearly two years after Release 11, it illustrated some of the problems Walker had been pointing out in his internal memos. The new list price for AutoCAD was set at \$3,750 with the cost to upgrade from earlier releases \$500. The DOS version began shipping in July 1992. Foreign language and some UNIX versions continued to lag however. As an example, the UNIX version of Release 11 for the IBM RS/6000 began shipping about the same time that the company was beginning to ship the UNIX version of Release 12 for the Sun platform. The Windows version of Release 12 lagged considerably behind the DOS implementation mainly because of performance concerns. It was eventually released in February 1993.

Vermont Microsystems lawsuit

One byproduct of the Release 12 Windows activity was a lawsuit filed by Vermont Microsystems Incorporated (VMI). This company had developed several display list software packages called AutoMate and AutoMate/Pro that improved

display performance considerably, especially in regards to the Windows implementation of Release 11.

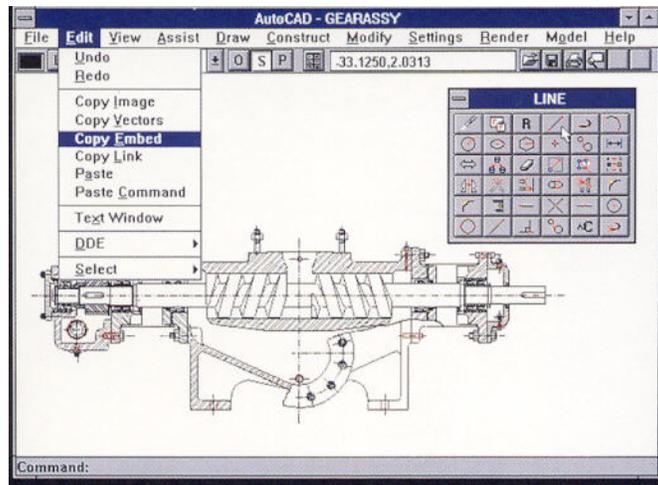


Figure 8.3
AutoCAD Release 12 for Windows²⁷

One of the developers of AutoMate was a programmer named Otto Berkes who was hired by Autodesk in October 1991. When he left VMI he was warned that the work he had done for that company was proprietary and that he was not to disclose any trade secrets to Autodesk. In spite of this warning and warnings to Autodesk management, Berkes did end up working on the display list software incorporated in the Windows implementation of Release 12 using techniques he had first developed at VMI.

VMI sued Autodesk and won its case in December 1994 and was awarded \$25.5 million while Autodesk was allowed to continue using the code. After several appeals, this was reduced to \$7.8 million plus interest in February 1998 which Autodesk subsequently paid. Berkes ended up going to work for Microsoft where he was involved in the early development of the Xbox game system.

By mid-July the company's stock price had edged back up to \$39 and investment companies including Goldman Sachs were recommending purchase of the stock. The increasing size of the AutoCAD installed base and the higher upgrade price were expected to provide over \$12 million in upgrade revenues over the next six quarters. A large number of users (62 percent) were still using Release 10 or earlier versions of AutoCAD. Autodesk was also benefiting from the new higher performance Intel 486-based PCs that were available at attractive prices due to price competition among the PC vendors.

Bartz takes charge

During her first months as CEO, Bartz continued to build her management team. She added Steve McMann as vice president of human resources and Jackie

²⁷ Autodesk AutoCAD Release 12 for Windows brochure, October 1993

Rae as vice president of corporate marketing. Eric Herr was given the additional responsibility of vice president of emerging technologies with the task of overseeing the retail, multimedia and scientific modeling product lines. Autodesk also hired Dominic Gallelo, the former head of Intergraph Japan, to head sales in the Asia/Pacific area and Godfrey Sullivan to do the same in the Americas. Some people said this was the first professional management team the company had, but this was probably unfair to those who preceded them.

Perhaps the most significant issue Bartz and her new team had to consider was whether AutoCAD and the CAD market overall had sufficient potential that this was where the company should focus the bulk of its resources or if this market was close to saturation and the company should plunge into new areas of software development. The decision was that the CAD market still had substantial potential and the company should focus its resources on AutoCAD and related products.

The first significant indication of this renewed focus on the CAD market was the announcement on August 20, 1992 that the company would cease funding Xanadu and AMIX after a 30-day grace period.²⁸ This basically spelled the death knell for Xanadu although remnants of the project hung on for over two years. Bartz was fairly blunt in announcing the change:

“The new management team has carefully looked at what Autodesk’s business model should be. Both AMIX and Xanadu are important companies with exciting futures, but they do not fit into Autodesk’s core business.”²⁹

Mark Stiegler chose to leave Autodesk and briefly joined Xanadu and AMIX. After a few months, he left those companies and retired to a ranch in Arizona. Xanadu never proceeded beyond the vaporware stage but AMIX did hold some real promise. It was wine before its time, however, in that implementing AMIX exchange technology in the late 1980s and early 1990s involved writing a lot of code that simply was not necessary once the World Wide Web was up and running along with virtually free Web browsers.

The next major step Bartz took was the acquisition of Micro Engineering Solutions, Inc. for slightly less than \$15 million. Located in Novi, Michigan, MES was the developer of SOLTUION 3000, a suite of design and NC software packages that used NURBS-based surface modeling. The company’s two leading products at the time were called Design Expert and Manufacturing Expert. The bulk of the users of this software were in the automotive industry. Bartz had indicated earlier that she saw the mechanical segment of the CAD market being a major opportunity for Autodesk and this appeared to be the first step in that direction. The company’s founder, Ken Spenser, agreed to stay with Autodesk and run the 50-person organization which was called the Autodesk Mechanical Division. The acquisition of MES also indicated that plans to extend AME by

²⁸ Dr. Joel Orr who wrote the forward for this book served as chairman of the board at Xanadu after Autodesk spun it off.

²⁹ Autodesk Press Release, August 20, 1992

adding the ACIS geometric kernel were put on hold although the company stated at the time that AME would stay in the product line.

The company also considered several areas where it might broaden its software product line. It introduced a diagramming package called Actrix that competed with similar software from Visio and Autodesk even acquired a presentation package from a company in Sweden that enabled it to compete with Microsoft's PowerPoint software. Neither of these were particularly successful but they did cause some distraction as Bartz was trying to get the company turned around.

As 1992 progressed, Autodesk seemed to be regaining some of its earlier momentum. Revenues in the quarter that ended October 31, 1992 were up 33 percent to nearly \$94 million although earnings dropped as the company worked on expanding its internal infrastructure. The major task facing Autodesk as 1992 drew to a close was completing the development of AutoCAD Release 13 which involved a major restructuring of the software package's basic architecture. It was a necessary step if Autodesk were to compete on even terms with the high-end CAD vendors in the future but it would turn out to be a problem-filled release.

The new Autodesk starts to evolve

In February 1993, Autodesk introduced several products that indicated the general direction the company intended to take. The Mechanical Division launched two new software packages based upon the technology obtained when the company acquired MES the previous year. Autodesk DesignExpert incorporated NURBS-based Auto-Surf, AutoCAD Release 12 and an IGES translator for a list price of \$7,750. Autodesk Manufacturing Expert included the same suite of software plus 2- to 5-axis NC software for \$13,750.

