Table A-1

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Worldwide, All Platforms, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	355.7	403.7	442.8	9.7	8.2
2	IBM	366.3	398.3	436.1	9.5	8.0
3	Intergraph	310.2	321.2	317.7	-1.1	5.9
4	Cadence	318.3	228.6	261.7	14.5	4.8
5	Parametric Technology	81.2	149.6	201.2	34.5	3.7
6	Mentor Graphics	152.3	170.0	172.1	1.2	3.2
7	Fujitsu	114.3	165.8	165.9	0.1	3.1
8	EDS Unigraphics	113.1	144.4	163.5	13.2	3.0
9	Computervision	228.9	165.0	163.3	-1.0	3.0
10	Synopsys	64.1	114.1	142.7	25.0	2.6
11	ESRI	91.9	108.8	128.3	17.9	2.4
12	MacNeal-Schwendler	106.3	116.7	114.0	-2.3	2.1
13	SDRC	83.7	85.6	111.4	30.1	2.1
14	Hewlett-Packard	94.1	104.0	106.9	2.9	2.0
15	NEC	84.5	96.4	101.7	5.6	1.9
16	Hitachi	73.1	80.8	86.9	7.5	1.6
17	Zuken-Redac	81.8	71.5	77.7	8.7	[illegible]
18	Viewlogic Systems	46.2	62.2	74.1	19.1	1.4
19	Siemens Nixdorf Info systeme	94.8	68.6	71.3	3.9	1.3
20	Toshiba--NO OEM	59.8	64.8	70.3	8.6	1.3
21	Nihon Unisys	44.2	62.9	66.5	5.6	1.2
22	Quickturn Design Systems	24.1	49.6	58.6	18.2	1.1
23	Nemetschek	32.5	44.7	58.1	30.1	1.1
24	Landmark Graphics	29.8	50.9	56.8	11.6	1.0
25	Matra Datavision	48.7	50.3	54.8	9.0	1.0
26	IEZ	26.6	29.6	40.3	35.9	0.7
27	Zycad	33.6	32.8	39.7	21.2	0.7
28	COMPASS Design Automation	32.4	33.5	38.8	15.6	0.7
29	Sharp System Products--NO OEM	23.9	27.9	32.5	16.4	0.6
30	Ansys	24.1	26.7	30.7	14.8	0.6
	All N.A. Companies	3,191.5	3,475.2	3,862.4	11.1	71.1
	All European Companies	695.9	666.5	734.0	10.1	13.5
	All Asian Companies	710.0	783.1	833.9	6.5	15.4
	All Companies	4,597.4	4,924.8	5,430.2	10.3	100.0

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-2

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Worldwide, Technical Workstation, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	128.7	214.6	263.1	22.6	6.8
2	Cadence	312.8	228.6	261.7	14.5	6.7
3	Intergraph	256.3	262.1	234.0	-10.7	6.0
4	Parametric Technology	81.2	143.5	183.3	27.7	4.7
5	Mentor Graphics	150.9	167.2	170.1	1.7	4.4
6	EDS Unigraphics	101.6	121.2	163.5	35.0	4.2
7	Computervision	214.4	155.5	147.8	-5.0	3.8
8	Synopsys	63.6	113.9	142.7	25.2	3.7
9	SDRC	80.8	84.8	111.4	31.4	2.9
10	Fujitsu	62.9	98.3	110.3	12.3	2.8
11	Hewlett-Packard	91.4	101.8	103.4	1.5	2.7
12	ESRI	75.8	77.8	95.5	22.8	2.5
13	MacNeal-Schwendler	58.8	64.5	81.1	25.8	2.1
14	NEC	53.2	70.7	78.0	10.4	2.0
15	Zuken-Redac	78.0	68.7	74.4	8.3	1.9
16	Hitachi	52.6	61.4	68.8	12.[illegible]	1.8
17	Quickturn Design Systems	24.1	49.6	58.6	18.2	1.5
18	Landmark Graphics	29.8	50.9	56.8	11.6	1.5
19	Nihon Unisys	14.7	50.0	56.1	12.3	1.4
20	Toshiba--NO OEM	41.6	49.6	55.3	11.5	1.4
21	Matra Datavision	48.7	49.3	53.6	8.8	1.4
22	Siemens Nixdorf Info systeme	88.1	48.6	50.4	3.7	1.3
23	Viewlogic Systems	34.7	41.3	48.4	17.3	1.2
24	Zycad	33.6	32.8	39.7	21.2	1.0
25	COMPASS Design Automation	31.9	33.5	38.8	15.6	1.0
26	IEZ	26.6	29.6	38.1	28.7	1.0
27	Sharp System Products--NO OEM	23.6	27.9	32.5	16.4	0.8
28	Alias Research	23.5	24.4	29.6	21.3	0.8
29	Applicon	40.2	29.4	28.6	-2.6	0.7
30	Autodesk	21.3	24.2	26.6	9.7	0.7
	All N.A. Companies	2,200.3	2,426.5	2,762.0	13.8	71.1
	All European Companies	473.6	417.2	470.1	12.7	12.1
	All Asian Companies	488.7	584.6	652.2	11.6	16.8
	All Companies	**3,162.6**	**3,428.2**	**3,884.3**	**13.3**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-3

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Worldwide, Host Dependent, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	137.3	114.8	109.6	-4.6	43.2
2	Fujitsu	34.3	57.7	45.9	-20.6	18.1
3	MacNeal-Schwendler	45.8	51.2	32.0	-37.4	12.6
4	GDS	26.3	28.7	16.0	-44.3	6.3
5	Nihon Unisys	29.6	13.0	10.4	-20.2	4.1
6	Siemens Nixdorf Info systeme	6.7	11.1	6.8	-39.0	2.7
7	NEC	9.0	6.1	4.8	-21.3	1.9
8	Hitachi	7.3	6.1	4.8	-21.3	1.9
9	Ansys	4.6	3.4	3.4	0.9	1.4
10	ESRI	0.5	5.4	2.6	-52.7	1.0
11	Aspen Technology	1.5	2.8	2.1	-24.6	0.8
12	Exapt	3.1	2.7	2.0	-23.9	0.8
13	Mechanical Dynamics	1.0	2.3	2.0	-13.7	0.8
14	GRAFTEK	2.3	2.0	1.7	-13.2	0.7
15	Autometric	0.6	1.5	1.4	-5.9	0.6
16	EA Systems	3.7	1.5	1.3	-15.2	0.5
17	Toyo Information Systems-NO OEM	1.6	1.3	1.1	-20.1	0.4
18	Kubota Computer	-	1.1	0.9	-19.4	0.3
19	SHL Vision Solutions	4.2	1.1	0.8	-27.4	0.3
20	Computational Mechanics	1.5	0.6	0.5	-12.9	0.2
21	Framasoft	0.4	0.5	0.5	3.6	0.2
22	ACA Ltd.	1.3	0.7	0.5	-33.3	0.2
23	Whessoe Computing Systems	0.8	0.5	0.5	-13.5	0.2
24	PROCAD GmbH	0.7	0.6	0.4	-20.0	0.2
25	debis Systemhaus	0.4	0.4	0.4	-7.0	0.2
26	Century Research Center	0.6	0.5	0.4	-22.2	0.1
27	Harris EDA	0.8	0.5	0.3	-33.3	0.1
28	Analogy	0.5	0.3	0.3	-18.8	0.1
29	Compact Software	0.9	0.2	0.2	-18.2	0.1
30	Meta-Software	0.6	0.4	0.2	-56.0	0.1
	All N.A. Companies	272.4	246.5	174.1	-29.4	68.6
	All European Companies	34.6	21.7	11.7	-46.2	4.6
	All Asian Companies	85.3	85.9	68.2	-20.6	26.8
	All Companies	**392.3**	**354.1**	**254.0**	**-28.3**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-4

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Worldwide, Personal Computer, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	334.4	379.5	416.2	9.7	32.2
2	Intergraph	48.1	57.2	83.7	46.3	6.5
3	IBM	100.3	68.9	63.4	-8.0	4.9
4	Nemetschek	17.5	35.3	32.0	-9.4	2.5
5	ESRI	15.6	25.7	30.3	18.0	2.3
6	MapInfo	8.8	15.9	28.3	78.1	2.2
7	Viewlogic Systems	11.5	20.9	25.6	22.6	2.0
8	Softdesk	11.6	17.8	25.1	41.6	1.9
9	Eagle Point	7.9	11.8	21.0	78.7	1.6
10	NEC	22.3	19.6	18.9	-3.2	1.5
11	Parametric Technology	-	6.1	17.9	192.2	1.4
12	Ziegler Informatics	14.4	15.3	16.6	8.7	1.3
13	Wacom	26.8	16.9	15.7	-6.6	1.2
14	Computervision	12.4	9.5	15.6	64.0	1.2
15	RIB/Bausoftware	4.9	10.7	15.0	40.6	1.2
16	Toshiba--NO OEM	15.2	15.2	15.0	-1.0	1.2
17	Wiechers Datentechnik	7.1	14.1	14.9	5.5	1.1
18	Mutoh Industries--NO OEM	17.9	14.5	14.5	0.2	1.1
19	Siemens Nixdorf Info systeme	-	8.9	14.1	58.7	1.1
20	Hitachi	13.2	13.3	13.3	0.1	1.0
21	Soft-Tech Software Technologies	10.4	11.4	13.3	16.8	1.0
22	Strategic Mapping	9.0	11.2	13.0	16.2	1.0
23	Graphisoft Group	6.0	6.7	11.0	64.4	0.9
24	CPU	7.1	9.6	10.7	11.2	0.8
25	Investronica SA	7.7	8.3	10.5	26.7	0.8
26	Fujitsu	17.2	9.8	9.7	-0.4	0.8
27	CAD Distribution	6.7	7.1	9.2	29.8	0.7
28	Design Automation	9.5	8.3	9.1	10.5	0.7
29	PADS Software	3.6	8.3	8.9	7.0	0.7
30	ALTERA	7.0	8.0	8.5	6.3	0.7
	All N.A. Companies	718.7	802.2	926.3	15.5	71.7
	All European Companies	187.8	227.6	252.2	10.8	19.5
	All Asian Companies	136.0	112.6	113.5	0.8	8.8
	All Companies	**1,042.5**	**1,142.4**	**1,292.0**	**13.1**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-5

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, North America, All Platforms, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	162.9	189.8	203.7	7.3	10.3
2	Intergraph	164.3	169.4	171.5	1.3	8.7
3	Cadence	154.8	101.2	116.8	15.4	5.9
4	Parametric Technology	52.5	95.8	112.0	16.8	5.7
5	EDS Unigraphics	69.5	88.6	104.7	18.1	5.3
6	IBM	87.2	91.1	97.2	6.6	4.9
7	Mentor Graphics	77.9	94.8	89.8	-5.2	4.6
8	Synopsys	37.6	61.6	75.6	22.7	3.8
9	MacNeal-Schwendler	55.6	59.5	63.1	5.9	3.2
10	ESRI	51.3	47.9	53.9	12.6	2.7
11	Computervision	35.8	32.3	52.6	63.0	2.7
12	Viewlogic Systems	32.1	39.1	49.9	27.4	2.5
13	SDRC	27.6	26.5	45.7	72.0	2.3
14	Quickturn Design Systems	20.8	36.2	41.0	13.3	2.1
15	Zycad	21.4	23.6	29.0	22.9	1.5
16	Landmark Graphics	12.0	21.8	25.5	17.2	1.3
17	Hewlett-Packard	24.9	23.9	25.4	6.4	1.3
18	Softdesk	11.7	17.8	24.9	39.5	1.3
19	MapInfo	7.8	14.6	22.0	50.5	1.1
20	Eagle Point	7.8	11.7	20.9	79.0	1.1
21	Alias Research	15.3	15.9	19.5	23.0	1.0
22	COMPASS Design Automation	14.1	16.8	19.3	15.0	1.0
23	IKOS Systems	9.3	14.7	17.0	15.7	0.9
24	Ansys	9.8	13.4	15.6	16.7	0.8
25	Applicon	14.4	12.1	14.2	17.7	0.7
26	Strategic Mapping	7.4	11.5	13.7	18.8	0.7
27	Rasna Corporation	7.3	10.1	10.6	4.5	0.5
28	Auto-Trol	10.2	10.0	10.4	3.6	0.5
29	Accugraph	3.9	5.6	10.1	80.2	0.5
30	GRAFTEK	8.2	9.0	10.0	10.5	0.5
	All N.A. Companies	1,540.5	1,709.1	1,918.6	12.3	97.2
	All European Companies	42.8	40.0	48.7	21.9	2.5
	All Asian Companies	8.5	6.6	6.5	-0.9	0.3
	All Companies	**1,591.8**	**1,755.7**	**1,973.8**	**12.4**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-6

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, North America, Technical Workstation, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Intergraph	133.9	141.7	123.1	-13.2	9.0
2	Cadence	151.2	101.2	116.8	15.4	8.5
3	EDS Unigraphics	59.7	75.6	104.7	38.5	7.6
4	Parametric Technology	52.5	91.5	100.8	10.1	7.3
5	Mentor Graphics	76.4	92.0	88.9	-3.4	6.5
6	Synopsys	37.2	61.4	75.6	23.1	5.5
7	IBM	31.3	45.3	53.6	18.4	3.9
8	Computervision	29.4	28.6	47.9	67.5	3.5
9	SDRC	26.7	26.3	45.7	73.7	3.3
10	MacNeal-Schwendler	33.8	34.8	45.2	30.0	3.3
11	Quickturn Design Systems	20.8	36.2	41.0	13.3	3.0
12	ESRI	41.7	34.2	40.1	17.2	2.9
13	Viewlogic Systems	23.8	26.3	32.6	23.8	2.4
14	Zycad	21.4	23.6	29.0	22.9	2.1
15	Landmark Graphics	12.0	21.8	25.5	17.2	1.9
16	Hewlett-Packard	23.4	23.1	24.0	4.0	1.8
17	Alias Research	15.3	15.9	19.5	23.0	1.4
18	COMPASS Design Automation	13.8	16.8	19.3	15.0	1.4
19	IKOS Systems	9.3	14.7	17.0	15.7	1.2
20	Applicon	14.4	12.1	13.7	14.0	1.0
21	Autodesk	9.8	11.4	12.2	7.3	0.9
22	Ansys	5.2	9.0	11.1	23.0	0.8
23	Auto-Trol	10.2	10.0	10.4	3.6	0.8
24	Integrated Silicon Systems	1.4	3.7	9.1	145.9	0.7
25	LSI Logic	6.9	8.0	9.1	14.0	0.7
26	Rasna Corporation	5.8	8.1	9.0	11.4	0.7
27	Accugraph	3.4	5.2	9.0	73.4	0.7
28	GRAFTEK	6.3	7.5	8.6	15.7	0.6
29	CIMLINC	5.9	6.7	8.1	21.2	0.6
30	Harris EDA	8.5	7.9	7.9	-0.9	0.6
	All N.A. Companies	1,034.0	1,161.5	1,333.4	14.8	97.2
	All European Companies	24.4	25.7	32.6	26.9	2.4
	All Asian Companies	7.7	5.7	5.6	-1.2	0.4
	All Companies	**1,066.1**	**1,192.8**	**1,371.5**	**15.0**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-7