For the first time, Autodesk offered a software maintenance agreement for these packages. The expectation was with the next release of AutoCAD these mechanical packages would eliminate the need to use IGES to move data between programs. Other than the AutoCAD portion, the products consisted mostly of MES software with an Autodesk label on it. The company subsequently decided to focus on design software and the NC applications were sold to CAMAX Manufacturing Technologies in August 1994. CAMAX was subsequently acquired by SDRC in 1996.

The other new product was AutoCAD Release 12 for Windows. This was done much better than the earlier Release 11 Extension for Windows in that performance was better and the software used Microsoft tools such as OLE (Object Linking and Embedding) to move data between AutoCAD and Windows programs such as Word.

Changing Autodesk's competitive posture

Later in the spring Autodesk announced that the Retail Products Division would become part of the Design Automation Group headed by Len Rand. The company was also becoming more competitive in regards to other companies in the CAD industry. As described in Chapter 13, IBM and Dassault were struggling

with customer transition from CADAM to CATIA and everyone wanted a piece of the CADAM installed base.

Working with Integrated Industrial Information of Raleigh, North Carolina, Autodesk introduced two packages aimed at these CADAM users. The first, Aemulus, provided a CADAM-like front end for AutoCAD while the second, Aemulus_{mf} was a mainframe tool that provided bidirectional data file access between CADAM and AutoCAD. These had to be two of the worst product names in the history of the CAD industry. About this same time, Autodesk confirmed that it planned to use Spatial Technology's ACIS geometric kernel in upcoming versions of AutoCAD as well as Ithaca Software's HOOPS graphics software. The latter was not a surprise since Autodesk owned 20 percent of Ithaca. Autodesk eventually acquired Ithaca Software in 1993 and then spun it off as Tech Soft America in 1996.

Len Rand, who had joined Autodesk about the same time Carol Bartz was hired, quietly left the company in late July perhaps as a result of John Lynch taking on more of the Design Automation Group's development responsibilities. According to David Cohn: "The heralded arrival of Len Rand as Vice President of the newly formed Design Automation Group was far different from the silence surrounding his departure."³⁰

From a business point of view, the big news in the fall of 1993 was the Navy's splitting the \$550 million NAVFAC portion of its CAD 2 procurement between Intergraph and Cordant, the latter acting as a system integrator for Autodesk. As described in Chapter 14, this procurement had dragged on for more than seven years. The contract resulted in substantial business for Autodesk, especially within the Navy and the architecture and engineering firms working for various government agencies.

AutoCAD LT ignites controversy

For several years, the AutoCAD user group had met in the summer in conjunction with the company's CAD Camp, held for dealers and developers. In October 1993, the user group held its first meeting separate from CAD Camp. Now called Autodesk University, it was significant that the user group changed the AutoCAD in NAAUG to Autodesk. Carol Bartz gave the opening night keynote speech, and as she liked to do so often, emphasized the numbers associated with the company – two million users, 4,000 resellers, 2,000 application developers and 600 authorized training centers.

A new conflict was starting to emerge between the company and application developers that would only become more intense as time went on. The attitude among many developers was that Autodesk should focus on basic technology and they would create and market vertical applications as well as programs that filled gaps in the AutoCAD product. It is quite clear that Bartz did not buy into this separation of powers, especially in regards to product gaps in the short term and applications in the long term. The new mechanical packages based on the MES software was just the start.

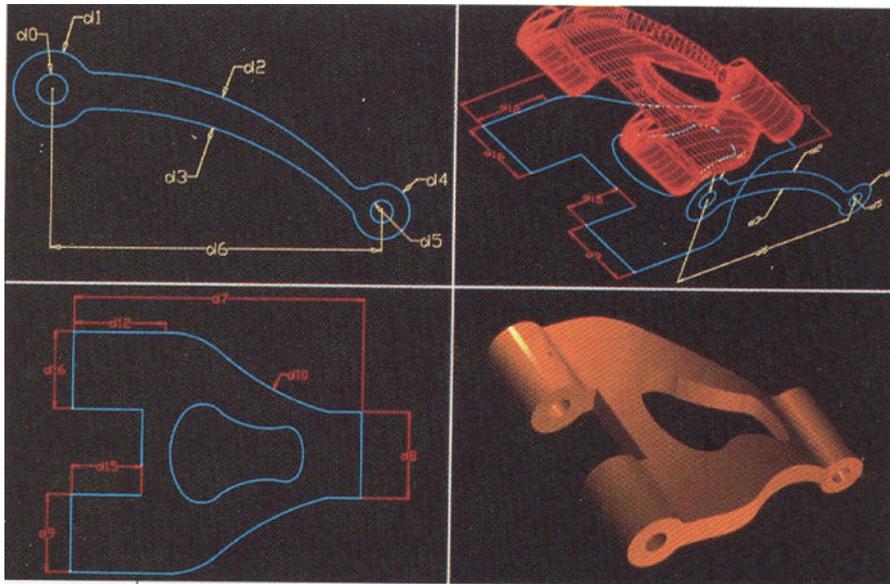
³⁰ Cohn, David, "What's Going On At Autodesk?," *CADalyst*, November 1993, Pg. 14

Two examples of this new philosophy were the AutoCAD Data Extension (ADE) which enabled users and developers to simultaneously access multiple AutoCAD files or multiple users to access the same drawing and an upcoming drawing management package tentatively named Technical Document Management (TDM). It was eventually release in August 1994 as WorkCenter. Other developments included the demise of AutoShade after Pixar withdrew the company's rights to resell RenderMan and the shifting of all Generic CADD development to the company's offices in California.

In early November 1993 Autodesk introduced a new Windows-based low-end drafting package called AutoCAD LT priced at \$495. John Walker had initially recommended a low-cost version of AutoCAD as early as July 1984. At the time he called it AutoCAD Lite.³¹ A major controversy swirled around this product in that Autodesk initially planned to include a version of AutoLisp but at the last moment decided not to do so. This severely limited the ability of user and third party developers to create applications on top LT. Obviously, the company was concerned that a version of LT that was too close to the capabilities of AutoCAD would reduce sales of the higher-priced package to the point that it would hurt the company's overall revenues.

More emphasis on the mechanical market

The major product announcement at AUTOFACT later that month was the introduction of AutoCAD Designer, a \$1,500 ACIS-based front end to AutoCAD. Autodesk had acquired a small company in Oregon called Woodbourne that had previously developed a two-dimensional parametric front end to AutoCAD called Design Companion. The president of Woodbourne was Robert (Buzz) Kross who eventually would become a vice president at Autodesk and responsible for the development of all mechanical CAD software.



³¹ Walker, John, "Expanding the Product Line," *The Autodesk File*, Pg. 219

Figure 8.4 AutoCAD Designer

While this early version of Designer had bi-directional associativity with AutoCAD and could handle under-constrained sketches and feature-based modeling, it could not handle assembly design. At the same time, Autodesk introduced AutoSURF 2.0, a NURBS surface modeler that was integrated with AutoCAD Release 12. The surfaces created with AutoSurf, however, could not be incorporated into Designer models.

Towards the end of 1993, the media started to get a good idea of what Autodesk was planning for AutoCAD Release 13, expected in the second half of 1994. It involved using HOOPS for the graphics interface, incorporating ACIS solids modeling in the basic product and changing the underlying architecture to a more object oriented methodology. I was not optimistic about the company's ability to pull this off:

“When Release 13 does appear, probably in the second half of 1994, many users may decide to stick with Release 12 for a period of time. ...Some users may feel that the new solids capability is not worth the effort of installing it and making it work in their design environment.

“The odds are also good that Release 13 will have its share of bugs due to all the new technology incorporated in it. Also, many of the older PCs users currently have installed may not support Release 13. Autodesk will try to make the software as platform independent as possible, but there are a lot of odd configurations in daily use.”³²

As customers waited for Release 13, the company's revenue growth began to suffer. During the quarter ending January 31, 1994, revenues grew by just four percent to \$102 million. To help jump start the company's business, Autodesk hired James D'Arezzo as vice president of marketing in mid-January. While D'Arezzo had no prior experience in the CAD industry he had held senior marketing positions at IBM where he had helped launch the PC and at Compaq Computer where he was a marketing vice president.

Market changes impact dealer organization

By early 1994 it was becoming clear that Autodesk was refocusing its energies on AutoCAD and related products. A new term the company was using was “adjacency.” Executives such as Bartz and Herr often talked in the context that there were 10, 20 or even 50 users of graphic information for every AutoCAD user who created graphical data. One example frequently used by Herr was Chevron Oil Company which had about 100 copies of AutoCAD at the time. Herr described how the company was using GIS technology to manage its assets

³² *Engineering Automation Report*, December 1993, Pg. 4

and that there was a need for a huge number of copies of a product such as LT to access the data Chevron created with AutoCAD.

They saw AutoCAD LT as providing a tool for these adjacent users and if they didn't provide it, someone else would. Autodesk felt that in the long run, LT would not adversely impact total revenues but would actually stimulate sales of the full AutoCAD package. It was a high risk move but one that eventually paid off for the company. Around this time, the company shipped the millionth copy of AutoCAD to Consolidated Edison in New York.

While the product line was being refocused on AutoCAD and related packages, the dealer channel was undergoing traumatic changes. For a number of years dealers had been selling AutoCAD for a miniscule profit, hoping to make their real profit on the sale of the computer hardware needed to run this software. Some dealers even assembled PCs from readily available components and made another \$1,000 or so on each seat.

Two things happened in the early 1990s to upset this applecart. First, PCs sold by the major vendors achieved a much higher level of performance and there was less the dealer could add to these systems that would create incremental revenue. The second issue was that the prices for standard PCs dropped significantly and the profit on selling standard machines nearly evaporated. By 1994, most small dealers were struggling and an industry-wide consolidation started that continues to this day.

Autodesk tried to help the dealer channel by opening regional offices around the country in order to provide more local support. Initially, these offices did not handle direct sales but that would change with time. One major problem was that dealers were restricted to relatively small geographic areas. That meant that a large engineering firm with offices in ten cities might have to deal with ten different dealers. It would take some time before Autodesk solved this problem.

Autodesk also began insisting that AutoCAD and related products (but not LT) could no longer be sold by mail or telephone. Initially the company insisted that dealers have face-to-face contact with customers. In mid-1996 this was changed to an "Area of Primary Responsibility" which typically translated into the requirement that customers be within 250 miles of the dealer's office. Autodesk also began requiring dealers to provide weekly inventory status reports and other sales information.

Release 13 – Major changes lead to significant problems

At the A/E/C SYSTEMS '94 conference in June in Washington, D.C., Autodesk previewed Release 13. The software had a number of new entity types due to the new object-oriented data structure and the incorporation of ACIS, a new Application Programming Interface (API) for software developers and an improved Windows-oriented user interface. I was not terribly impressed, "Although there are some attractive new features in this release, for the most part, the changes simply add functions that other packages have had for some time." It looked like availability would slip into early 1995.³³

³³ *Engineering Automation Report*, July 1994, Pg. 9

Several months later at Autodesk University in Atlanta, the company demonstrated a more finished version of Release 13 and I was more impressed than I had been in June. Autodesk had added additional drawing productivity enhancements and the new user interface was very flexible. For the first time, the software would be available on CD-ROM. In fact customers would have to pay \$245 extra to get the software on a set of 23 diskettes. Since less than 10 percent of AutoCAD sales were for one of the UNIX versions, Autodesk was requiring that the workstation vendors support porting the software to their platforms. A DOS and Windows 3.1 implementation of Release 13 began shipping in November 1994 with the Windows NT version several months later.

About the same time Autodesk reorganized into specific market groups with Dominic Gallelo in charge of the mechanical group and Godfrey Sullivan in charge of the AEC group. The company also formed a new division called Autodesk Data Publishing whose first product was Autodesk Mechanical Library with drawing data for over 200,000 common parts from 17 manufacturers.

Release 13 got off to a rocky start and the situation did not improve much until Release 14 came out more than two years later. User complaints revolved mostly around performance issue, software reliability and product compatibility. Release 13 ran noticeably slower than Release 12, especially in Windows mode. In fact, AutoCAD was one of the last major applications where many users still preferred the DOS version.

Autodesk probably contributed to this dissatisfaction by not recommending more aggressively that customers upgrade their PC hardware in order to adequately support Release 13. A new version utilizing graphics technology the company referred to as WHIP, came out in 1995 and improved the situation somewhat, especially for Windows NT.

Within four months the company shipped two maintenance updates. The current version as of March 1995 was Release 13c2 which proved to be fairly stable. In early 1996, the company began shipping Release 13c4 which was Windows 95 compliant and included ARX (AutoCAD Runtime Extension), a C++ application programming environment for software professionals. Release 13 did get Autodesk's revenue growth back on track, at least for a few quarters but then it basically stalled again as customers became increasingly concerned with performance, reliability and compatibility issues. Many customers were still using Release 10 and 11 in late 1996.

In April 1995, Autodesk released AutoCAD LT Release 2 which was a substantial improvement over the initial LT product. One problem was that it was still compatible with AutoCAD Release 12, not Release 13. If a Release 13 users wanted to transfer data to LT it had to be saved in the Release 12 file format and then transferred. It would June 1996 before the company released AutoCAD LT Release 3 for Windows 95 that was file compatible with AutoCAD Release 13. Possibly the best comment on Release 13 was John Lynch's: "One of the issues we came up against in Release 13 was that we tried too hard to be all things to all people."³⁴

³⁴ *Cadence*, November 1996, Pg. A29

Interoperability

Beginning in the spring of 1995 the issue of data interoperability took on new importance as Autodesk pushed the concept of object-oriented data structures. Initially, the intent was to get AutoCAD applications to share more than just the graphic representation of objects such as doors, windows, valves, etc. The first step in this direction was the establishment of the Industry Alliance for Interoperability (IAI) which was established to publish definitions for these objects called Industry Foundation Classes (IFC).

The first attempt was to create a class library for commercial buildings. For a long time IAI efforts were almost entirely AEC-centric. A significant development occurred when Bentley Systems joined IAI later that year.

Autodesk also began offering an OEM version of AutoCAD with one significant caveat – they would not license this software to any company that offered or planned to offer a product that competed with any Autodesk products. As a consequence, there were few takers.