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, North America, Host Dependent, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	41.5	39.8	40.5	1.6	58.1
2	MacNeal-Schwendler	20.5	24.3	17.4	-28.5	24.9
3	GDS	11.8	6.7	2.7	-60.4	3.8
4	Autometric	0.6	1.5	1.3	-10.6	1.9
5	GRAFTEK	1.9	1.5	1.3	-14.3	1.9
6	Ansys	1.9	1.3	1.2	-12.1	1.7
7	Aspen Technology	0.8	1.4	1.1	-20.3	1.6
8	ESRI	0.3	2.4	1.1	-54.8	1.5
9	Mechanical Dynamics	0.5	1.0	0.9	-12.5	1.3
10	EA Systems	2.9	0.9	0.7	-19.8	1.0
11	SHL Vision Solutions	1.8	0.5	0.3	-29.8	0.5
12	PROCAD GmbH	0.6	0.3	0.3	-13.8	0.4
13	Computational Mechanics	0.5	0.2	0.2	-10.5	0.2
14	Harris EDA	0.4	0.2	0.2	-23.8	0.2
15	Kubota Computer	-	0.2	0.1	-12.5	0.2
16	Analogy	0.2	0.1	0.1	-14.3	0.2
17	Meta-Software	0.3	0.2	0.1	-56.0	0.1
18	Accugraph	0.5	0.4	0.1	-77.0	0.1
19	Dynamic Graphics	0.5	0.1	0.1	-27.3	0.1
20	Compact Software	0.4	0.1	0.1	-37.5	0.1
21	SIMUCAD	0.1	0.0	0.0	-19.2	0.0
22	Radian Corporation	-	0.0	0.0	-25.0	0.0
23	Framasoft	-	-	0.0	n/a	0.0
24	EDS Unigraphics	9.8	13.1	-	-100.0	-
25	Intergraph	5.0	1.6	-	-100.0	-
26	ICEM Technologies	5.8	1.1	-	-100.0	-
27	Synercom	1.2	0.7	-	-100.0	-
28	Georgia Tech Research Corp.	0.4	0.4	-	-100.0	-
29	MARC	0.4	0.3	-	-100.0	-
30	SDRC	1.0	0.3	-	-100.0	-
	All N.A. Companies	112.7	98.9	69.1	-30.1	99.2
	All European Companies	7.3	1.6	0.4	-74.1	0.6
	All Asian Companies	-	0.2	0.1	-12.5	0.2
	All Companies	**120.0**	**100.7**	**69.7**	**-30.8**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-8

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, North America, Personal Computer, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	153.1	178.4	191.5	7.3	36.0
2	Intergraph	25.4	26.1	48.4	85.7	9.1
3	Softdesk	11.2	17.1	24.0	39.8	4.5
4	MapInfo	7.4	14.2	20.9	47.4	3.9
5	Eagle Point	7.8	11.6	20.9	79.3	3.9
6	Viewlogic Systems	8.4	12.8	17.3	34.8	3.2
7	ESRI	9.3	11.3	12.7	12.7	2.4
8	Strategic Mapping	7.4	10.6	12.3	16.2	2.3
9	Parametric Technology	-	4.3	11.2	159.6	2.1
10	CADKEY	7.0	7.5	7.9	5.3	1.5
11	American Small Business Comp.	4.7	6.9	7.6	10.7	1.4
12	ALTERA	6.4	7.0	7.5	7.4	1.4
13	ORCAD	5.1	6.9	7.3	4.8	1.4
14	Microsim	4.5	4.6	5.9	30.4	1.1
15	Micrografx	4.0	4.9	5.5	11.9	1.0
16	CNC Software	3.6	4.9	5.4	10.7	1.0
17	MCS	3.0	3.1	4.8	57.1	0.9
18	Computervision	6.2	3.7	4.7	27.9	0.9
19	PADS Software	3.5	3.5	4.6	30.6	0.9
20	Algor Interactive Systems	3.5	4.1	4.5	10.8	0.9
21	Rebis	4.9	5.0	4.4	-12.6	0.8
22	Enghouse Systems Ltd.	3.8	3.6	4.4	21.8	0.8
23	Tactician	3.0	3.5	4.2	21.7	0.8
24	CAMAX Manufacturing	4.6	5.0	4.0	-20.7	0.8
25	GeoGraphix	2.4	3.0	3.6	23.0	0.7
26	Moda CAD	2.8	3.1	3.5	11.5	0.7
27	Ansys	2.7	3.1	3.4	10.7	0.6
28	Data I/O	3.1	3.4	3.4	1.1	0.6
29	XILINX	6.6	5.6	3.3	-40.7	0.6
30	Sweet's Electronic Publishing	2.2	3.0	3.3	12.8	0.6
	All N.A. Companies	393.8	448.7	516.1	15.0	96.9
	All European Companies	11.2	12.6	15.7	24.2	3.0
	All Asian Companies	0.8	0.7	0.8	4.1	0.1
	All Companies	**405.7**	**462.1**	**532.6**	**15.2**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-9

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Europe, All Platforms, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	150.7	160.2	170.7	6.6	9.8
2	Autodesk	132.7	133.2	150.5	13.0	8.7
3	Intergraph	117.0	114.5	109.1	-4.8	6.3
4	Computervision	150.4	96.7	85.0	-12.0	4.9
5	Parametric Technology	18.1	40.4	67.2	66.2	3.9
6	Siemens Nixdorf Info systeme	90.7	65.3	65.9	0.9	3.8
7	Cadence	57.1	56.4	65.1	15.4	3.7
8	Nemetschek	32.5	44.7	58.1	30.1	3.3
9	Hewlett-Packard	52.0	47.2	48.8	3.4	2.8
10	Matra Datavision	43.5	43.6	47.1	8.2	2.7
11	ESRI	23.4	35.9	44.9	25.0	2.6
12	EDS Unigraphics	31.1	36.3	40.9	12.8	2.4
13	Mentor Graphics	39.7	43.7	40.4	-7.6	2.3
14	IEZ	26.3	27.8	36.2	30.1	2.1
15	MacNeal-Schwendler	29.6	35.0	33.9	-3.1	2.0
16	Synopsys	14.8	25.5	30.0	17.5	1.7
17	SDRC	26.0	24.8	27.8	12.1	1.6
18	Straessle Informationssysteme	25.4	20.8	22.4	7.4	1.3
19	Wiechers Datentechnik	13.2	20.7	21.5	3.8	1.2
20	RIB/Bausoftware	6.7	13.4	20.6	53.4	1.2
21	Smallworldwide	5.8	13.8	19.5	41.5	1.1
22	Landmark Graphics	10.6	17.4	18.5	6.2	1.1
23	Ziegler Informatics	14.3	15.2	16.5	8.8	0.9
24	Applicon	24.6	16.2	14.2	-12.2	0.8
25	ISD Software	14.0	13.6	14.1	3.8	0.8
26	Viewlogic Systems	9.6	13.1	14.1	7.2	0.8
27	Han Dataport	13.3	10.9	13.7	26.6	0.8
28	Soft-Tech Software Technologies	10.4	11.4	13.3	16.8	0.8
29	Zuken-Redac	19.4	13.4	13.1	-2.4	0.8
30	ICL	11.9	12.6	12.1	-4.0	0.7
	All N.A. Companies	997.7	1,003.1	1,093.1	9.0	62.9
	All European Companies	624.2	589.6	632.6	7.3	36.4
	All Asian Companies	19.4	13.6	13.2	-2.5	0.8
	All Companies	**1,641.4**	**1,606.3**	**1,738.9**	**8.3**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-10

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Europe, Technical Workstation, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	70.2	103.7	122.6	18.1	10.0
2	Intergraph	98.7	90.2	83.2	-7.8	6.8
3	Computervision	142.8	91.7	76.7	-16.4	6.3
4	Cadence	55.7	56.4	65.1	15.4	5.3
5	Parametric Technology	18.1	38.6	60.5	56.6	4.9
6	Siemens Nixdorf Info systeme	84.4	46.4	48.2	3.9	3.9
7	Hewlett-Packard	50.9	46.6	47.8	2.6	3.9
8	Matra Datavision	43.5	42.7	46.1	7.9	3.8
9	EDS Unigraphics	31.1	29.0	40.9	41.1	3.3
10	Mentor Graphics	39.7	43.7	39.8	-8.8	3.3
11	IEZ	26.3	27.8	34.3	23.3	2.8
12	ESRI	18.9	25.7	33.4	30.2	2.7
13	Synopsys	14.8	25.5	30.0	17.5	2.4
14	SDRC	25.0	24.6	27.8	13.2	2.3
15	Nemetschek	14.9	9.4	26.2	178.8	2.1
16	MacNeal-Schwendler	14.0	19.3	23.9	23.9	2.0
17	Straessle Informationssysteme	25.4	20.8	22.4	7.4	1.8
18	Smallworldwide	5.8	13.8	19.5	41.5	1.6
19	Landmark Graphics	10.6	17.4	18.5	6.2	1.5
20	Han Dataport	11.5	9.2	13.7	49.4	1.1
21	Applicon	24.6	16.2	13.7	-15.0	1.1
22	ICL	11.9	12.6	12.1	-4.0	1.0
23	ISD Software	9.7	11.0	11.5	4.4	0.9
24	Cisigraph	10.3	11.4	11.3	-0.1	0.9
25	Zuken-Redac	16.4	11.3	10.5	-7.1	0.9
26	Viewlogic Systems	6.5	8.2	9.2	12.8	0.8
27	ASCAD/ASCAM	8.2	8.5	9.1	7.0	0.7
28	Autodesk	8.0	8.0	9.0	13.0	0.7
29	Sysdeco Innovation	3.5	8.4	8.8	5.5	0.7
30	Quickturn Design Systems	0.1	4.0	8.8	121.6	0.7
	All N.A. Companies	720.3	735.4	814.1	10.7	66.4
	All European Companies	428.0	363.5	400.7	10.2	32.7
	All Asian Companies	16.4	11.4	10.6	-7.2	0.9
	All Companies	**1,164.6**	**1,110.4**	**1,225.4**	**10.4**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-11

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Europe, Host Dependent, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	60.5	45.7	42.7	-6.6	63.6
2	MacNeal-Schwendler	15.7	15.5	9.8	-36.8	14.5
3	Siemens Nixdorf Info systeme	6.3	10.4	6.0	-42.4	8.9
4	Exapt	3.1	2.7	2.0	-23.9	3.0
5	GDS	6.8	3.8	1.8	-52.7	2.7
6	ESRI	0.2	1.8	0.9	-49.9	1.3
7	Ansys	1.8	0.8	0.7	-3.9	1.1
8	Framasoft	0.4	0.4	0.4	0.7	0.7
9	Aspen Technology	0.4	0.7	0.4	-40.6	0.6
10	debis Systemhaus	0.4	0.4	0.4	-7.0	0.6
11	Mechanical Dynamics	0.2	0.4	0.4	-9.3	0.6
12	ACA Ltd.	1.1	0.6	0.4	-36.8	0.5
13	Whessoe Computing Systems	0.6	0.3	0.3	-15.2	0.4
14	Computational Mechanics	1.1	0.3	0.2	-14.3	0.4
15	SHL Vision Solutions	1.1	0.3	0.2	-22.2	0.3
16	EA Systems	0.5	0.2	0.1	-23.2	0.2
17	Analogy	0.2	0.1	0.1	-25.0	0.1
18	GRAFTEK	-	0.1	0.1	12.5	0.1
19	ISDATA	0.1	0.1	0.1	-40.0	0.1
20	Harris EDA	0.2	0.1	0.1	-64.3	0.1
21	Compact Software	0.2	0.1	0.1	-	0.1
22	Dynamic Graphics	0.2	0.0	0.0	-25.0	0.0
23	Autometric	-	-	0.0	n/a	0.0
24	Meta-Software	0.1	0.0	0.0	-56.0	0.0
25	Assigraph	1.1	0.2	0.0	-93.3	0.0
26	Accugraph	0.0	0.0	0.0	-79.5	0.0
27	EDS Unigraphics	-	7.3	-	-100.0	-
28	ICEM Technologies	6.4	1.7	-	-100.0	-
29	Han Dataport	0.9	0.8	-	-100.0	-
30	MARC	0.8	0.5	-	-100.0	-
	All N.A. Companies	94.6	77.8	57.4	-26.3	85.4
	All European Companies	24.7	18.3	9.8	-46.3	14.6
	All Asian Companies	-	-	-	n/a	-
	All Companies	**119.3**	**96.1**	**67.2**	**-30.1**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-12

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Europe, Personal Computer, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	124.7	125.2	141.5	13.0	31.7
2	Nemetschek	17.5	35.3	32.0	-9.4	7.2
3	Intergraph	18.3	24.3	25.9	6.5	5.8
4	Ziegler Informatics	14.3	15.2	16.5	8.8	3.7
5	RIB/Bausoftware	4.9	10.7	15.0	40.6	3.4
6	Wiechers Datentechnik	7.1	14.0	14.5	3.6	3.2
7	Soft-Tech Software Technologies	10.4	11.4	13.3	16.8	3.0
8	Siemens Nixdorf Info systeme	-	8.5	11.7	37.5	2.6
9	ESRI	4.3	8.5	10.6	25.0	2.4
10	CAD Distribution	6.7	7.1	9.2	29.8	2.1
11	Computervision	5.9	5.0	8.4	67.6	1.9
12	Graphisoft Group	4.6	4.9	8.0	64.3	1.8
13	ACA Ltd.	5.1	6.2	7.4	18.5	1.7
14	RoboCAD Solutions	5.9	6.2	6.9	11.2	1.5
15	Serbi	6.3	6.1	6.8	10.7	1.5
16	Parametric Technology	-	1.8	6.7	269.4	1.5
17	Investronica SA	6.2	6.2	6.2	-1.0	1.4
18	Norlinvest Ltd.	3.9	4.8	5.8	18.8	1.3
19	Tebis	10.1	6.3	5.7	-8.8	1.3
20	IBM	20.0	10.8	5.4	-49.5	1.2
21	Viewlogic Systems	3.1	5.0	4.9	-2.0	1.1
22	Technische Computer Systeme	1.4	4.0	4.5	10.4	1.0
23	Computer Services Consultants	4.2	4.2	4.4	5.2	1.0
24	Hochtief	3.3	3.5	4.3	23.6	1.0
25	Ground Modelling Systems	2.5	2.2	3.7	65.0	0.8
26	CAD Lab	2.5	2.5	3.5	39.9	0.8
27	MapInfo	0.5	-	3.4	n/a	0.8
28	Softronics	3.0	3.4	3.0	-9.9	0.7
29	Kloeckner-Moeller	3.1	3.0	2.9	-2.0	0.6
30	Whessoe Computing Systems	2.2	2.5	2.8	12.7	0.6
	All N.A. Companies	182.9	190.0	221.6	16.7	49.7
	All European Companies	171.5	207.8	222.1	6.9	49.8
	All Asian Companies	3.1	2.1	2.6	22.7	0.6
	All Companies	**357.5**	**399.9**	**446.3**	**11.6**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-13