Autodesk launches Mechanical Desktop

In the fall of 1995 Autodesk announced a new mechanical design and drafting product called Mechanical Desktop. It combined AutoCAD Designer 2.0, AutoSurf 3.0, AutoCAD Release 13, IGES and software that tied it all together in a single integrated solution. Previously, users had to translate data to move between these applications. The intent for Mechanical Desktop was to move away from just mechanical drafting to true product design with tools incorporated to facilitate assembly modeling.

While not competitive with products such as Pro/ENGINEER or Unigraphics, it was a distinct step forward. Autodesk also had to compete with new products such as SolidWorks and Intergraph's Solid Edge, both of which were introduced around the same time. The major shortcoming was that users had to work interactively in a wireframe mode while competitive products allowed them to work with hidden lines removed or with shaded images. The suggested list price was \$6,250.³⁵

Shipment of a production release of Mechanical Desktop was delayed until early 1996. At that time, Dominic Gallelo clarified the company's mechanical market position as still being drafting-centric rather than competing directly with heavyweight competitors such as PTC or the new mid-range vendors. Basically, the company was planning on playing to its strengths, at least for the time being.

Mechanical Desktop Version 1.1 was released in September 1996 with the major enhancement being the ability to work with shaded or hidden line models. The company also release Web version of PartSpec and WorkCenter.

A substantially new version of Mechanical Desktop had to wait for AutoCAD Release 14 described below. A few months after Release 14 began shipping the company began delivering Mechanical Desktop Release 2.0 that incorporated Spatial Technology's ACIS Version 3.0. Compared to the prior version Mechanical Desktop Release 2.0 had improved geometry definition capabilities, improved performance, better assembly modeling and an improved user interface. The company also launched an enhancement to AutoCAD Release 14 that facilitated mechanical drafting. It was simply called AutoCAD Mechanical.

³⁵ Mechanical Desktop was known as Project Texas during development

In May 1998, Autodesk acquired Amberg, Germany-based Genius CAD-Software GmbH for \$68 million. This company was a leading vendor of mechanical design automation software in Europe. The company's primary product was Genius Desktop, a plug-in for Autodesk Mechanical Desktop that provided a more vertically focused set of features for electromechanical and industrial machinery design. The downside to the acquisition was that third party software partners began to see Autodesk as one of their primary competitors.

Multimedia business becomes separate division

Visualization and animation had been an important element of Autodesk's business model for a number of years. In April 1996 the company gave this activity more focus by changing the Multimedia Market Group to a separate entity called Kinetix, relocated from San Rafael to San Francisco. The new unit's general manager was Larry Crume.

Kinetix was responsible for products such as 3D Studio and 3D Studio Max as well as Internet initiatives including a new AutoCAD format called DWF (Drawing Web Format). A year later, a new package, Autodesk Walkthrough, was introduced that facilitated animated visualizations of proposed facilities such as office buildings and process plants.

Autodesk acquires Softdesk

By late 1996 Eric Herr had become president and COO of Autodesk and was taking on so much responsibility, that I predicted in January 1997 the Carol Bartz might be leaving and going into politics. One of the reasons I made this prediction was that when Autodesk announced on December 10, 1996 that it was acquiring Softdesk for \$72 million (later raised to \$90 million when PTC came in with a competitive offer) it was Herr who made the announcement, not Bartz. The final acquisition price was about twice Softdesk's annual revenues.

Softdesk was founded in 1985 by David Arnold and David Paine as DCA Engineering, a civil engineering and surveying firm in Henniker, New Hampshire. It was an early user of AutoCAD and in 1987 decided to begin developing civil engineering and surveying software packages that ran on top of AutoCAD. The company kept the prices for its packages reasonably low and used many of the Autodesk dealers to sell these programs. In 1991 the company's name was changed to Softdesk and it quickly became the largest third party developer of AutoCAD applications. In 1993, Softdesk acquired Archsoft Group (ASG) which was located in Sausalito and was the second largest vendor of AutoCAD applications. ASG was also the original developer of the AutoCAD AEC application described earlier. ASG's founder, Jesse Devitte, remained with Softdesk after that deal occurred as well as after the Autodesk acquisition.

The company's revenues hit \$14.5 million in 1993 and in early 1994 Softdesk went public. Using its stock and some cash, the company began acquiring a number of smaller software firms in order to fill out its suite of AEC applications. These companies included:

- Image Systems Technology (raster image software)
- IntelliCADD (software for the utility industry and the developer of the technology used in AutoCAD Data Extension)

- Advantage Engineering (process plant design software)
- Foresight Resources (low-cost architectural applications).

The acquisition of Softdesk was a significant move by Autodesk in that it now put the company in direct competition with many of its third party developers. The plan was to make Softdesk the base for the company's AEC Market Group with Arnold in charge, reporting to Herr. This only lasted a short while and by fall Arnold had moved to the position of chief technology officer for the company and Devitte was the general manager of the AEC group. Subsequent to AutoCAD Release 14, a new release of the Softdesk software was made that was referred to as Softdesk 8.

There was a significant antitrust issue that nearly derailed the acquisition. After acquiring IntelliCADD, Softdesk put its programmers to work creating a low-cost clone of AutoCAD. The Federal Trade Commission felt that Autodesk's acquisition of Softdesk would eliminate potential competition and it held up the deal until Softdesk agreed to spin off that operation as Boomerang Technology which was then acquired by Visio. The AutoCAD knockoff was subsequently given the temporary name of Phoenix and was eventually released in early 1998 as Visio IntelliCAD using a reverse-engineered AutoCAD DWG file format as its underlying data structure.

AutoCAD Release 14 – finally

Nearly two and a half years after ill-fated Release 13, Autodesk launched AutoCAD Release 14, a significant improvement over the prior version. In March 1997, *A-E-C Automation* personnel tested a beta version of the software and were impressed with its reliability, performance, improved user interface and tighter integration with other Autodesk products. Other than the ability to work with hybrid raster and vector drawings there were few new functional enhancements this time around.³⁶

The beta test program involved over 16,000 users, a first for the company. The price remained at \$3,750 with subsequent upgrades available for \$295 per year through the company's new VIP Subscription Service. This was a Windows 95 and NT only release. There were no plans to produce DOS or UNIX versions of Release 14 or support earlier versions of Windows and the software was available only on CD-ROM. No more diskettes.

Release 14 was shown publicly at A/E/C SYSTEMS '97 in Philadelphia that June. The keynote address contained one of the best lines ever heard at a CAD industry conference. Sitting between Intergraph's Jim Meadlock and Bentley Systems' Keith Bentley who were in the middle of a nasty legal dispute, Carol Bartz started her talk with, "I feel like a rose between two thorns."

Autodesk began shipping Release 14 on May 9, 1997 and not a moment too soon. Revenue for the quarter ending April 30th were down 13 percent from the prior year to \$119 million and the company lost \$52.7 million (this was after a \$58.1 million charge related to the acquisition of Softdesk). With Release 14 receiving a good reception from users and prospects, sales soared to \$154 million the following quarter and earnings were once again positive at \$17.8 million. With just the U. S. version available, Autodesk still shipped 60,000 new seats and 65,000 upgrades during the quarter. Release 14 truly marked an inflection point in the history of Autodesk although AutoCAD now amounted

³⁶ *A-E-C Automation Newsletter*, March 1997, Pg. 1

to just 75 percent of the company's overall revenues, down from the 90 percent it represented a few years earlier.

A few months later the company began shipping Mechanical Desktop 2.0 which incorporated Release 14 and ACIS 3.0. It included a new model browser, shelling, improved fillets and blends and an improved menu structure. The company's MAI (Mechanical Applications Initiative) Partnership was attracting third party software developers who marketed a growing number of Mechanical Desktop applications including finite element analysis (FEA), kinematic simulation, mold design, tolerance analysis and NC.

Visualization was starting to become more of a mainstream activity. While 3D Studio MAX was an excellent package, it took far too much effort to learn for casual users. Autodesk responded by introducing 3D Studio VIZ, an easier to use visualization package aimed at broadening the market. Although it appeared that Autodesk was starting to get its act together, there was a potential cloud on the horizon. The threat goes back to John Walker's "Nightmare Scenario" where he forecast that a low-end competitor (potentially Microsoft) would come out with a substantially lower cost version of AutoCAD. That threat appeared to be Visio's Phoenix project mentioned earlier.

For \$500 users could have a package that emulated 90 percent of AutoCAD's functionality and was file compatible with earlier versions of AutoCAD back to Release 10. *Forbes* thought this was a real threat: "If the easy-to-use Phoenix fulfills its promise of AutoCAD compatibility, it could displace AutoCAD even among hard-core technical users."³⁷ That never did happen, as described in Chapter 21.

In October 1997, the company held its first Autodesk Design World which combined the Partner Summit (previously CAD Camp) and Autodesk University at the Los Angeles Convention Center with 5,300 people attending. The meeting was kicked off with a video introduction by Microsoft's Bill Gates followed by an upbeat presentation by Carol Bartz that emphasized the three building blocks for the future at Autodesk – intelligent objects, the Web and three dimensional modeling. At this point, the company products and markets and the unit managers were:

- Geographic Information Management Systems – Dr. Joseph Astroth
- Mechanical – Dominic Gallelo
- AEC –Jesse Devitte
- Personal Solutions (AutoCAD LT and Autosketch) – Godfrey Sullivan
- Kinetix – Jim Guerard
- AutoCAD – Robert Carr

In mid-1998, Autodesk introduced a new AutoCAD application development tool called Visual LISP. A significant differences with the earlier AutoLISP was that the new version resulted in compiled code rather than interpreted applications. Hence, they ran as much as two to five times faster. Also, Visual LISP could access Release 14's object-oriented files through the use of Autodesk's ObjectARX programming environment.

OpenDWG Alliance

One of the byproducts of AutoCAD success was that there was a growing number of companies that wanted to directly read and write DWG files. Autodesk's response was

³⁷ Young, Jeffrey, "The Case of the Unlucky 13," *Forbes*, September 22, 1997, Pg. 236

to offer an OEM version of Release 14 except, as mentioned earlier, not to competitors. A number of companies used DWG information that had been reversed engineered by MarComp, a two-person software firm. Sensing something better organized was needed, Visio Corporation, which had earlier acquired MarComp, convinced about 15 other software companies to contribute \$25,000 each towards establishing the OpenDWG Alliance (ODA) in February 1998. Significantly missing from this first group of members was Bentley Systems. Autodesk had been asked to join but refused for obvious reasons.

One of the first actions was to run a full-page add in *The Wall Street Journal* attacking Autodesk for keeping the DWG format proprietary. This was somewhat hypocritical in that most of the Alliance members kept their own file formats proprietary. Visio contributed the MarComp technology to ODA and the original developers of that software continued to work on it. ODA periodically released new software that enabled its members to read and write the latest AutoCAD DWG files. Evan Yares became executive director of ODA in September 1998 and in October 2003, after Bentley joined, the name was changed to the Open Design Alliance.

Autodesk's position over the years was that no one else could provide DWG compatibility to the extent that it could since Autodesk controlled the content of the format and did not have to reverse engineer data files.

Autodesk's product line expands

In early 1998, Mark Sawyer, who had previously been with Auto-trol Technology and Spatial Technology, became general manager of the AEC Market group and was subsequently promoted to vice president. He reported to Carl Bass who was the company's chief technology officer (Dave Arnold had left the company by then). Bass was in charge of a new AECAD Group which combined AutoCAD and the AEC Market group.

That May, the company introduced AutoCAD Architectural Desktop, an integrated solution for building design along the lines of the previously described Mechanical Desktop product. It added a number of object-oriented architectural features to AutoCAD Release 14 and provided an incremental step for users interested in moving to three-dimension building modeling. The company tended to downplay this later aspect of the product. According to Ian Howell, an AEC marketing manager: "We made a decision early in the design of the product that we would not mandate our users into 3D data input."³⁸ Architectural Desktop, which began shipping in October, had a list price of \$4,795.

The architectural software was followed a few months later by a new suite of civil engineering and surveying software. The base product was called AutoCAD Land Development Desktop which consisted of AutoCAD Release 14, a GIS module called AutoCAD Map 3.0, new menus, an enhanced symbol library and some application specific functions. This had a list price of \$4,995. The company also launched two add-on applications, Autodesk Survey and Autodesk Civil Design. Survey was priced at \$995 while Civil Design was an additional \$2,995. These prices were less than competitive packages such as Intergraph's INROADS, but also were functionally less extensive. Except for process plant design, Autodesk was now in direct competition with most of its third-party AEC software developers.

³⁸ *A-E-C Automation Newsletter*, June 1998, Pg. 6

The next major move was the acquisition of Discreet Logic, based in Montreal, Canada, that was announced on August 20, 1998. Discreet was a developer of high-end visualization and animation software used primarily in the entertainment industry for films such as *Armageddon*, *Titanic* and *Independence Day*. It took until March 1999 to complete this deal. The acquisition involved the issuance of about ten million shares of Autodesk stock worth approximately \$410 million at the time. The plan was to combine Discreet and Autodesk's Kinetix business unit into a single activity using the Discreet name. At the time, Discreet had annual revenues of about \$150 million. This did not turn out to be a great move for Autodesk in the long run and seven years later revenues for this business are about the same as they were in 1999. One result was that 3D Studio Max eventually became 3ds max (later 3ds Max) as the computer industry became enchanted with lower case business and product names. 3D Studio VIZ simply became VIZ

By the end of 1998, Autodesk had sold two million copies of AutoCAD and more than 800,000 of AutoCAD LT. The company also launched Actrix Technical, a two-dimensional software package clearly aimed at competing with Visio.

Autodesk changes AutoCAD nomenclature

In early 1999 Autodesk launched a new version of AutoCAD called AutoCAD 2000 rather than Release 15. There were more than 400 enhancements in this release, most of which were rather minor but a few were particularly significant. Overall, this version represented a maturing of the object-oriented ARX technology originally introduced with ill-fated Release 13.

With AutoCAD 2000, Autodesk completed the transformation of AutoCAD to a fully object-oriented architecture. This was key to supporting applications such as Architectural Desktop and Land Development Desktop. Equally important was the transition to a fully-compliant Windows implementation of the software. Users familiar with Microsoft operating systems and applications could now feel equally comfortable with AutoCAD and were ensured that data could be moved between AutoCAD and other Windows-compliant applications.