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Japan, All Platforms, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Fujitsu	114.3	165.8	165.9	0.1	11.9
2	IBM	110.3	125.8	143.4	13.9	10.3
3	NEC	84.5	96.4	101.7	5.6	7.3
4	Hitachi	73.1	80.8	86.9	7.5	6.2
5	Toshiba--NO OEM	59.8	64.8	70.3	8.6	5.0
6	Nihon Unisys	44.2	62.9	66.5	5.6	4.8
7	Cadence	75.9	47.9	54.3	13.6	3.9
8	Zuken-Redac	51.7	48.1	54.1	12.5	3.9
9	Autodesk	52.5	42.6	46.8	9.7	3.3
10	Synopsys	-	20.8	36.0	72.6	2.6
11	Sharp System Products--NO OEM	23.9	27.9	32.5	16.4	2.3
12	Mentor Graphics	25.8	24.3	31.1	28.1	2.2
13	Hewlett-Packard	15.0	29.8	29.8	0.2	2.1
14	SDRC	28.3	26.7	29.5	10.5	2.1
15	Mutoh Industries--NO OEM	32.3	26.0	27.4	5.5	2.0
16	CADIX	17.6	20.3	21.8	7.2	1.6
17	Wacom	29.5	18.9	18.0	-4.5	1.3
18	Yokogawa Digital Computer	11.9	15.4	17.2	11.3	1.2
19	Uchida Yoko	13.5	13.1	14.5	10.3	1.0
20	Tokyo Electron--NO OEM	16.0	12.6	14.3	13.5	1.0
21	Intergraph	14.0	15.5	14.2	-8.1	1.0
22	Seiko Instruments--NO OEM	17.3	13.4	14.1	5.2	1.0
23	Computervision	23.7	23.5	13.9	-40.7	1.0
24	Toshiba Engineering--no OEM	8.8	12.0	13.6	13.4	1.0
25	MacNeal-Schwendler	11.5	14.5	12.1	-16.6	0.9
26	GDS	7.9	12.5	12.0	-3.8	0.9
27	CPU	7.1	9.6	10.7	11.2	0.8
28	MARC	-	8.2	9.3	14.3	0.7
29	EDS Unigraphics	8.9	10.8	9.3	-14.3	0.7
30	Toyo Information Systems-NO OEM	7.2	8.4	9.2	9.8	0.7
	Other Companies	99.6	66.4	73.3	10.4	5.2
	All N.A. Companies	389.0	453.8	503.7	11.0	36.0
	All European Companies	6.3	10.7	14.6	35.8	1.0
	All Asian Companies	679.6	757.0	807.0	6.6	57.7
	All Companies	**1,174.5**	**1,288.0**	**1,398.6**	**8.6**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-14

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Japan, Technical Workstation, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Fujitsu	62.9	98.3	110.3	12.3	10.3
2	NEC	53.2	70.7	78.0	10.4	7.3
3	IBM	22.1	54.6	71.7	31.5	6.7
4	Hitachi	52.6	61.4	68.8	12.0	6.4
5	Nihon Unisys	14.7	50.0	56.1	12.3	5.2
6	Toshiba--NO OEM	41.6	49.6	55.3	11.5	5.2
7	Cadence	75.6	47.9	54.3	13.6	5.1
8	Zuken-Redac	51.7	48.1	54.1	12.5	5.0
9	Synopsys	-	20.8	36.0	72.6	3.4
10	Sharp System Products--NO OEM	23.6	27.9	32.5	16.4	3.0
11	Mentor Graphics	25.8	24.3	30.8	26.8	2.9
12	SDRC	27.3	26.4	29.5	11.7	2.8
13	Hewlett-Packard	15.0	29.1	28.8	-1.0	2.7
14	CADIX	17.6	20.3	21.8	7.2	2.0
15	Yokogawa Digital Computer	11.9	15.4	17.2	11.3	1.6
16	Tokyo Electron--NO OEM	16.0	12.6	14.3	13.5	1.3
17	Seiko Instruments--NO OEM	17.3	13.4	14.1	5.2	1.3
18	Toshiba Engineering--no OEM	8.8	12.0	13.6	13.4	1.3
19	Uchida Yoko	11.9	11.6	12.9	11.0	1.2
20	Mutoh Industries--NO OEM	14.4	11.5	12.9	12.2	1.2
21	Computervision	23.7	23.1	12.6	-45.6	1.2
22	Intergraph	11.7	11.9	10.3	-13.6	1.0
23	MARC	-	6.9	9.3	34.5	0.9
24	EDS Unigraphics	7.7	9.2	9.3	0.6	0.9
25	INS Engineering	7.0	7.5	8.4	12.3	0.8
26	MacNeal-Schwendler	4.7	5.5	8.2	50.3	0.8
27	Mitsui Engineering	8.5	7.3	8.2	12.2	0.8
28	Toyo Information Systems-NO OEM	5.7	7.0	8.1	15.5	0.8
29	Graphtec Engineering	6.9	7.0	7.9	12.4	0.7
30	Century Research Center	7.7	7.0	7.7	11.4	0.7
	Other Companies	88.6	63.1	71.7	13.6	6.7
	All N.A. Companies	233.6	307.3	357.8	16.4	33.4
	All European Companies	5.3	9.1	12.2	33.6	1.1
	All Asian Companies	462.4	562.5	630.3	12.1	58.8
	All Companies	**789.8**	**942.0**	**1,071.9**	**13.8**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-15

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Japan, Host Dependent, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Fujitsu	34.3	57.7	45.9	-20.6	44.5
2	IBM	28.1	23.9	21.5	-10.1	20.9
3	Nihon Unisys	29.6	13.0	10.4	-20.2	10.0
4	GDS	6.1	9.2	6.2	-32.3	6.1
5	NEC	9.0	6.1	4.8	-21.3	4.7
6	Hitachi	7.3	6.1	4.8	-21.3	4.7
7	MacNeal-Schwendler	6.6	8.8	3.8	-57.4	3.6
8	Toyo Information Systems-NO OEM	1.6	1.3	1.1	-20.1	1.0
9	Ansys	-	1.0	0.8	-20.4	0.8
10	Kubota Computer	-	0.9	0.7	-20.7	0.7
11	Century Research Center	0.6	0.5	0.4	-22.2	0.3
12	PROCAD GmbH	-	0.3	0.2	-26.9	0.2
13	ESRI	-	0.2	0.1	-50.0	0.1
14	Framasoft	-	0.0	0.0	46.0	0.0
15	SIMUCAD	-	-	0.0	n/a	0.0
16	EDS Unigraphics	1.3	1.6	-	-100.0	-
17	MARC	-	1.2	-	-100.0	-
18	SDRC	1.0	0.3	-	-100.0	-
19	Intergraph	0.3	0.1	-	-100.0	-
	Other Companies	7.1	3.4	2.4	-29.4	2.3
	All N.A. Companies	43.9	46.4	32.4	-30.1	31.4
	All European Companies	0.3	0.3	0.2	-21.7	0.2
	All Asian Companies	85.3	85.7	68.0	-20.6	66.0
	All Companies	**136.5**	**135.7**	**103.0**	**-24.1**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-16

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Japan, Personal Computer, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	60.0	47.3	50.1	5.9	22.3
2	Autodesk	49.3	40.1	44.0	9.7	19.6
3	NEC	22.3	19.6	18.9	-3.2	8.4
4	Wacom	26.8	16.9	15.7	-6.6	7.0
5	Toshiba--NO OEM	15.2	15.2	15.0	-1.0	6.7
6	Mutoh Industries--NO OEM	17.9	14.5	14.5	0.2	6.5
7	Hitachi	13.2	13.3	13.3	0.1	5.9
8	CPU	7.1	9.6	10.7	11.2	4.8
9	Fujitsu	17.2	9.8	9.7	-0.4	4.3
10	Design Automation	9.3	7.3	7.7	5.6	3.4
11	Intergraph	2.0	3.5	4.0	14.8	1.8
12	Viewlogic Systems	-	2.1	2.5	20.9	1.1
13	PADS Software	-	2.7	2.1	-20.9	1.0
14	MapInfo	-	0.3	1.7	505.6	0.8
15	Uchida Yoko	1.6	1.5	1.6	4.7	0.7
16	Computervision	-	0.4	1.4	262.0	0.6
17	GDS	-	-	1.1	n/a	0.5
18	Hewlett-Packard	-	0.6	1.0	56.5	0.4
19	ESRI	-	0.7	0.9	23.7	0.4
20	ADRA Systems	-	0.8	0.8	3.7	0.4
21	CAMAX Manufacturing	-	-	0.8	n/a	0.3
22	Ansys	-	0.7	0.7	2.9	0.3
23	Cimatron	0.1	0.3	0.6	138.2	0.3
24	Mitsui Engineering	0.7	0.6	0.6	-	0.3
25	ACTEL	-	0.3	0.5	73.7	0.2
26	APTIX	-	0.3	0.5	44.4	0.2
27	PROCAD GmbH	-	0.4	0.5	17.5	0.2
28	MCS	-	-	0.5	n/a	0.2
29	ULTImate Technology	0.4	0.4	0.5	28.6	0.2
30	INS Engineering	0.3	0.4	0.4	2.8	0.2
	Other Companies	-	-	-	n/a	-
	All N.A. Companies	111.6	100.2	113.5	13.3	50.6
	All European Companies	0.7	1.4	2.2	62.2	1.0
	All Asian Companies	132.0	108.8	108.7	-0.1	48.4
	All Companies	**244.3**	**210.4**	**224.5**	**6.7**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-17

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Asia-Pacific, All Platforms, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	0.5	22.0	24.1	9.7	13.5
2	Cadence	19.0	20.8	23.0	10.2	12.9
3	IBM	9.8	11.3	12.8	12.9	7.2
4	ESRI	-	7.8	9.7	24.2	5.4
5	Mentor Graphics	6.1	4.0	9.4	133.4	5.2
6	SDRC	1.8	7.5	8.3	10.5	4.7
7	Zuken-Redac	2.1	4.8	5.6	15.8	3.1
8	EDS Unigraphics	1.3	5.8	5.4	-6.6	3.0
9	Computervision	9.8	9.2	5.4	-40.8	3.0
10	COMPASS Design Automation	2.0	4.0	5.2	28.4	2.9
11	Siemens Nixdorf Info systeme	3.1	2.9	5.0	72.1	2.8
12	Intergraph	4.1	4.9	4.4	-9.4	2.5
13	Investronica SA	0.6	0.9	3.0	247.1	1.7
14	Delcam International	-	2.0	2.5	24.0	1.4
15	Zycad	1.3	1.6	2.4	45.2	1.3
16	Viewlogic Systems	-	3.3	2.4	-27.5	1.3
17	Quickturn Design Systems	-	4.0	2.3	-40.9	1.3
18	Matra Datavision	0.1	1.5	2.3	52.0	1.3
19	IEZ	-	1.5	2.0	35.1	1.1
20	Ansys	-	1.1	1.8	73.3	1.0
21	CAD Centre	0.5	0.8	1.7	117.9	0.9
22	CAMAX Manufacturing	-	0.6	1.5	172.9	0.8
23	Design Automation	0.2	1.0	1.4	47.9	0.8
24	ARCSYS	-	0.4	1.3	272.0	0.8
25	MCS	-	-	1.3	n/a	0.7
26	MacNeal-Schwendler	2.7	2.2	1.2	-43.2	0.7
27	Summitt Design	-	0.8	1.1	44.0	0.6
28	Synopsys	-	2.0	1.1	-45.2	0.6
29	Gerber Systems	-	0.5	1.0	99.9	0.6
30	ADRA Systems	-	0.7	0.8	21.2	0.4
	Other Companies	17.5	19.6	21.4	9.3	12.0
	All N.A. Companies	59.4	116.9	130.0	11.2	72.9
	All European Companies	4.8	11.2	19.7	75.5	11.1
	All Asian Companies	2.5	5.9	7.1	20.2	4.0
	All Companies	**84.2**	**153.6**	**178.2**	**16.0**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-18

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Asia-Pacific, Technical Workstation, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Cadence	18.9	20.8	23.0	10.2	17.8
2	Mentor Graphics	6.1	4.0	9.2	129.4	7.1
3	SDRC	1.7	7.5	8.3	11.7	6.5
4	ESRI	-	5.6	7.2	29.4	5.6
5	IBM	2.2	5.0	6.4	29.4	5.0
6	Zuken-Redac	2.1	4.8	5.6	15.8	4.3
7	EDS Unigraphics	1.1	5.0	5.4	9.4	4.2
8	COMPASS Design Automation	1.9	4.0	5.2	28.4	4.0
9	Computervision	9.8	9.0	4.9	-45.6	3.8
10	Intergraph	3.4	3.8	3.2	-15.5	2.5
11	Zycad	1.3	1.6	2.4	45.2	1.9
12	Quickturn Design Systems	-	4.0	2.3	-40.9	1.8
13	Matra Datavision	0.1	1.5	2.2	53.8	1.7
14	Delcam International	-	1.9	2.2	14.9	1.7
15	IEZ	-	1.5	1.9	28.0	1.5
16	Siemens Nixdorf Info systeme	2.7	1.9	1.9	-1.6	1.5
17	CAD Centre	0.5	0.8	1.7	117.9	1.3
18	Viewlogic Systems	-	2.2	1.5	-30.5	1.2
19	Autodesk	0.0	1.3	1.4	9.7	1.1
20	ARCSYS	-	0.4	1.3	272.0	1.0
21	Synopsys	-	2.0	1.1	-45.2	0.9
22	Summitt Design	-	0.7	1.1	44.0	0.8
23	Gerber Systems	-	0.5	1.0	99.9	0.8
24	CAMAX Manufacturing	-	0.6	0.9	57.8	0.7
25	MacNeal-Schwendler	1.1	0.8	0.8	2.4	0.7
26	Ansys	-	0.6	0.8	33.3	0.6
27	Straessle Informationssysteme	-	-	0.7	n/a	0.5
28	ADRA Systems	-	0.5	0.7	42.6	0.5
29	PCI Remote Sensing Corp	-	-	0.5	n/a	0.4
30	MCS	-	-	0.5	n/a	0.4
	Other Companies	19.7	18.7	20.1	7.6	15.6
	All N.A. Companies	48.2	81.3	91.3	12.3	70.9
	All European Companies	3.5	8.3	11.6	39.8	9.0
	All Asian Companies	2.3	5.0	5.7	14.9	4.4
	All Companies	**73.8**	**113.3**	**128.8**	**13.7**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-19

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Asia-Pacific, Host Dependent, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	2.8	2.5	2.3	-9.0	47.6
2	Siemens Nixdorf Info systeme	0.4	0.7	0.8	13.6	15.6
3	Ansys	-	0.3	0.7	155.6	14.4
4	MacNeal-Schwendler	1.5	1.3	0.4	-71.0	8.1
5	ESRI	-	0.4	0.2	-50.6	4.0
6	Framasoft	-	0.0	0.0	-2.6	0.2
7	SIMUCAD	-	-	0.0	n/a	0.1
8	EDS Unigraphics	0.2	0.9	-	-100.0	-
9	SDRC	0.1	0.1	-	-100.0	-
10	Intergraph	0.1	0.1	-	-100.0	-
	Other Companies	1.7	0.8	0.5	-38.9	10.0
	All N.A. Companies	5.1	5.5	3.6	-35.4	74.2
	All European Companies	0.4	0.7	0.8	13.4	15.8
	All Asian Companies	-	-	-	n/a	-
	All Companies	**7.2**	**7.0**	**4.8**	**-31.1**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-20