With Autodesk no longer supporting UNIX, DOS or MAC/OS, the company's programmers were able to take advantage of all the capabilities built into the Windows operating systems including file management, menu management, input and output device control, network communications and many other "housekeeping tasks." Leaving these tasks up to the operating system made Autodesk's software more compatible with other applications. In addition, it freed up programming resources that could be assigned to other projects. During development of Release 9 and 10, the company's programmers probably spent 70 percent or more of their time on these housekeeping tasks. By the time AutoCAD 2000 was released, they were probably spending less than 20 percent.

The most significant functional enhancement was the ability to open several drawings at the same time and display them in individual windows or overlapped like tabbed folders.

AutoCAD 2000 was somewhat slower to take off than initially expected. Release 14 had been a significant enhancement over Release 13 and many users (about 45 percent were using Release 14) were satisfied and saw no immediate need to upgrade. Also, it took some time for Autodesk and third party applications that were compatible with

AutoCAD 2000 to become available. One result was that revenues for the quarter ending April 30, 1999 dropped 13 percent to \$195 million.

In mid-2000, the software was updated with a number of Web-centric capabilities and renamed AutoCAD 2000i. This nomenclature was also used for other AutoCAD and LT-based products. At the same time, the company launched a Web-centric method for customers to access information from Autodesk called simply Autodesk Point A.

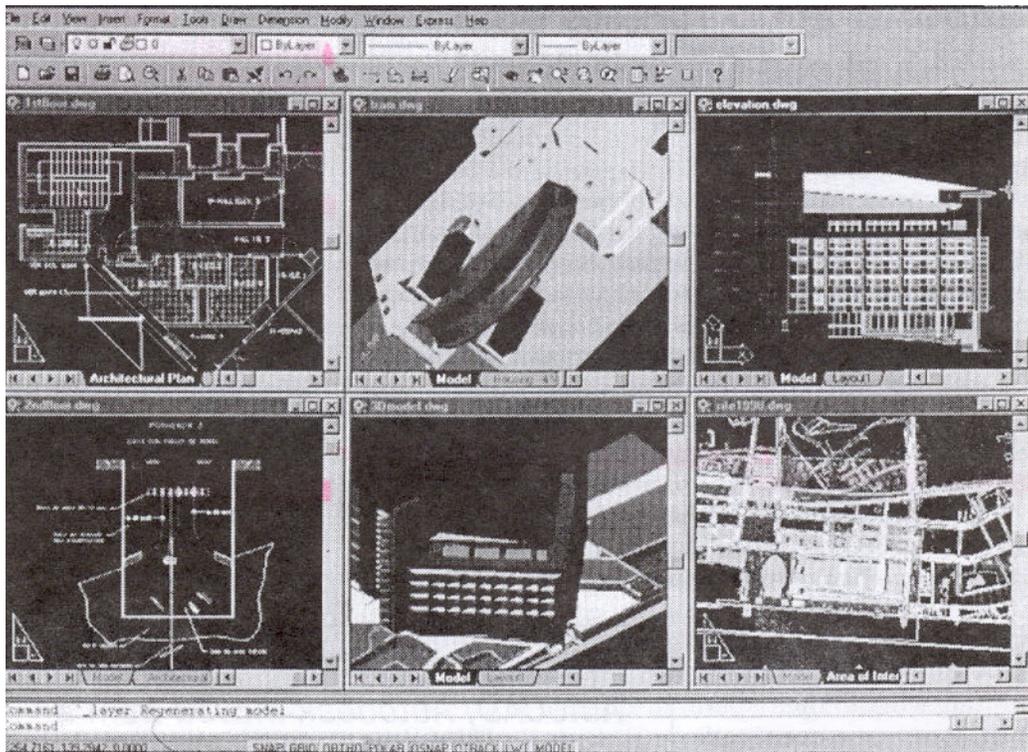


Figure 8.5
AutoCAD 2000 Multiple Design Environment

Let's rearrange the deck chairs one more time

It seemed as if Autodesk was constantly looking for the “right” organizational structure that would propel it into the ranks of leading software companies. With revenues stagnant in mid-1999, it was time to rearrange the deck chairs one more time. First, Eric Herr announced that he was retiring and Carol Bartz took back the position of president which she had relinquished several years earlier. The company was then restructured into four business units each headed by an executive vice-president.

- **Design Solution Division** (Dominic Gallelo) – responsible for industry specific applications in mechanical and AEC areas as well base products such as AutoCAD and AutoCAD LT.
- **Discreet Division** (Godfrey Sullivan) – responsible for digital media tools as well as previous Kinetix products such as 3D Studio Max. In early

2005, this group was renamed the Autodesk Media and Entertainment division.

- **GIS Solutions Division** (Joe Astroth) – responsible for mapping and utility information management applications. In April, Autodesk had acquired Vision* Solutions Group, a software firm that specialized in mapping applications for utilities. The company paid \$26 million for this division of MCI Systemhouse. This division also was given the responsibility for Land Development Desktop and other civil and surveying applications in either 1999 or 2000. Later, it was renamed Location Services Division.
- **Autodesk Ventures** (Carl Bass) – responsible for new business opportunities such as Web-based services. Bass retained his position as chief technology officer.

The reorganization was probably caused in part by the fact that revenues were continuing to deteriorate. Revenue for the quarter ending July 31, 1999 was down 11 percent to \$203 million. AutoCAD 2000 was a solid piece of software but customers were upgrading slowing. By the end of the quarter, only eight percent of the user base had upgraded. Since the company's cost structure was based on the expectation of higher revenues, Bartz announced a 10 percent layoff or about 350 positions. Analysts were turning negative on the company. The Motley Fool web site was perhaps the most cynical:

"The company cranked up the same excuse broken record it has used to explain away year-over-year earnings declines in the prior two quarters, blaming the shortfall on product transition factors and slack demand for its core PC design software products. Fearing the product transition explanation may be wearing a little thin on investors who have watched 42% of the company's market value evaporate so far this year, Bartz offered up a new spin on things. It seems that customers are more interested in Web-based applications than the plain-vanilla offerings Autodesk has been serving up. In response, the company will be plowing some of the cost savings it reaps from the job cuts into developing Internet-enabled products. However, it will take some time for the new Web efforts to ramp up, suggesting Autodesk's shareholders will get more doses of the broken-record blues in Q3 and Q4."³⁹

Buzzsaw.com joins project management web hosting parade

By 1999 one of the hottest areas of activity in the AEC market was the management of design and construction projects using Web hosting techniques. The concept involved storing design documents on a Web server and providing access to these documents as well as a variety of project management services to all the individuals involved in the project. Over a period of several years more than \$1 billion in venture funding was provided to nearly 170 companies including Blueline/Online, BricsNet, Bidcom, Cubus, Buildpoint.⁴⁰

³⁹ Motley Fool Web Site

⁴⁰ Cohen, Peter S., "Deconstructing Buzzsaw.com," *The Standard*, May 15, 2000

Autodesk was not to be left out of this parade but on the other hand, did not want to have the startup costs for entering this business impact the company's earnings. The way around this was to set up a separate company in December 1999 called Buzzsaw with \$15 million in initial funding from Autodesk and another \$15 million from Crosspoint Venture Partners. The company subsequently raised a total of \$90 million of venture funding. Carl Bass and Anne Bonaparte moved over from Autodesk to run Buzzsaw.