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Asia-Pacific, Personal Computer, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	0.5	20.6	22.6	9.7	51.6
2	IBM	4.9	3.8	4.1	5.9	9.3
3	Investronica SA	0.6	0.9	3.0	247.1	6.7
4	Siemens Nixdorf Info systeme	-	0.3	2.4	634.4	5.4
5	ESRI	-	1.8	2.3	24.4	5.2
6	Design Automation	0.2	1.0	1.4	47.9	3.2
7	Intergraph	0.6	1.1	1.2	18.5	2.8
8	Viewlogic Systems	-	1.0	0.8	-21.1	1.9
9	MCS	-	-	0.8	n/a	1.7
10	PADS Software	-	0.8	0.7	-20.9	1.5
11	CAMAX Manufacturing	-	-	0.6	n/a	1.4
12	Computervision	-	0.2	0.5	228.5	1.2
13	Graphisoft Group	-	0.0	0.4	1146.7	0.9
14	Tebis	-	0.2	0.4	92.3	0.9
15	Ansys	-	0.2	0.3	83.3	0.8
16	Cimatron	0.1	0.3	0.3	2.1	0.6
17	Delcam International	-	0.1	0.3	239.7	0.6
18	ACTEL	0.1	0.1	0.3	124.4	0.6
19	Norlinvest Ltd.	0.2	0.2	0.3	18.2	0.6
20	PCI Remote Sensing Corp	-	-	0.2	n/a	0.5
21	Vero International Software	-	0.1	0.2	45.4	0.5
22	Mentor Graphics	-	-	0.2	n/a	0.4
23	ADRA Systems	-	0.2	0.1	-31.6	0.3
24	APTIX	-	0.1	0.1	44.4	0.3
25	IEZ	-	-	0.1	n/a	0.2
26	CAD-UL	-	0.1	0.1	4.1	0.2
27	ULTImate Technology	0.1	0.1	0.1	60.0	0.2
28	SIMUCAD	-	-	0.1	n/a	0.1
29	Summitt Design	-	0.0	0.1	44.0	0.1
30	Matra Datavision	-	0.1	0.1	0.4	0.1
	Other Companies	-	-	-	n/a	-
	All N.A. Companies	6.0	30.1	35.1	16.6	79.9
	All European Companies	0.8	2.3	7.4	223.9	16.8
	All Asian Companies	0.2	1.0	1.4	47.9	3.2
	All Companies	**7.1**	**33.3**	**43.9**	**31.7**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-21

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Rest of World, All Platforms, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Intergraph	10.8	17.0	18.5	8.9	13.1
2	Autodesk	7.1	16.1	17.7	9.7	12.6
3	ESRI	11.2	14.1	16.0	13.5	11.4
4	IBM	8.2	9.8	12.1	22.9	8.6
5	GDS	1.8	12.1	10.1	-16.3	7.2
6	Genasys II	5.2	6.1	6.3	4.3	4.5
7	Computervision	9.2	3.4	6.3	84.9	4.5
8	Landmark Graphics	2.0	3.6	3.9	9.4	2.8
9	EDS Unigraphics	2.3	2.9	3.3	12.8	2.3
10	Radian Corporation	2.4	2.4	2.9	24.6	2.1
11	Hewlett-Packard	2.2	3.1	2.8	-7.9	2.0
12	Cadence	9.5	2.2	2.4	9.8	1.7
13	Cimatron	1.3	1.8	2.4	35.1	1.7
14	MapInfo	0.8	1.4	2.4	65.3	1.7
15	MacNeal-Schwendler	3.4	2.3	2.3	-2.5	1.6
16	Delcam International	1.1	1.3	1.9	51.6	1.4
17	Mentor Graphics	2.3	1.9	1.4	-29.2	1.0
18	Smallworldwide	-	-	1.3	n/a	0.9
19	Enghouse Systems Ltd.	0.3	1.1	1.3	22.9	0.9
20	PCI Remote Sensing Corp	-	-	1.3	n/a	0.9
21	Softdesk	0.4	0.7	1.2	91.2	0.9
22	CNC Software	1.1	1.0	1.2	24.2	0.8
23	CAD Centre	1.8	0.3	1.2	343.0	0.8
24	Integrated Silicon Systems	-	-	1.1	n/a	0.8
25	LSI Logic	0.6	0.8	1.0	18.1	0.7
26	ALTERA	0.6	1.0	1.0	-2.0	0.7
27	Analogy	0.5	0.7	0.8	17.4	0.6
28	SHL Vision Solutions	1.4	0.7	0.8	17.6	0.6
29	Investronica SA	0.4	0.7	0.8	19.7	0.6
30	Norlinvest Ltd.	0.5	0.7	0.8	8.6	0.5
	All N.A. Companies	94.5	112.7	127.7	13.3	90.8
	All European Companies	11.0	8.5	13.0	53.0	9.2
	All Asian Companies	-	-	-	n/a	-
	All Companies	**105.5**	**121.2**	**140.7**	**16.1**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-22

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Rest of World, Technical Workstation, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Intergraph	8.6	14.5	14.3	-1.3	16.5
2	ESRI	9.1	10.1	11.9	18.1	13.8
3	IBM	2.9	6.0	8.8	44.9	10.1
4	Genasys II	4.7	5.5	5.7	4.3	6.6
5	Computervision	8.8	3.1	5.7	82.0	6.6
6	GDS	0.4	3.2	3.9	25.3	4.6
7	Landmark Graphics	2.0	3.6	3.9	9.4	4.5
8	EDS Unigraphics	1.9	2.5	3.3	33.0	3.8
9	Hewlett-Packard	2.1	3.0	2.7	-9.4	3.1
10	Cadence	9.3	2.2	2.4	9.8	2.8
11	Radian Corporation	0.6	1.5	1.9	27.0	2.2
12	Delcam International	1.1	1.2	1.7	40.3	2.0
13	MacNeal-Schwendler	2.2	1.3	1.6	25.6	1.9
14	Cimatron	0.8	1.1	1.4	35.1	1.7
15	Mentor Graphics	2.3	1.9	1.3	-30.3	1.6
16	Smallworldwide	-	-	1.3	n/a	1.5
17	CAD Centre	1.8	0.3	1.2	343.0	1.3
18	Autodesk	0.4	1.0	1.1	9.7	1.2
19	Integrated Silicon Systems	-	-	1.0	n/a	1.2
20	LSI Logic	0.6	0.8	1.0	18.1	1.1
21	PCI Remote Sensing Corp	-	-	0.9	n/a	1.0
22	Analogy	0.5	0.7	0.8	19.4	0.9
23	SHL Vision Solutions	1.0	0.6	0.7	25.9	0.8
24	Matra Datavision	0.4	0.3	0.5	60.9	0.6
25	Earth Resource Mapping	0.2	0.4	0.5	27.0	0.5
26	Laser-Scan	0.2	0.4	0.4	18.9	0.5
27	Ansys	0.5	0.4	0.4	11.1	0.5
28	UNISYS	0.2	0.3	0.4	29.0	0.5
29	ERDAS	0.3	0.3	0.4	25.8	0.4
30	Rasna Corporation	0.2	0.3	0.4	20.6	0.4
	All N.A. Companies	61.1	65.1	78.6	20.9	90.7
	All European Companies	7.1	4.7	8.1	71.4	9.3
	All Asian Companies	-	-	-	n/a	-
	All Companies	**68.2**	**69.8**	**86.7**	**24.3**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-23

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Rest of World, Host Dependent, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	GDS	1.4	8.9	5.3	-41.1	56.8
2	IBM	4.4	2.9	2.6	-9.3	28.1
3	MacNeal-Schwendler	1.1	1.0	0.6	-38.0	6.8
4	ESRI	0.1	0.7	0.3	-54.5	3.4
5	SHL Vision Solutions	0.4	0.1	0.1	-30.0	0.8
6	Whessoe Computing Systems	0.1	0.1	0.1	-	0.8
7	Ansys	0.2	0.1	0.1	-	0.6
8	Computational Mechanics	-	0.1	0.1	-	0.6
9	Siemens Nixdorf Info systeme	-	0.1	0.1	-28.6	0.5
10	Autometric	-	-	0.0	n/a	0.5
11	Radian Corporation	-	0.0	0.0	-25.0	0.3
12	GRAFTEK	0.0	0.0	0.0	-	0.3
13	Compact Software	0.1	0.0	0.0	-33.3	0.2
14	Analogy	0.0	0.0	0.0	-50.0	0.1
15	Dynamic Graphics	0.1	0.0	0.0	-	0.1
16	Accugraph	0.0	0.0	0.0	-79.5	0.0
17	EDS Unigraphics	0.3	0.4	-	-100.0	-
18	Intergraph	0.4	0.1	-	-100.0	-
19	ICEM Technologies	0.3	0.1	-	-100.0	-
20	Georgia Tech Research Corp.	0.1	0.0	-	-100.0	-
21	VEDA	0.0	0.0	-	-100.0	-
22	Synercom	0.0	0.0	-	-100.0	-
	All N.A. Companies	9.0	14.4	9.1	-36.9	98.1
	All European Companies	0.4	0.3	0.2	-39.2	1.9
	All Asian Companies	-	-	-	n/a	-
	All Companies	**9.4**	**14.7**	**9.3**	**-37.0**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table A-24

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

Top 30 Worldwide Software Companies, Rest of World, Personal Computer, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	6.7	15.1	16.6	9.7	37.1
2	Intergraph	1.8	2.3	4.1	79.0	9.2
3	ESRI	2.0	3.3	3.8	13.7	8.5
4	MapInfo	0.8	1.4	2.3	61.5	5.1
5	Softdesk	0.4	0.6	1.2	91.1	2.6
6	CNC Software	1.1	1.0	1.2	24.2	2.6
7	Enghouse Systems Ltd.	0.2	0.8	1.0	22.2	2.2
8	Radian Corporation	1.8	0.8	1.0	22.5	2.2
9	Cimatron	0.6	0.7	1.0	35.1	2.2
10	ALTERA	0.6	1.0	1.0	-2.0	2.1
11	GDS	-	-	0.9	n/a	2.0
12	Investronica SA	0.4	0.7	0.8	19.7	1.8
13	Norlinvest Ltd.	0.5	0.7	0.8	8.6	1.7
14	Graphisoft Group	0.2	0.3	0.8	123.2	1.7
15	IBM	1.0	0.9	0.7	-22.4	1.6
16	International Software Systems	0.5	0.6	0.7	16.7	1.5
17	Genasys II	0.5	0.6	0.6	4.3	1.4
18	Computervision	0.4	0.3	0.6	116.9	1.4
19	CADKEY	-	0.5	0.5	-7.3	1.0
20	PCI Remote Sensing Corp	-	-	0.4	n/a	0.9
21	Whessoe Computing Systems	0.3	0.3	0.4	22.6	0.8
22	ACTEL	0.2	0.3	0.3	-9.8	0.6
23	Strategic Mapping	1.7	0.2	0.3	16.2	0.6
24	ORCAD	1.1	0.2	0.2	9.1	0.5
25	American Small Business Comp.	0.1	0.2	0.2	12.4	0.5
26	Compact Software	0.1	0.2	0.2	-	0.5
27	Delcam International	-	0.1	0.2	326.3	0.5
28	CAMAX Manufacturing	0.4	0.4	0.2	-53.5	0.4
29	PADS Software	0.1	0.2	0.2	15.3	0.4
30	Hochtief	0.1	0.1	0.2	28.0	0.4
	All N.A. Companies	24.5	33.2	40.0	20.4	89.3
	All European Companies	3.5	3.5	4.8	36.0	10.7
	All Asian Companies	-	-	-	n/a	-
	All Companies	**27.9**	**36.7**	**44.8**	**21.9**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table B-1

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

All Worldwide Software Companies, Worldwide, All Platforms, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	3Soft	-	1.0	1.6	60.0	0.0
2	A.I. Systems	0.7	0.6	-	-100.0	-
3	Abstract Hardware	1.0	1.5	1.1	-23.5	0.0
4	ACA Ltd.	6.4	7.0	7.9	13.1	0.1
5	Accel Technologies	2.0	2.3	2.8	21.4	0.1
6	Accugraph	4.2	6.0	10.9	80.2	0.2
7	ACTEL	5.5	4.7	4.1	-13.4	0.1
8	Adam Net	2.4	5.4	6.8	25.8	0.1
9	ADRA Systems	13.4	16.2	18.7	15.5	0.3
10	ALDEC	0.8	0.8	1.1	31.6	0.0
11	Algor Interactive Systems	3.6	5.0	5.6	12.6	0.1
12	Alias Research	23.5	24.4	29.6	21.3	0.5
13	ALS Design	2.3	2.2	2.3	5.9	0.0
14	ALTERA	7.0	8.0	8.5	6.3	0.2
15	American Small Business Comp.	4.9	7.1	7.9	10.8	0.1
16	Analogy	9.7	11.3	12.6	11.7	0.2
17	Anilam Electronics	1.6	1.8	2.0	14.6	0.0
18	Ansys	24.1	26.7	30.7	14.8	0.6
19	APIC Systemes	3.4	4.2	5.2	21.8	0.1
20	Applicon	40.2	29.4	29.6	0.6	0.5
21	APTIX	0.1	1.8	2.3	30.0	0.0
22	ARCSYS	-	1.8	6.0	233.3	0.1
23	ARKTEC	0.9	-	1.1	n/a	0.0
24	ASCAD/ASCAM	8.4	8.7	9.3	6.7	0.2
25	Aspen Technology	5.1	11.0	11.4	3.2	0.2
26	Assigraph	2.3	2.3	2.2	-2.2	0.0
27	AT & T	2.7	2.4	3.4	42.9	0.1
28	Aucos elektronische Gerate	0.9	0.8	-	-100.0	-
29	Aucotec	3.4	4.4	3.4	-22.7	0.1
30	Aura CAD/CAM Systems	0.9	1.0	-	-100.0	-
31	Auto-Trol	13.2	13.1	13.6	3.9	0.3
32	Autodesk	355.7	403.7	442.8	9.7	8.2
33	Autometric	2.3	3.7	5.0	34.4	0.1
34	BATISOFT	3.1	1.5	-	-100.0	-
35	CAD Centre	12.0	13.0	15.5	19.2	0.3
36	CAD Distribution	6.7	7.5	9.6	28.3	0.2
37	CAD Lab	15.2	11.4	11.7	3.0	0.2
38	CAD-Capture	0.6	0.3	-	-100.0	-

Table B-1

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

All Worldwide Software Companies, Worldwide, All Platforms, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
39	CAD-UL	2.5	2.8	2.7	-1.8	0.1
40	Cadence	318.3	228.6	261.7	14.5	4.8
41	CADIX	17.6	20.3	21.8	7.2	0.4
42	CADKEY	8.1	8.5	8.4	-2.1	0.2
43	CADSI	2.9	2.7	3.2	17.9	0.1
44	CADWORKS	0.8	0.9	1.0	12.9	0.0
45	CAE-link	1.0	1.2	-	-100.0	-
46	CAMAX Manufacturing	11.3	12.4	15.8	27.4	0.3
47	CAMTEK	1.1	1.2	-	-100.0	-
48	Caroline Informatique	1.2	1.4	-	-100.0	-
49	Carrier Corporation	1.1	1.1	1.3	14.5	0.0
50	Cascade Design Automation	7.5	8.6	10.3	20.2	0.2
51	CATALPA groupe Missler	1.5	1.2	1.1	-10.3	0.0
52	Century Research Center	8.3	7.4	8.1	9.3	0.1
53	Chronology	-	1.0	1.2	15.0	0.0
54	Cimatron	8.5	10.0	13.3	34.0	0.2
55	CIMLINC	9.8	12.0	14.1	17.5	0.3
56	Cisigraph	15.7	16.0	16.7	4.3	0.3
57	CLARIS	2.8	1.2	-	-100.0	-
58	Clemessy Geocity	0.9	1.0	1.1	9.7	0.0
59	CNC Software	4.6	5.8	6.6	12.9	0.1
60	Compact Software	3.1	2.7	2.8	2.2	0.1
61	COMPASS Design Automation	32.4	33.5	38.8	15.6	0.7
62	Complansoft CAD	2.5	3.1	3.4	9.9	0.1
63	Computational Mechanics	2.4	2.0	2.2	6.9	0.0
64	Computer Services Consultants	4.2	4.2	4.4	5.2	0.1
65	Computervision	228.9	165.0	163.3	-1.0	3.0
66	Concentra	11.2	7.5	11.0	47.1	0.2
67	Contec Microelectronics	3.8	4.4	5.0	13.9	0.1
68	Contract Data Research	0.6	0.4	-	-100.0	-
69	CPU	7.1	9.6	10.7	11.2	0.2
70	CrossCheck Technology	3.1	6.5	7.4	14.2	0.1
71	DAPCO	1.2	0.4	0.5	25.0	0.0
72	Data I/O	7.1	4.2	4.2	-0.7	0.1
73	Datagraphic	1.4	1.4	-	-100.0	-
74	debis Systemhaus	3.4	3.8	3.9	3.7	0.1
75	Delcam International	12.6	12.2	14.7	20.7	0.3
76	Design Acceleration	-	0.8	1.9	137.5	0.0

Table B-1

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

All Worldwide Software Companies, Worldwide, All Platforms, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
77	Design Automation	9.5	8.3	9.1	10.5	0.2
78	Dynamic Graphics	4.1	3.6	4.0	10.9	0.1
79	EA Systems	3.7	2.2	2.0	-7.0	0.0
80	Eagle Point	8.0	11.8	21.1	78.3	0.4
81	Earth Resource Mapping	1.8	3.7	4.3	15.6	0.1
82	ECOM Associates	1.0	1.4	-	-100.0	-
83	EDS Unigraphics	113.1	144.4	163.5	13.2	3.0
84	Elstree Computing	1.2	1.1	1.2	4.5	0.0
85	EME	1.6	0.9	-	-100.0	-
86	Enghouse Systems Ltd.	6.2	7.4	8.7	17.8	0.2
87	Engineered Software	1.1	1.0	1.1	12.4	0.0
88	Engineering Mechanics	5.5	6.2	7.2	15.0	0.1
89	EPIC Design Technology	2.5	4.8	9.7	102.1	0.2
90	ERDAS	6.7	6.4	7.3	14.4	0.1
91	ESRI	91.9	108.8	128.3	17.9	2.4
92	Evolution Computing	1.6	1.9	1.3	-32.2	0.0
93	Exapt	4.2	3.8	3.2	-17.4	0.1
94	Exemplar Logic	0.8	1.2	2.5	108.2	0.0
95	Facility Mapping Systems	1.4	1.8	2.0	11.4	0.0
96	FEA	0.7	0.9	-	-100.0	-
97	FEGS	1.0	0.9	-	-100.0	-
98	Fintronic	-	1.4	1.4	5.2	0.0
99	Framasoft	4.6	4.4	4.8	8.7	0.1
100	Fujitsu	114.3	165.8	165.9	0.1	3.1
101	Gable CAD Systems	0.6	0.7	0.7	-	0.0
102	GDS	34.4	38.7	30.7	-20.8	0.6
103	Genasys II	12.9	15.0	16.9	12.5	0.3
104	Geo/SQL Corp.	2.2	0.9	1.1	22.2	0.0
105	GeoGraphix	2.4	3.0	3.6	23.0	0.1
106	GEOMAX Intl.	2.1	1.5	1.7	13.2	0.0
107	Geometria GIS Systems House	0.4	0.2	0.2	-3.3	0.0
108	Georgia Tech Research Corp.	1.9	1.8	-	-100.0	-
109	GEOVISION Inc.	0.3	0.2	-	-100.0	-
110	Gerber Systems	8.6	11.4	10.9	-4.6	0.2
111	GRAFTEK	10.4	11.6	12.9	11.0	0.2
112	Graphisoft Group	6.0	6.7	11.0	64.4	0.2
113	GRAPHSOFT	1.4	2.8	2.0	-27.1	0.0
114	Graphtec Engineering	6.9	7.0	7.9	12.4	0.1

Table B-1

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

All Worldwide Software Companies, Worldwide, All Platforms, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
115	Ground Modelling Systems	2.8	2.5	4.0	59.4	0.1
116	Han Dataport	13.3	10.9	13.7	26.6	0.3
117	Harris EDA	19.9	20.6	21.3	3.4	0.4
118	Hewlett-Packard	94.1	104.0	106.9	2.9	2.0
119	High Level Design Systems	0.6	2.7	3.3	22.6	0.1
120	Hitachi	73.1	80.8	86.9	7.5	1.6
121	Hitachi Zosen Info Systems	5.2	4.8	5.4	11.9	0.1
122	Hochtief	3.4	3.7	4.5	22.1	0.1
123	i-Logix	4.9	5.5	6.0	8.9	0.1
124	IBM	366.3	398.3	436.1	9.5	8.0
125	ICEM Technologies	22.2	10.3	10.9	5.7	0.2
126	ICL	11.9	12.6	12.1	-4.0	0.2
127	IEZ	26.6	29.6	40.3	35.9	0.7
128	IKOS Systems	13.8	18.1	21.1	16.4	0.4
129	IMSI	1.8	2.1	3.0	40.2	0.1
130	Infinite Graphics	2.5	4.9	5.2	6.1	0.1
131	Innovative Data Design	1.0	1.0	-	-100.0	-
132	INS Engineering	7.3	7.9	8.8	11.8	0.2
133	Integrated Silicon Systems	2.3	5.5	10.6	94.4	0.2
134	Integrity Engineering	-	0.6	0.6	-	0.0
135	Intergraph	310.2	321.2	317.7	-1.1	5.9
136	InterHDL	-	1.0	1.2	15.0	0.0
137	International Software Systems	1.0	1.2	1.4	16.7	0.0
138	Intrinsix	0.8	0.7	-	-100.0	-
139	Intusoft	-	0.8	0.9	15.0	0.0
140	Investronica SA	7.7	8.3	10.5	26.7	0.2
141	ISD Software	14.0	13.6	14.1	3.8	0.3
142	ISDATA	1.8	1.6	1.8	8.0	0.0
143	Isicad CAD/CAM Systeme	23.0	12.8	8.7	-31.9	0.2
144	ISKA	1.3	1.2	1.2	0.5	0.0
145	ItalCad	12.5	5.3	-	-100.0	-
146	Kloeckner-Moeller	3.1	3.0	2.9	-2.0	0.1
147	Kockums Computer Systems	5.6	4.0	4.4	10.0	0.1
148	Kreon	0.2	0.2	-	-100.0	-
149	Kubota Computer	8.3	7.2	8.3	15.6	0.2
150	Lamp Software	1.5	1.7	-	-100.0	-
151	Land Innovation	2.6	1.5	-	-100.0	-
152	Landmark Graphics	29.8	50.9	56.8	11.6	1.0

Table B-1

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

All Worldwide Software Companies, Worldwide, All Platforms, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
153	Laser-Scan	4.7	6.1	6.4	4.4	0.1
154	LSI Logic	12.8	13.8	15.6	12.7	0.3
155	M.O.C.	3.8	4.0	2.0	-49.2	0.0
156	Macao Systems	0.6	0.6	-	-100.0	-
157	MacNeal-Schwendler	106.3	116.7	114.0	-2.3	2.1
158	MapInfo	9.2	16.4	29.8	81.2	0.5
159	Maptech	0.9	1.2	-	-100.0	-
160	MARC	11.8	13.1	15.0	14.5	0.3
161	Marcus Computer Systeme	6.8	3.1	1.6	-48.9	0.0
162	MASSTECK	1.3	1.2	-	-100.0	-
163	Matra Datavision	48.7	50.3	54.8	9.0	1.0
164	mb Programme	1.8	2.2	2.3	7.3	0.0
165	MC2 Engineering Software	0.7	0.7	-	-100.0	-
166	MCS	9.8	9.4	12.6	34.5	0.2
167	Mechanical Dynamics	6.8	10.4	11.7	13.0	0.2
168	MEDesign	0.7	0.7	-	-100.0	-
169	Mentor Graphics	152.3	170.0	172.1	1.2	3.2
170	Meta-Software	6.8	8.4	9.2	9.7	0.2
171	Micrografx	4.0	4.9	5.5	11.9	0.1
172	Microsim	5.7	5.8	7.5	30.2	0.1
173	Minc Software	2.6	0.5	0.6	9.9	0.0
174	Mitsui Engineering	9.2	7.9	8.8	11.2	0.2
175	Moda CAD	2.8	3.2	3.6	11.6	0.1
176	Moss Systems Group	5.3	3.6	6.0	67.2	0.1
177	MOTOROLA	2.6	3.0	3.4	14.4	0.1
178	Mucke Software	0.4	0.5	-	-100.0	-
179	Mutoh Industries--NO OEM	32.3	26.0	27.4	5.5	0.5
180	NEC	84.5	96.4	101.7	5.6	1.9
181	Nemetschek	32.5	44.7	58.1	30.1	1.1
182	NEOCAD	3.0	5.3	5.9	11.4	0.1
183	Nextwave DA	-	0.5	0.7	40.0	0.0
184	Nihon Unisys	44.2	62.9	66.5	5.6	1.2
185	Norlinvest Ltd.	5.8	7.1	8.1	14.7	0.1
186	OEA International	-	0.7	0.9	28.6	0.0
187	Omron	6.4	5.4	6.0	11.3	0.1
188	Optem Engineering	-	0.4	0.5	25.0	0.0
189	ORCAD	6.2	7.2	7.5	4.9	0.1
190	Pacific Numerics	4.4	4.8	5.1	4.8	0.1

Table B-1
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
All Worldwide Software Companies, Worldwide, All Platforms, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
191	PACSOFT	1.0	1.1	1.4	22.5	0.0
192	PADS Software	4.4	9.8	10.5	6.8	0.2
193	PAFEC	8.3	6.5	6.5	-0.8	0.1
194	Parametric Technology	81.2	149.6	201.2	34.5	3.7
195	Pathtrace Engineering Systems	2.2	2.1	2.5	19.5	0.0
196	PCI Remote Sensing Corp	5.5	9.0	10.2	13.3	0.2
197	Phase Three Logic	0.5	0.6	-	-100.0	-
198	Poppenhaeger Grips	1.9	2.6	2.7	3.3	0.0
199	PROCAD GmbH	9.7	10.2	11.7	15.0	0.2
200	Quantic Laboratories	2.6	2.2	2.5	12.8	0.0
201	Quickturn Design Systems	24.1	49.6	58.6	18.2	1.1
202	Radan Computational	8.8	9.6	9.6	-	0.2
203	Radian Corporation	4.8	4.7	5.6	18.9	0.1
204	Rasna Corporation	8.8	12.2	14.5	18.6	0.3
205	Rebis	4.9	5.0	5.2	3.6	0.1
206	Research Engineers--Civilsoft	1.7	2.1	2.3	11.1	0.0
207	RIB/Bausoftware	6.7	13.4	20.6	53.4	0.4
208	Ricoh--NO OEM	3.6	1.7	2.1	23.4	0.0
209	RoboCAD Solutions	5.9	6.2	6.9	11.2	0.1
210	Royal Digital Centers	0.9	1.5	1.5	2.7	0.0
211	S.T.L.D. s.r.l.	0.5	0.4	-	-100.0	-
212	Sagantec	6.7	6.1	6.2	1.8	0.1
213	SDRC	83.7	85.6	111.4	30.1	2.1
214	Seiko Instruments--NO OEM	17.3	13.4	14.1	5.2	0.3
215	Sener Inginiera y Sistemaus	3.0	3.2	3.0	-8.1	0.1
216	Serbi	6.3	6.1	6.8	10.7	0.1
217	SES Inc.	5.0	7.0	7.9	13.7	0.1
218	Sharp System Products--NO OEM	23.9	27.9	32.5	16.4	0.6
219	SHL Vision Solutions	14.0	7.3	8.0	8.7	0.1
220	Siemens Nixdorf Info systeme	94.8	68.6	71.3	3.9	1.3
221	Sigma Design	6.7	5.2	5.7	10.0	0.1
222	Silicon Valley Research	6.6	5.9	5.0	-15.4	0.1
223	SIMUCAD	1.7	1.2	1.4	15.9	0.0
224	Simulation Technology	-	0.5	0.6	16.0	0.0
225	Sinus Software	0.8	0.6	0.7	10.2	0.0
226	Smallworldwide	5.8	15.0	26.0	73.6	0.5
227	Soft-Tech Software Technologies	10.4	11.4	13.3	16.8	0.2
228	Softdesk	12.1	18.6	26.3	41.5	0.5