The initial product was called ProjectPoint. The plan was to provide the management of a limited amount of data for free (initially 100 MB) and to charge for larger projects. Like many other dot com startups, Buzzsaw also talked about generating revenue from advertising and other services such as transaction fees on building components ordered through ProjectPoint. By mid-2000, Buzzsaw had 240 employees, 10,500 projects on-line and 50,000 registered users. One early customer was Bank of America which was using Buzzsaw to help manage its commercial construction lending business.⁴¹ Buzzsaw was chewing up cash at a \$10 million per quarter rate.

In April 2000 the company invested in a second information management company called RedSpark.com that targeted manufacturing industries. Dominic Gallelo moved over from Autodesk to head up this startup. By later that year, Autodesk owned a majority of both Buzzsaw and RedSpark and as a consequence was required to consolidate their losses with its financial results. In March 2001, RedSpark announced RADIPteam, a solution for communication and collaboration between project managers, engineers, and material suppliers, and ProductEdge, an eBusiness platform for standard component manufacturers.⁴²

In a somewhat hard to follow move, Autodesk established another on-line project management service as part of its Inventor initiative (see below) called Streamline. Launched in February 2001, it was a hosted online service for sharing digital design data across the extended manufacturing enterprise, including sales, marketing, purchasing, documentation, the shop floor, and suppliers.

It is interesting to note that Bartz assigned two of her top executives to run these startups, neither of which ever made it as independent companies. When Buzzsaw was brought back inside the corporate fold in mid-2003, Bass returned to Autodesk as the company's chief operating officer while Bonaparte became president and CEO at MailFrontier, a vendor of email security and anti-spam software.

RedSpark, on the other hand, was simply disbanded in October 2001 and the entire staff of 42 employees including Gallelo were laid off. Autodesk cited "a weak manufacturing economy and a difficult private capital market," and was quick to note that RedSpark was not part of Autodesk, but rather a company that Autodesk had nurtured and invested in. There was apparently overlap with the previously mentioned Streamline product which was probably why Autodesk did not simply acquire the portion of RedSpark it did not already own and bring the company in-house as it did with Buzzsaw.

⁴¹ Autodesk Press Release, April 10, 2000

⁴² *Engineering Automation Report*, April 2001, Pg.16

Streamline is an Autodesk hosted system based on software from eRoom Technology and RealityWave. It enables the creators of data to post design information that can then be accessed by others within the company or by outside suppliers such as machine shops. Basically, it does for manufacturing companies what Buzzsaw does for AEC-related firms.

Autodesk launches Inventor – a new mechanical design package

Mechanical Desktop as described above targeted mechanical designers who considered that compatibility with AutoCAD and its DWG file format to be more important than having the most effective design tool. Autodesk recognized early on that this was an interim solution and that eventually it would have to provide a more up-to-date feature-based parametric modeler if it were to become a major player in the mechanical CAD arena.

Work on a new, built from the ground up, software package, code-named Rubicon, began in early 1996. During the next several years, Autodesk spent over \$25 million and built up a team of more than 90 people working on this project in Tualatin, Oregon under the supervision of Buzz Kross. Prior to its release in late 1999, the new software was named Autodesk Inventor. It used Spatial Technology's latest geometric kernel, ACIS 5.2.

There were several key aspects to this package. Autodesk put substantial effort into making the software easy to use with minimal initial training. One characteristic of this was Inventor avoided most of the difficult parent/child restrictions that users of other systems such as Pro/ENGINEER had to work with. The company also claimed that Inventor would handle large assemblies without undue problems. The latter was accomplished through the use of a new data architecture called a segmented database.⁴³

Introduction of Inventor did not mean that Autodesk was abandoning AutoCAD-based mechanical design. New releases of both AutoCAD Mechanical and Mechanical Desktop continued to be worked on. The company added what it called "Power Packs" to these products that incorporated technology obtained when it had earlier acquired Genius. Basically, Autodesk wanted to claim that it provided the best technology for users who wanted to move from two-dimensional to three-dimensional design while at the same time continue to generate substantial revenue from customers who wanted to continue working in a drawing-centric mode.

Within a few months the company began shipping Inventor Release 2 with improved assembly modeling capabilities, sheet metal modeling and improved drafting. It still did not have the surface geometry capabilities of the Mechanical Desktop package. By late 2001 the company was shipping Inventor Release 5 although it still did not have significant surface geometry capabilities. As of the end of 2001, Autodesk had shipped more than 50,000 copies of inventor.

Autodesk and the 21st Century

In the early years of the new century, Autodesk focused on consolidating its product line and attempted to get its revenue growth back on track. It took a

⁴³ *Engineering Automation Report*, September 1999, Pg. 9

few years, but by 2005 the company seemed to be on a roll. After nearly doubling between fiscal 1995 and 1999 to \$894 million, the company's revenues were erratic to say the least over the next five years, sinking to \$825 million in fiscal 2003 and never getting much above \$950 million. Then in the last quarter of fiscal 2004, it was as if someone lit the corporate afterburner as revenues for the quarter increased 51 percent to \$295 million. Revenues soared to over \$1.2 billion in fiscal 2005 and the company earned more than \$220 million. Fiscal 2006 was even better with revenues of \$1.5 billion and earnings of over \$300 million. The company's stock jumped from a split adjusted \$10 in mid 2003 to nearly \$50 per share in late 2005. In May 2006, Carol Bartz became executive chairman of the company and Carl Bass became CEO.

Some of the highlights during this period not mentioned earlier or simply involving normal product enhancements included:

- In late 2001, Autodesk announced that it planned to develop its own geometric modeling software called ShapeManager based on Spatial's ACIS 7.0. This move was partially a result of the fact that Spatial was now a Dassault Systèmes subsidiary and partially the desire by Autodesk to control its own technology. Under its earlier license agreement with Spatial, Autodesk had rights to a permanent license of the ACIS kernel.
- Spatial sued Autodesk claiming that the latter company had breached its contract by improperly providing access to the ACIS source code to third parties including D-Cubed, a developer of constraint management software. In October 2003, a jury ruled in favor of Autodesk.
- Autodesk acquired Revit, a vendor of architectural modeling software, for \$133 million in January 2002. Revit was started by several ex-PTC software developers and was becoming a significant player in the architectural modeling market. Under Autodesk, Revit sales initially grew rather slowly. In late 2003, the company combined Revit with AutoCAD 2004 into a product called Revit Series in an attempt to stimulate sales. Revit currently represents a distinct platform within the company's Building Solutions Division, much the way Inventor is a platform within the Mechanical Solutions Division. A major differentiator, however, is that while Inventor competes against the likes of SolidWorks, Solid Edge, CATIA, Pro/ENGINEER, and a host of others, Revit has significantly less competition. Autodesk coined the acronym BIM (Building Information Modeling) to identify the way Revit enables architects, designers, and engineers to capture decisions during the design process and incorporate them into the overall database that represents the 3D virtual prototype of the building. This technology is now being mandated by the General Services Administration (GSA) and a number of major corporate developers.⁴⁴ By 2007, Autodesk was selling 75,000 copies of Revit annually.