Table B-1

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

All Worldwide Software Companies, Worldwide, All Platforms, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
229	Softronics	3.0	3.4	3.0	-9.9	0.1
230	Spectrum Software	1.1	1.2	-	-100.0	-
231	Speed	-	1.0	1.1	10.0	0.0
232	Star Informatic	10.9	7.6	8.4	10.1	0.2
233	Straessle Informationssysteme	27.5	22.2	23.9	7.5	0.4
234	Strategic Mapping	9.0	12.2	14.4	18.8	0.3
235	Summitt Design	8.5	8.7	12.5	44.0	0.2
236	Sunrise Test Systems	2.5	3.9	-	-100.0	-
237	Superdraft	1.2	1.2	1.3	8.6	0.0
238	Sweet's Electronic Publishing	2.2	3.0	3.3	12.8	0.1
239	Synercom	5.4	4.4	-	-100.0	-
240	Synopsys	64.1	114.1	142.7	25.0	2.6
241	Sysdeco Innovation	4.4	8.6	9.1	5.8	0.2
242	Systems Science	0.8	0.6	0.9	50.0	0.0
243	Tactician	3.0	3.5	4.2	21.7	0.1
244	Tanner Research	0.5	0.8	1.1	39.1	0.0
245	Tebis	10.1	6.5	6.9	7.2	0.1
246	Technische Computer Systeme	7.7	10.9	12.1	10.5	0.2
247	TERADYNE	8.4	5.0	-	-100.0	-
248	Terr-Mar Resource Info Svs	1.1	1.6	1.8	13.1	0.0
249	Terra Sciences	1.9	2.3	2.8	20.3	0.1
250	Tokyo Electron–NO OEM	16.0	12.6	14.3	13.5	0.3
251	Toshiba Engineering--no OEM	8.9	12.1	13.7	13.2	0.3
252	Toshiba–NO OEM	59.8	64.8	70.3	8.6	1.3
253	Toyo Information Systems-NO OEM	7.2	8.4	9.2	9.8	0.2
254	Triplan	2.1	2.2	2.3	7.9	0.0
255	TYDAC Technology	3.2	3.8	4.5	16.5	0.1
256	Uchida Yoko	13.5	13.1	14.5	10.3	0.3
257	ULTImate Technology	2.1	1.8	2.0	7.7	0.0
258	Understanding Systems	0.6	0.6	-	-100.0	-
259	UNISYS	3.5	4.7	6.9	47.6	0.1
260	VEDA	4.5	3.4	2.5	-25.1	0.0
261	Veritools	-	0.5	0.6	16.0	0.0
262	Vero International Software	2.9	1.1	1.6	45.4	0.0
263	Viewlogic Systems	46.2	62.2	74.1	19.1	1.4
264	VLSI Libraries	0.7	1.3	3.4	165.6	0.1
265	Wacom	29.5	18.9	18.0	-4.5	0.3
266	Whessoe Computing Systems	3.8	3.8	4.2	10.2	0.1

Table B-1

1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)

All Worldwide Software Companies, Worldwide, All Platforms, All Applications

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
267	Wiechers Datentechnik	13.2	21.0	22.2	5.8	0.4
268	XILINX	11.1	9.2	10.9	18.2	0.2
269	Yokogawa Digital Computer	11.9	15.7	17.4	10.8	0.3
270	Ziegler Informatics	14.4	15.3	16.6	8.7	0.3
271	Zuken-Redac	81.8	71.5	77.7	8.7	1.4
272	Zycad	33.6	32.8	39.7	21.2	0.7
	All N.A. Companies	3,191.5	3,475.2	3,862.4	11.1	71.1
	All European Companies	695.9	666.5	734.0	10.1	13.5
	All Asian Companies	710.0	783.1	833.9	6.5	15.4
	All Companies	**4,597.4**	**4,924.8**	**5,430.2**	**10.3**	**100.0**

OEM revenue removed to prevent double-counting the market

Source: Dataquest (March 1995)

Table C-1

1994 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units)

Top 30 Worldwide Vendors, Worldwide, All Platforms, All Applications

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Factory Revenue	1994 Share of Market (%)
1	IBM	87,331	436.1	1,142.9	365.1	2,059.5	12.3
2	Sun Microsystems	97,055	-	1,666.8	313.1	1,979.9	11.8
3	Hewlett-Packard	81,900	106.9	1,247.4	280.0	1,634.3	9.8
4	Digital Equipment	87,774	-	1,028.1	161.6	1,189.7	7.1
5	Intergraph	20,339	317.7	301.8	292.7	993.0	5.9
6	Fujitsu	30,636	165.9	388.0	59.9	657.3	3.9
7	Silicon Graphics	16,963	-	520.4	60.7	581.1	3.5
8	Autodesk	-	442.8	-	-	442.8	2.6
9	Cadence	-	264.7	-	160.3	425.0	2.5
10	NEC	20,083	101.7	169.9	37.2	399.6	2.4
11	Mentor Graphics	747	172.1	17.3	159.0	348.3	2.1
12	EDS Unigraphics	4,968	166.5	67.2	61.3	295.0	1.8
13	Computervision	-	163.3	-	119.6	283.0	1.7
14	Nihon Unisys	2,169	66.5	135.8	51.2	265.2	1.6
15	Parametric Technology	-	201.2	-	58.5	259.6	1.6
16	Siemens Nixdorf Info systeme	7,809	71.3	78.3	62.6	220.1	1.3
17	Synopsys	-	142.7	-	67.1	209.8	1.3
18	Hitachi	5,501	86.9	69.8	20.1	196.2	1.2
19	Apple Computer	45,768	-	147.1	-	184.1	1.1
20	Toshiba--NO OEM	4,474	70.3	65.5	17.5	169.7	1.0
21	SDRC	-	111.4	-	56.2	167.5	1.0
22	ESRI	-	128.3	-	31.1	159.4	1.0
23	Zuken-Redac	812	77.7	32.4	46.1	156.2	0.9
24	Landmark Graphics	413	56.8	15.3	40.2	125.1	0.7
25	MacNeal-Schwendler	-	114.0	-	5.6	119.7	0.7
26	Viewlogic Systems	-	89.4	-	29.2	118.6	0.7
27	Hitachi Zosen Info Systems	1,076	5.4	66.0	11.2	103.0	0.6
28	Matra Datavision	1,965	54.8	29.4	10.4	100.6	0.6
29	Nemetschek	1,874	58.1	21.4	8.0	92.1	0.6
30	GDS	953	33.5	24.3	13.0	76.8	0.5
	Other Companies	318,237	-	754.8	14.1	975.4	5.8
	All N.A. Companies	372,777	3,862.4	5,161.1	2,499.7	11,800.9	70.5
	All European Companies	28,739	734.0	331.3	249.2	1,384.7	8.3
	All Asian Companies	76,560	833.9	1,145.6	290.1	2,570.9	15.4
	All Companies	**796,312**	**5,430.2**	**7,392.8**	**3,053.0**	**16,731.9**	**100.0**

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

Source: Dataquest (March 1995)

Table C-2

1994 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units)

Top 30 Worldwide Vendors, Worldwide, Technical Workstation, All Applications

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Factory Revenue	1994 Share of Market (%)
1	Sun Microsystems	97,055	-	1,666.8	313.1	1,979.9	16.4
2	Hewlett-Packard	53,155	103.4	1,162.6	270.6	1,536.6	12.7
3	IBM	27,153	263.1	770.7	238.4	1,328.3	11.0
4	Intergraph	11,813	234.0	267.0	261.1	835.1	6.9
5	Silicon Graphics	16,963	-	520.4	60.7	581.1	4.8
6	Digital Equipment	19,534	-	378.8	69.7	448.5	3.7
7	Cadence	-	264.7	-	160.3	425.0	3.5
8	Fujitsu	10,428	110.3	217.2	43.2	398.3	3.3
9	Mentor Graphics	747	170.1	17.3	159.0	346.3	2.9
10	EDS Unigraphics	4,968	166.5	67.2	61.3	295.0	2.4
11	Computervision	-	147.8	-	119.6	267.4	2.2
12	NEC	7,670	78.0	90.7	23.9	257.9	2.1
13	Parametric Technology	-	183.3	-	53.3	236.5	2.0
14	Synopsys	-	142.7	-	67.1	209.8	1.7
15	Nihon Unisys	2,085	56.1	96.7	36.7	199.2	1.7
16	SDRC	-	111.4	-	56.2	167.5	1.4
17	Siemens Nixdorf Info systeme	2,428	50.4	51.0	53.1	157.5	1.3
18	Hitachi	3,205	68.8	54.9	15.8	154.4	1.3
19	Zuken-Redac	812	74.4	32.4	44.1	150.9	1.3
20	Toshiba--NO OEM	1,580	55.3	51.1	13.6	132.8	1.1
21	Landmark Graphics	413	56.8	15.3	40.2	125.1	1.0
22	ESRI	-	95.5	-	28.8	124.3	1.0
23	Hitachi Zosen Info Systems	1,076	5.4	63.3	10.8	98.8	0.8
24	Matra Datavision	1,756	53.6	28.7	10.4	98.6	0.8
25	MacNeal-Schwendler	-	81.1	-	5.2	86.2	0.7
26	Viewlogic Systems	-	55.5	-	22.8	78.3	0.6
27	IEZ	1,320	38.1	18.7	12.2	72.0	0.6
28	Applicon	757	28.6	12.3	19.1	68.2	0.6
29	Quickturn Design Systems	-	58.6	-	6.9	65.5	0.5
30	Sharp System Products--NO OEM	550	32.5	15.2	-	58.7	0.5
	All N.A. Companies	184,568	2,762.0	4,079.0	2,178.4	9,183.4	76.1
	All European Companies	14,149	470.1	247.2	202.3	959.0	7.9
	All Asian Companies	35,810	652.2	801.2	228.3	1,922.5	15.9
	All Companies	**234,527**	**3,884.3**	**5,127.3**	**2,609.0**	**12,064.9**	**100.0**

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

Source: Dataquest (March 1995)

Table C-3

1994 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units)

Top 30 Worldwide Vendors, Worldwide, Host Dependent, All Applications

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Factory Revenue	1994 Share of Market (%)
1	Digital Equipment	6,214	-	479.1	85.8	564.9	36.9
2	IBM	706	109.6	164.4	123.3	456.6	29.9
3	Fujitsu	1,842	45.9	42.6	16.7	118.5	7.7
4	Nihon Unisys	84	10.4	39.1	14.5	65.9	4.3
5	NEC	207	4.8	27.5	4.4	48.3	3.2
6	GDS	410	17.8	16.0	8.2	47.5	3.1
7	MacNeal-Schwendler	-	32.0	-	0.4	32.5	2.1
8	Siemens Nixdorf Info systeme	126	6.8	8.8	8.0	26.8	1.8
9	Autometric	76	1.4	2.6	6.3	11.8	0.8
10	Hitachi	707	4.8	3.9	1.1	11.4	0.7
11	Exapt	70	2.0	1.7	1.0	5.9	0.4
12	Kubota Computer	45	0.9	4.1	0.4	5.4	0.4
13	GRAFTEK	116	1.7	1.7	0.7	4.7	0.3
14	Ansys	-	3.4	-	0.8	4.2	0.3
15	Hitachi Zosen Info Systems	-	-	2.7	0.4	4.2	0.3
16	Toyo Information Systems-NO OEM	20	1.1	1.6	0.5	3.4	0.2
17	Aspen Technology	-	2.1	-	1.2	3.2	0.2
18	ESRI	-	2.6	-	0.6	3.2	0.2
19	EA Systems	-	1.3	-	1.6	2.9	0.2
20	Mechanical Dynamics	-	2.2	-	0.4	2.6	0.2
21	SHL Vision Solutions	1	0.8	0.1	0.6	1.5	0.1
22	Framasoft	-	0.5	-	0.5	1.0	0.1
23	Century Research Center	2	0.4	0.3	0.1	0.9	0.1
24	Whessoe Computing Systems	-	0.6	-	-	0.6	0.0
25	ACA Ltd.	-	0.5	-	0.1	0.6	0.0
26	Computational Mechanics	-	0.5	-	-	0.5	0.0
27	PROCAD GmbH	-	0.4	-	0.1	0.5	0.0
28	debis Systemhaus	1	0.4	0.1	0.1	0.5	0.0
29	Harris EDA	3	0.3	0.1	-	0.4	0.0
30	Analogy	-	0.3	-	0.1	0.3	0.0
	Other Companies	284	-	55.4	14.1	275.9	18.0
	All N.A. Companies	5,004	174.1	488.1	230.1	959.4	62.7
	All European Companies	198	11.7	10.6	9.8	36.3	2.4
	All Asian Companies	2,906	68.2	121.6	38.1	257.9	16.9
	All Companies	**8,392**	**254.0**	**675.7**	**292.1**	**1,529.5**	**100.0**

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

Source: Dataquest (March 1995)

Table C-4

1994 CAD/CAM/CAE/GIS Total Vendor Market Share Table (Revenue in $M, Actual Units)

Top 30 Worldwide Vendors, Worldwide, Personal Computer, All Applications

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Factory Revenue	1994 Share of Market (%)
1	Autodesk	-	416.2	-	-	416.2	13.3
2	IBM	59,472	63.4	207.8	3.3	274.5	8.7
3	Apple Computer	45,768	-	147.1	-	184.1	5.9
4	Digital Equipment	62,027	-	170.2	6.1	176.3	5.6
5	Intergraph	8,527	83.7	34.7	31.6	157.9	5.0
6	Fujitsu	18,366	9.7	128.2	-	140.5	4.5
7	Hewlett-Packard	28,745	3.5	84.8	9.4	97.7	3.1
8	NEC	12,207	18.9	51.6	8.9	93.3	3.0
9	Nemetschek	1,340	32.0	11.7	4.4	50.7	1.6
10	Viewlogic Systems	-	33.9	-	6.4	40.3	1.3
11	Investronica SA	1,368	10.5	10.5	3.9	38.3	1.2
12	Toshiba--NO OEM	2,894	15.0	14.4	3.8	36.8	1.2
13	Siemens Nixdorf Info systeme	5,255	14.1	18.5	1.6	35.8	1.1
14	ESRI	-	30.3	-	1.6	31.9	1.0
15	MapInfo	-	28.3	-	2.9	31.1	1.0
16	Hitachi	1,589	13.3	11.0	3.2	30.5	1.0
17	Softdesk	-	25.1	-	1.6	26.7	0.9
18	Mutoh Industries--NO OEM	845	14.5	3.9	2.0	23.9	0.8
19	Parametric Technology	-	17.9	-	5.2	23.1	0.7
20	Wiechers Datentechnik	445	14.9	4.6	3.4	22.8	0.7
21	Wacom	697	15.7	4.1	2.6	22.4	0.7
22	Eagle Point	-	21.0	-	0.1	21.1	0.7
23	Soft-Tech Software Technologies	1,156	13.3	-	1.6	17.0	0.5
24	Ziegler Informatics	-	16.6	-	-	16.6	0.5
25	RIB/Bausoftware	-	15.3	-	1.0	16.3	0.5
26	Computervision	-	15.6	-	-	15.6	0.5
27	CPU	362	10.7	4.8	-	15.5	0.5
28	Strategic Mapping	-	13.0	-	2.3	15.3	0.5
29	Design Automation	478	11.7	0.5	0.5	14.9	0.5
30	Tebis	137	6.2	1.8	3.8	13.1	0.4
	Other Companies	317,953	-	699.5	-	699.5	22.3
	All N.A. Companies	183,204	926.3	594.0	91.2	1,658.1	52.8
	All European Companies	14,392	252.2	73.5	37.1	389.4	12.4
	All Asian Companies	37,844	113.5	222.8	23.6	390.5	12.4
	All Companies	**553,393**	**1,292.0**	**1,589.8**	**151.9**	**3,137.5**	**100.0**

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

Source: Dataquest (March 1995)

Dataquest

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December 1994

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Jeffrey A. Byrne
Vice President
Worldwide Marketing

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Global Market Insight for Information Technology Companies

1995 RESEARCH PROGRAMS

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Computer Systems and Peripherals

Computer Systems
- Client/Server Computing *Worldwide*
- Advanced Desktop, Workstation, and Client/Server Distribution Channels
- Computer and Client/Server Systems *Europe*
- PC and Low-End Computer Servers *Europe*
- UNIX and Open Systems *Europe*
- Computer Systems *Japan*

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

Personal Computing
- Personal Computers *Worldwide*
- *European* PC Strategic Service
- *European* (PC) Market Update
- Personal Computers *Asia/Pacific*
- PCMCIA Systems and Peripherals *Worldwide*
- Mobile Computing *Worldwide*
- PC Quarterly Statistics *United States*
- *European* (PC) Quarterly Statistics
- PC Quarterly Statistics *Japan*
- PC Distribution Channels *Worldwide*
- PC Distribution Channels *Europe*
- Network Distribution Channels *Europe-Upgrade*
- PC Distribution Channels Quarterly Statistics
- PC Tracking Services *Asia/Pacific*

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

Graphics
- Graphics and Displays *Worldwide*

Online, Multimedia, and Software

Emerging Technologies
- Multimedia *Worldwide*
- Online Strategies *Worldwide*

Business Productivity
- Client/Server Software *Worldwide*
- Personal Computing Software *Worldwide*
- *European* Personal Computing Software
- *European* Personal Operating Systems
- Workgroup Computing *Worldwide*
- *European* Workgroup Computing

Technical Applications
- AEC and GIS Applications *Worldwide*
- Electronic Design Automation *Worldwide*
- Mechanical CAD/CAM/CAE *Worldwide*
- CAD/CAM/CAE/GIS *Europe*
- CAD/CAM/CAE/GIS *Asia/Pacific*

Services

Customer Services
- Customer ServiceTrends *North America*
- *European* Customer Services

Professional Services
- Professional ServiceTrends *North America*
  - Systems Integration and Applications Development
  - Consulting and Education
  - Systems Management
- Professional ServiceTrends: Vertical Market Opportunities *North America*
- *European* Professional Services

Sector Programs
- System Services *North America*
- *European* Desktop Support Services
- Network Integration and Support Services *North America*
- *European* Network Integration & Support Services
- Software Services *North America*
- Strategic Service Partnering *North America*

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Document Management

Emerging Technologies
- Digital Documents *North America*
- Colour Products *Europe*

Copiers
- Copiers *North America*
- Copiers *Europe*

Facsimile
- Facsimile *North America*

Printers
- Printers *North America*
- Printers *Europe*
- Printer Distribution Channels *Europe*
- Printer Tracking Services *Asia/Pacific*

Semiconductors

Regional Markets
- Semiconductors *Worldwide*
  - Semiconductor Industry Snapshot
- Semiconductors *Europe*
- Semiconductors *Asia/Pacific*
- Semiconductors *Japan*
- Strategic Tracking Services
  - China/Hong Kong
  - Taiwan
  - Korea
  - Singapore

Products
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- ASICs Product Planning *Europe*
- Memories *Worldwide*
- Memory Product Planning *Europe*
- Microcomponents *Worldwide*
- Microcomponent Product Planning *Europe*
- Discretes Product Planning *Europe*

Application Markets
- Semiconductor Application Markets *Worldwide*
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- Semiconductor Application Markets *Asia/Pacific*
- Communications Semiconductors & Applications
- PC Semiconductors and Applications
- PC Teardown Analysis
- PC Watch *Europe*
- Electronic Equipment Production Monitor *Europe*

Manufacturing
- Semiconductor Equipment, Manufacturing, and Materials *Worldwide*
- LCD Multi-client Study

Pricing Trends
- Semiconductor Procurement *Worldwide*

Telecommunications

Networking
- Networking *North America*
  - Local Area Networks *North America*
  - Digital WANs *North America*
  - Modems *North America*
- Networking *Europe*
  - Asynchronous Transfer Mode (ATM) *Europe*
  - ISDN *Europe*
  - Modems *Europe*
  - Local Area Networks *Europe*
  - Private Digital WAN *Europe*
- Networking Market Watch—Intelligent Hubs
- Network Distribution Channels *Europe*

Voice
- Voice Communications *North America*
  - Voice Processing *North America*
  - Integrated Calls Centers *North America*
  - Premise Switching Systems *North America*
- Voice Communications *Europe*
  - Voice Processing *Europe*
  - Call Centres *Europe*
  - Telephones *Europe*
  - PBX/KTS Systems *Europe*

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

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

Dataquest Catalyst Programs

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- Government Agencies
- IT Business Strategy and Planning Organizations
- Publishing, Media, and Consulting Firms
- IS and Purchasing Organizations
- IT Supporting Organizations

Emerging Markets

Central and Eastern European Markets
- Printers
- Personal Computers

Information Technology Market Opportunities
- China
- Asia/Pacific
- Latin America

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Global Market Insight for Information Technology Companies

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- Total factory, hardware, and software revenue
- Service revenue
- Computer shipments
- Distribution channels

Industries

- 25 major industries

Applications

- Documentation/drafting
- Conceptual design
- Functional design
- Analysis
- Manufacturing engineering
- Manufacturing process simulation
- System management tools

Platforms

- Personal computer
- Technical workstation
- Host-based
- Server

Operating Systems

- All major personal computer and UNIX operating systems (10) plus VMS and VM/MVS

Modeling Technologies

- 2-D, 3-D, Solids, and Integrated

Geographies

- North America
- Major European countries (7)
- Major Asian countries (6)
- Rest of world
- Worldwide

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Worldwide Online, Multimedia, and Software Group

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MECHANICAL CAD/CAM/CAE WORLDWIDE

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User Wants and Needs: Dataquest's annual mechanical CAD/CAM/CAE end-user survey interviews users, managers, and executives in the discrete manufacturing industries. The study analyzes MCAD applications currently in use, site penetration, productivity gains, and work habit expectation/changes. Hands-on reviews rate software performance and assess user satisfaction.

Available in the first quarter of 1995

Market Analysis

Mechanical CAD/CAM/CAE Market Trends: This report includes detailed analysis from several perspectives on the forces driving the MCAD market. Trends and issues, changing end-user requirements, high-growth applications, analysis of leading vendors, regional differences, and computer industry technology changes are discussed in relation to their impact on MCAD market dynamics.

Available in the fourth quarter of 1995

Mechanical CAD/CAM/CAE Market Statistics: This report provides the most reliable and comprehensive set of market data on the MCAD market. It contains hardware, software, and service forecasts and market share for worldwide MCAD companies and applications. A total of four reports are published each year. Two reports presenting market share and forecasts are published during the first half of the year; these are updated during the second half of the year. A multidimensional database is used to capture and analyze all elements of Dataquest's CAD/CAM/CAE market coverage. Customized analysis of this database is available to our clients.

Perspective

Timely newsletters presenting analysis and commentary on key events/issues in the MCAD software market. Topics under consideration for the year include product data management, analysis applications, manufacturing applications, documentation and drafting, and knowledge-based engineering. These documents are published on an event-driven basis throughout the year and include:

- **Dataquest Predicts**—Forward-looking analysis of MCAD software market dynamics that include Dataquest's predictions about future industry and technology directions
- **Research Briefs**—Analysis of industry news, mergers, announcements, and shows

QuickTakes

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News and commentary on late-breaking mechanical CAD/CAM/CAE industry events delivered by fax and/or email.

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May 29, 1995

Dear Dataquest CAD/CAM/CAE/GIS Client,

Converting the CAD/CAM/CAE/GIS database to modern software has been a real adventure. While we are making all of our deadlines, we are still developing complete forecasting tools. Thus, for this edition of our forecast, we must focus on the core metric of software revenue. The enclosed book is an abbreviated Forecast, for this update only, of software revenue by application, by operating system, and by region. Following the Market Share Update, the forecasting procedures will be developed that will expand this forecast to countries and to hardware revenue, service revenue, and units. This forecast illustrates our new focus on reporting by operating system instead of computer platform—a change many of you have requested.

The software revenue data in this book will not exactly match that in the Market Share report published on March 27. Since that publication, we have restructured the database, which has caused certain shifts in the data. Details of restructuring and data changes are described on page 3 of the Forecast book (see "Changes to Our Forecast Structure").

We regret any inconvenience this forecast may cause, and we assure you that the future will bring better, more accessible data. Many of you are already enjoying our new capability to e-mail Excel workbooks of any published CAD data, including this forecast. Just give us a call.

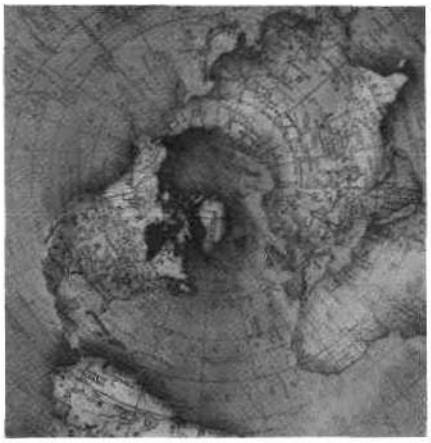
We appreciate your patience as we make this important transition. Because I have not yet designed all the forecasting table formats, I welcome your input. Please contact me at 408-437-8135 with any suggestions you might have.

Sincerely,

Linda Anderson

Linda Anderson

CAD/CAM/CAE/GIS Market Research Analyst



Dataquest

CAD/CAM/CAE and GIS Worldwide 1994 Forecast

Market Statistics

Program: CAD/CAM/CAE/GIS Worldwide (includes these programs: AEC/GIS Worldwide, EDA Worldwide, Mechanical CAD/CAM Worldwide, CAD/CAM Europe, and CAD/CAM Asia/Pacific)
Product Code: CCAM-WW-MS-9501
Publication Date: May 29, 1995
Filing: Market Analysis

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Market Statistics

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Note: All tables show estimated data.

The Continuing Impact of Currency Shift

Fluctuating exchange rates once again masked the true market performance in the 1994 CAD/CAM/CAE and GIS market. Japanese CAD/CAM/CAE and GIS total software revenue grew a surprising 8.6 percent from 1993 to 1994 when measured in U.S. dollars, contrary to what would be expected in light of Japan's prolonged recession. However, because the dollar depreciated against the yen at a rate of 8.2 percent, Japanese CAD/CAM/CAE and GIS software revenue declined 0.3 percent from 1993 to 1994 when measured in yen.

European CAD/CAM/CAE and GIS software revenue grew 8.7 percent from 1993 to 1994 when measured in U.S. dollars. The dollar depreciated 1.5 percent against the ECU, so European CAD/CAM/CAE and GIS software revenue grew 7.1 percent from 1993 to 1994 when measured in ECU. Table 1 shows the impact of currency fluctuation on the CAD/CAM/CAE and GIS software market.

Looking ahead, currency fluctuations will continue to be felt in all global markets. The dollar has continued to weaken during the early months of this year, so if we were to assume a stable currency for the remainder of the year, 1995 will end with the dollar depreciating 13 percent against the yen and 9 percent against the ECU. Although Dataquest does not forecast currency exchange rates, we do forecast with the best information available. The exchange rate is calculated as the simple arithmetic mean of the 12 average monthly rates for each country. For the purpose of this forecast, Dataquest assumes that the April exchange rate will remain stable in the future.

Table 1
Software Revenue History and Forecast, All Companies, All Operating Systems

						Growth Rate (%)	
	1991	1992	1993	1994	1995	1993-1994	1994-1995
Worldwide (U.S.$M)							
Mechanical	1,926.2	2,104.7	2,296.2	2,520.3	2,764.8	9.8	9.7
AEC	673.4	736.5	786.3	871.8	1,017.0	10.9	16.7
GIS/Mapping	485.7	553.6	652.6	728.1	845.0	11.6	16.1
Electronic CAE	720.6	795.4	834.3	922.2	1,029.2	10.5	11.6
IC Layout	220.1	215.5	198.2	240.9	284.4	21.5	18.1
PCB/MCM/Hybrid	272.0	256.8	269.1	284.1	314.0	5.6	10.5
All Applications	4,298.0	4,662.5	5,036.7	5,567.4	6,254.3	10.5	12.3

(Continued)

Table 1 (Continued)
Software Revenue History and Forecast, All Companies, All Operating Systems

						Growth Rate (%)	
	1991	1992	1993	1994	1995	1993-1994	1994-1995
Japan (U.S.$M)							
Mechanical	552.9	607.2	686.5	742.0	789.7	8.1	6.4
AEC	182.4	148.0	181.3	186.1	212.9	2.7	14.4
GIS/Mapping	70.5	82.3	89.4	100.1	117.2	12.0	17.1
Electronic CAE	163.7	164.2	157.4	178.9	206.7	13.7	15.6
IC Layout	81.7	68.1	56.7	66.2	78.1	16.8	18.0
PCB/MCM/Hybrid	133.6	119.3	134.3	144.3	157.8	7.4	9.3
All Applications	1,184.8	1,189.1	1,305.6	1,417.6	1,562.4	8.6	10.2
Exchange Rate, Yen/U.S.$	134.59	126.34	110.85	101.8	88.14	-8.2	-13.4
Japan (¥100M)							
Mechanical	744.1	767.1	760.9	755.3	696.1	-0.7	-7.8
AEC	245.5	187.0	201.0	189.5	187.6	-5.7	-1.0
GIS/Mapping	94.9	104.0	99.1	101.9	103.3	2.8	-1.3
Electronic CAE	220.3	207.4	174.5	182.1	182.2	4.4	0
IC Layout	109.9	86.0	62.9	67.4	68.8	7.2	2.1
PCB/MCM/Hybrid	179.8	150.7	148.9	146.9	139.1	-1.4	-5.3
All Applications	1,594.6	1,502.3	1,447.3	1,443.1	1,377.1	-0.3	-4.6
Europe (U.S.$M)							
Mechanical	847.5	844.8	783.4	835.5	937.1	6.7	12.2
AEC	285.2	338.0	325.9	364.1	435.0	11.7	19.5
GIS/Mapping	172.5	212.2	239.7	263.7	310.8	10.0	17.9
Electronic CAE	171.7	181.9	195.6	217.4	233.3	11.1	7.3
IC Layout	33.1	37.2	37.0	44.0	52.0	18.8	18.3
PCB/MCM/Hybrid	66.9	55.7	52.3	51.7	57.7	-1.2	11.6
All Applications	1,576.9	1,669.8	1,634.0	1,776.5	2,026.0	8.7	14.0
Exchange Rate, ECU/U.S.$	0.8079	0.7686	0.8566	0.8436	0.7709	-1.5	-8.6
Europe (ECU M)							
Mechanical	6.8	6.5	6.7	7.0	7.2	5.0	2.5
AEC	2.3	2.6	2.8	3.1	3.4	10.0	9.2
GIS/Mapping	1.4	1.6	2.1	2.2	2.4	8.4	7.7
Electronic CAE	1.4	1.4	1.7	1.8	1.8	9.5	-1.9
IC Layout	0.3	0.3	0.3	0.4	0.4	17.0	8.1
PCB/MCM/Hybrid	0.5	0.4	0.4	0.4	0.4	-2.7	1.9
All Applications	12.7	12.8	14.0	15.0	15.6	7.1	4.2

Source: Dataquest (May 1995)

Changes to Our Forecast Structure

Dataquest's CAD/CAM/CAE and GIS forecast is based upon the early market share software revenue, gathered primarily before the end of 1994. The CAD/CAM/CAE and GIS database has been restructured as follows:

- Japan is now tracked as a region separate from Asia/Pacific.
- Asia/Pacific now includes China, Hong Kong, Korea, Singapore, Taiwan, and the rest of Asia (Australia, New Zealand, India, and Southeast Asia).
- Service is divided into Hardware Service and Software Service.
- Platforms have been replaced by operating systems; this includes UNIX, host, Windows NT, and PC operating systems.