⁴⁴ Personal correspondence from David Cohn

- Later in 2002, Autodesk acquired CAiCE Software Corporation, a Tampa, Florida based developer of surveying and civil engineering software, for \$10 million. This acquisition provided Autodesk with highway design software capable of competing against similar applications offered by Bentley Systems.
- Autodesk bundled Inventor, AutoCAD Mechanical and Mechanical Desktop into a single product bundle called Inventor Series (now known as Inventor Suite) in early 2002 and priced this software suite at \$5,195, just slightly more than the price of Inventor itself. The street price tended to be closer to \$4,000.
- Autodesk has continued to update AutoCAD with additional three-dimensional capabilities, user interface improvements and better data interaction with databases and spreadsheets. By 2007, the company was selling nearly 250,000 copies of AutoCAD annually included copies included with various product suites. This was in addition to another 325,000 copies of AutoCAD LT annually.
- Gradually, the company began to increase its direct sales as a complement to its dealer network, especially in the mechanical CAD market.
- Autodesk continued to move its customers to the company's VIP subscription service. In some cases, specialized services were only available to customers who were VIP subscribers.
- Increasingly, the company focused on information management and collaboration software tools. The company's products, especially in the mechanical arena began to take on more and more of the characteristics of the company's larger competitors such as PTC, Dassault Systemes and UGS.
- The company attempted to regain a more profitable business model including a layoff of over 550 people in early 2004. Autodesk also drove upgrade revenue by more aggressively capping support for earlier releases of its software products. At some point, a user could no longer upgrade an earlier release but had to purchase a new license in order to obtain the latest version.
- Autodesk added Computer-Aided Industrial Design(CAID) to its product portfolio in 2005 when it acquired Alias, a Canadian software firm for \$182 million in cash. Alias, founded in 1983, was acquired by SGI in 1995 and merged with Wavefront to form Alias|Wavefront.⁴⁵ It was sold to a group of private investors in June 2004 for about \$57 million who quadrupled their money in a little over a year when they sold it to Autodesk.
- The company is also moving more aggressively into the process plant design market. In 2007, it released a drafting application particularly targeted at producing P&ID drawings and it plans to offer a piping design package in the near future.

⁴⁵ *Engineering Automation Report*, August 2003, Pg. 3

Why did Autodesk succeed when so many others failed?

The simple answer to this question is that in 1982 the existing CAD companies were wedded to traditional product concepts and business practices at a time when the computer industry was in the very early stages of revolutionary change. Autodesk recognized the impact the personal computer would have on this industry while the firms who dominated the industry in 1982 ignored this trend for far too long.

When Autodesk was started, the CAD industry was dominated by five major turnkey vendors: Auto-trol Technology (no longer in the CAD business), Applicon (acquired by UGS), Computervision (acquired by PTC), Calma (acquired by Prime Computer then merged with Computervision prior to the latter company's acquisition by PTC), and Intergraph, all of which had sales exceeding \$50 million per year. All five had a number of characteristics in common.

- They were hardware manufacturing companies as well as software vendors.
- They designed and built specialized graphics workstations that only ran their software.
- The typical system sold for \$80,000 to \$125,000 per seat.
- They provided all training and customer requests for customization.
- The systems were sold by a direct sales force.
- In 1982, they were all in the process of migrating from 16-bit computer systems to 32-bit systems.
- The new computer of choice was the Digital VAX 11/780.
- All applications were developed and sold by the system vendor except for the occasional analysis package.

There were numerous other vendors chasing after this business. Some, such as Gerber and IDI, also sold similar high-priced turnkey systems. There were also a number of so-called low cost system vendors. In 1982 low cost was defined as under \$80,000. Most of this later group of vendors (Arrigoni, Bruning, Summagraphics, Sigma, Calcomp, Nicolet-CAD, et al) also designed and manufactured specialized graphics hardware to support their software. In general, none of these companies took Autodesk seriously until it was too late.

Autodesk was successful for a number of business and technical reasons.

- The company was started on a cooperative basis with most of the founders having other jobs from which they earned enough to live on.
- They were excellent programmers.
- Walker managed the company's money very tightly—one could almost say he was as paranoid about expenses as he was about taxes.
- The company used standard PC hardware to the maximum extent possible.
- The software was priced low enough that most early users did not require a very high level of management approval for the purchase. Since hardware was purchased separately, a system could be split into two small procurements. It was also cheap enough for educational organizations and commercial training schools to buy.
- They quickly moved to support numerous foreign languages.

- Autodesk built a killer distribution channel. By 1985, more than 1,000 ComputerLand and Entre stores were handling AutoCAD in the U.S. and more than 500 dealers were selling this software in 40 foreign countries. Autodesk also sold a significant number of copies on an OEM basis through several PC manufacturers.
- Much of the sales expense such as training sales personnel and application engineers was absorbed by the dealer channel.
- Dealers provided much of the training and technical support. Mike Ford, in particular, felt that this saved Autodesk considerable expense during the early years.
- Customers paid for software upgrades when they came out.
- While dealers made some money selling AutoCAD, they made the bulk of their profit selling the PC hardware they configured for their customers. The most significant source of profit for many dealers was the money they made on training and support.
- The company welcomed third-party software developers and did not view them as competitors as did the large turnkey vendors. By June 1985 there were more than 100 such packages. Within a few years there would be thousands.
- One of the big factors that differentiated AutoCAD from most of its PC-based competitors was that, except for a short period of time, it had no copy protection on North American licenses. Other packages such as VersaCAD and CADplan had hardware locks. Since AutoCAD was easy to copy, many people did so and the number of pirated copies soared. This dramatically increased the number of trained users. Eventually, Autodesk implemented an anti-piracy campaign and even paid dealers a bounty to turn in organizations using stolen software. Autodesk has used hardware locks only on international copies of its software. The company has predominately relied on license agreements to control the number of illegal users.

The bottom line is that Autodesk was in the right place at the right time and it did not blow the opportunity as so many other companies in a similar position have done over the years. AutoCAD was not the only PC CAD package introduced in the early 1980s, but it definitely was the most successful.

Financial results

Some years have been restated due to mergers and acquisitions. Also, the company currently reports earnings on a pro forma basis that makes it difficult to compare recent earnings with earlier periods. Typically, special charges due to acquisitions are excluded from the earnings numbers.

Year ending January 31	Revenues in millions	Profits in millions
1983	\$0.015	(\$0.009)
1984	\$1.2	\$0.1
1985	\$9.9	\$1.6
1986	\$29.5	\$6.5
1987	\$52.4	\$11.6
1988	\$79.3	\$20.5
1989	\$117.6	\$32.7
1990	\$178.6	\$46.4
1991	\$237.9	\$56.8
1992	\$284.9	\$57.8
1993	\$353.2	\$43.9
1994	\$405.6	\$62.2
1995	\$454.6	\$56.6
1996	\$534.2	\$87.8
1997	\$496.7	\$41.6
1998	\$786.1	\$56.2
1999	\$893.8	\$97.1
2000	\$848.1	\$9.8
2001	\$936.3	\$93.2
2002	\$947.0	\$119.0
2003	\$824.9	\$31.9
2004	\$951.6	\$120.3
2005	\$1,234	\$221.5
2006	\$1,523	\$316.4
2007	\$1,840	\$349.7