This restructuring is reflected in the forecast. The net result is a better platform from which to forecast. Unfortunately, the data will not match the previously published market share data. In addition to some shifting of revenue to allow for the restructuring, several company changes were made:

- Work in the new database resulted in the loss of some companies' European and Asian revenue, most notably Altera. Data for these companies was corrected.
- UniCAD, which had inadvertently been excluded from our Market Share report, has been added.
- Mentor Graphics restated its revenue for 1992 and 1993, correcting an error in reporting by shifting revenue from the year of order to the year of sale and realigning sales to correspond to our new subapplication definitions.

Changes to Our Forecast Tables

The market share data, also changed as noted above, is being verified and updated and will be available by June 30 as the Market Share Update report. Dataquest will then perform an updated forecast that will be expanded to include country-level information, additional metrics, and in-depth analysis. This Forecast Update will be available July 31.

This document contains Dataquest's software forecast for all applications for the CAD/CAM/CAE and GIS industry. Included are the following:

- Three-year historical software revenue by region and operating system
- Five-year forecast of software revenue by region and operating system

We welcome your input on our new table formats.

Worldwide Forecast Assumptions

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

Mechanical Forecast Assumptions

The mechanical CAD/CAM/CAE software market grew 9.8 percent in 1994. Over the next five years, growth will be fueled by a complex and rich blend of end-user demands, new technologies, regional and emerging markets, and competition.

Regional Markets

Europe continues to emerge slowly from its recession. In 1994 the European market as a whole posted positive growth, in contrast to its sluggishness over the past few years. European markets will continue to grow over our forecast period as the European economies begin a major restructuring of their CAD tool investments. Asia/Pacific will continue to grow at a rate greater than the worldwide average because of this region's rapidly expanding economies and manufacturing focus.

Product Data Management

Product data management (PDM) is a mechanical CAD subapplication that has been waiting to take off for the past few years. PDM will be one of the more important drivers of the mechanical CAD market over the next five years. Designers worldwide need data management or file management systems to manage their work environment. Pilot PDM programs will begin moving into full-scale production usage within the next few years.

Activity at the Low End

The lower end of the mechanical CAD market is rapidly changing. As PCs and their operating systems increase in functionality and capability, they are becoming capable of handling the complexities of technical applications. Last year a number of leading vendors offered stripped-down versions of their flagship mechanical CAD products, targeted to run on PCs, and this year we have seen a handful of vendors announce new CAD software architectures based on Windows and Windows NT. While we will see a lot of activity at the lower end of the market over our forecast period, it will be somewhat masked by the lower prices that these applications command.

Demand for New Technologies

Emerging technologies will drive growth in the mechanical CAD/CAM market. Tighter integration between engineering and manufacturing, generative numerical control (NC) programming, analysis, and knowledge-based engineering will all drive expansion over the next five years.

AEC Forecast Assumptions

The Impact of Windows NT

Intergraph dominates the UNIX market in North America, and the company's shift to Windows NT will cause the collapse of North American UNIX sales and a gradual erosion of UNIX in Europe. Windows NT will get a boost in 1995, driven by frustrated PC users who demand high performance and who cannot wait for Windows 95 to solve their requirements.

Factors that should contribute to the long-term expansion of the AEC CAD market are as follows:

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

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

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

Two factors will inhibit growth in the AEC CAD industry: Today's AEC systems do not support the entire business problem, and there is poor cooperation among users.

First, AEC's design-one/build-one structure means that CAD provides fewer economic benefits to these users than does the design-one/build-many structure of manufacturing. Construction, which is essentially a prototype build, is fraught with uncertainties and delays that are not well addressed by AEC systems as they exist today. Design tools can only thrive in the AEC structure when they support more of the entire business problem.

Second, users are poorly organized to take advantage of improved products, partly because of competition between engineering constructors and partly because designs are often split among several different companies representing different and competing aspects of the design process. New approaches to the design and construction process are needed to allow users to take full advantage of CAD tools.

GIS/Mapping Forecast Assumptions

The Impact of Windows NT

Intergraph's move to Windows NT at the expense of UNIX will quickly make PC-based operating systems the dominant revenue stream in North America. In the long term, the GIS UNIX market is highly subject

to erosion by Windows NT because of the appeal of better integration of GIS and Windows-based productivity tools.

Factors that should contribute to the long-term expansion of the GIS market are as follows:

There Exists an Abundant Supply of Prospective Buyers. Penetration is still moderately low among core users. Bread-and-butter prospects in government and utilities are charged with maintaining information on land and assets in perpetuity. Many of these prospective buyers are still using paper maps, which will degrade over time. This creates a certain inevitability to moving from paper maps to computer-based systems.

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

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

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

Two factors seriously constrain the long-term expansion of the GIS market: high cost of entry remains a barrier, and price pressures inhibit growth.

First, there will remain an uncertain, but certainly high, cost of creating a working GIS system in traditional environments. No magic will emerge to create a low-cost, meaningful data set for mainstream customers in government and utilities. Data conversion will remain costly because the significant cost of correcting prior errors and omissions on paper maps is inevitably bundled into the cost of "conversion."

Second, price pressure will hold down total revenue. Innovation is the only way to maintain prices in any software industry, and GIS vendors

will struggle in their attempt to create compelling new applications and improved investment payoff for customers.

Electronic Design Automation

The EDA software market grew 11.2 percent in 1994. Over the next five years, growth will continue to be fueled by increasing design complexity and ever-higher speeds.

Electronic CAE

The demands that today's tools place on CPU processing speed and memory size are reversing the process of equalization and driving the sales of UNIX-class tools. Equalization (PC-based tools becoming more expensive as UNIX-based tools fall in price) was caused by either the stagnation of the design challenge or, more likely, the stagnation in tool development. Design complexity is forcing a large-scale swap: gate-level users are swapping up to the RT level, while RT-level users are moving up to ES-level tools. RT-level tools will begin to appear on Windows NT, competing with the UNIX-based tools, while the ES-level tools will remain UNIX based. In the meantime, low-end design, still manageable with PC-based tools, is shifting to Asia/Pacific, driving PC growth in that region. The main inhibitor to growth in CAE tools is the engineering learning curve.

IC Layout

The IC layout market grew as expected, 21.5 percent from 1993 to 1994, after several very sleepy years. Design complexity and high speed are forcing replacement of obsolete tools and driving this high growth. This is primarily a replacement market of very high-cost tools and very few players. The ensuing frenzy for market share is the result. The few PC-based tools in this market are being replaced by UNIX-class tools in North America and Japan. Growth in the very few PC-based tools is in Europe (including eastern Europe) and Asia/Pacific. It is yet unclear whether Windows NT will be able to penetrate the IC layout market.

PCB/MCM/Hybrid

The 5.6 percent growth in the printed circuit board (PCB) market comes as a surprise given the forecast negative 2 percent growth from 1993 to 1994. The strong yen masked a decline in PCB growth (in yen) in Japan, a region that accounts for half of PCB sales.

Organizational manufacturing models are driving changes in the PCB market. As manufacturing organizations are moving offshore to Asia/Pacific (from both North America and Japan), low-speed designing is following and driving PC sales. In North America, Europe, and Japan, high-speed board design is moving from manufacturing into engineering departments, which are traditionally UNIX based. Windows NT has an opportunity to take over both the CAE environment and the PCB environment wherever new engineering environments are being created for RT-level designs.

Forecast Methodology

Fundamental to the way Dataquest conducts its research is the underlying philosophy that the best data and analyses come from a well-balanced program. This program includes the following: balance

between primary and secondary collection techniques; balance between supply-side and demand-side analysis; balance between focused, industry-specific research and coordinated, "big-picture" analysis aided by integration of data from the more than 25 separate high-technology industries Dataquest covers; and balance between the perspectives of experienced industry professionals and rigorous, disciplined techniques of seasoned market researchers.

Dataquest also analyzes trends in the macro environment, which can have major influences on both supply-side and demand-side forecasting. In addition to demographics, analysts look at gross national product (GNP) growth, interest rate fluctuation, business expectations, and capital spending plans. In the geopolitical arena, the group looks at trade issues, political stability or lack thereof, tariffs, nontariff barriers, and such factors as the effect on Europe of the events of 1994.

Figure 1 shows the CAD/CAM/CAE and GIS forecasting model. The overall forecasting process uses a combination of techniques such as time series and technological modeling. Market estimates and forecasts are derived using the following research techniques:

- Segment forecasting—Individual forecasts are derived for each application segment tracked by the CAD/CAM/CAE and GIS group. Specifically, each application, segmented by region and platform, is forecast and rolled up. In this way, each application segment incorporates its own set of unique assumptions.
- Demand-based analysis—Market growth is tracked and forecast in terms of the present and anticipated demand of current and future users. This requires the development of a total available market model and a satisfied available market figure to assess the levels of penetration accurately. Dataquest analysts also factor in the acceptance or ability for users to consume new technology.
- Capacity-based analysis—This method involves identifying future shipment volume constraints. These constraints, or "ceilings," can be the result of component availability, manufacturing capacity, or distribution capacity. In any case, capacity limitations are capable of keeping shipments below the demand level.

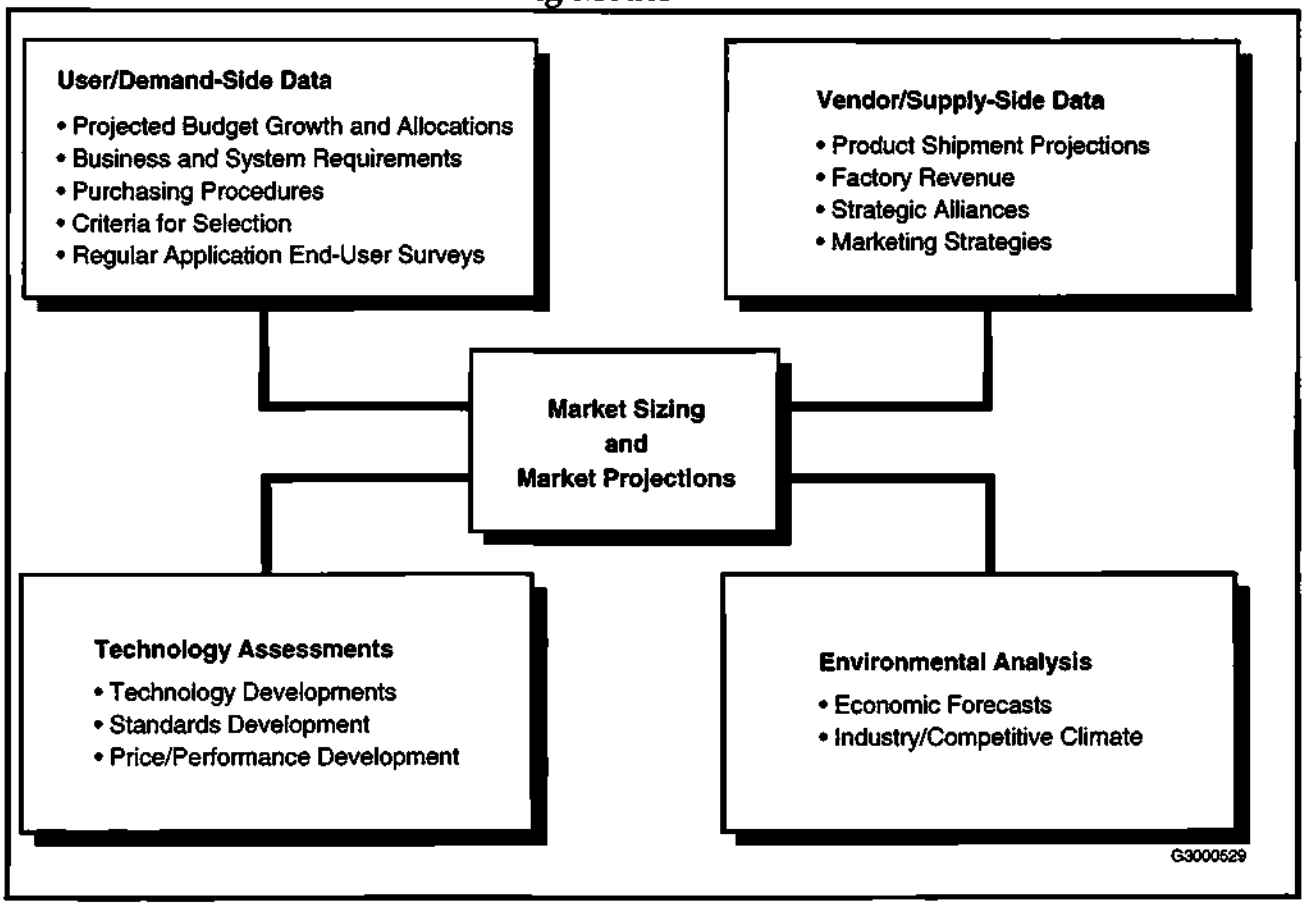
Segmentation Definitions

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

Applications

- Mechanical—The mechanical segment refers to computer-aided tools used by engineers, designers, analysts, technicians, and draftspeople working predominantly in the discrete manufacturing industries, but includes government and education. Users of mechanical CAD/CAM/CAE tools work in all departments across the typical organization, with a majority found in product design, advanced engineering, and manufacturing engineering. Common design applications include conceptual design, industrial design, structural or thermal analysis,

Figure 1
CAD/CAM/CAE and GIS Forecasting Model



Source: Dataquest (May 1995)

detail design, and electromechanical design (the mechanical part of design with electrical or electronic components and mechanisms). Common manufacturing applications include tool and fixture design, numerical control part programming, offline robotics programming, and interface to quality-control systems. Management tools for database control and distribution are included in this segment, as well as user-defined application programming.

- Architecture, Engineering, and Construction (AEC)—The AEC segment covers the use of computer-aided tools by architects, contractors, plant engineers, civil engineers, and other people associated with these disciplines to aid in designing and managing buildings, industrial plants, ships, and other types of nondiscrete entities.
- Geographic Information Systems (GIS)/Mapping—GIS is computer-based technology, and the segment is composed of hardware, software, and data used to capture, edit, display, and analyze spatial (tagged by location) information.
- Electronic Design Automation (EDA)—The EDA segment covers computer-based tools used to automate the process of designing an

electronic product, including printed circuit boards, ICs, and systems. EDA includes ECAE, IC layout, and PCB/hybrid/MCM, as follows:

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

Regions

The following paragraphs define the regions.

- North America—North America includes United States, Mexico, and Canada.
- Europe—Europe includes the United Kingdom, Scandinavia, Benelux, France, Germany, Italy, Spain, Austria/Switzerland, Russia, central Europe, and the rest of Europe.
- Japan
- Asia—Asia includes Singapore, Taiwan, Korea, China, Hong Kong, and the rest of Asia (Australia, India, and southeast Asia).
- Rest of World—Rest of World includes all other countries and regions, including Africa, the Middle East, Central America, and South America.

Operating Systems

Dataquest defines the operating systems as follows:

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

- PC: PC includes DOS, Windows, Windows 95, and Apple operating systems.

Line Items

This forecast covers application software revenue only. Our Forecast Update (to be published by September) will include the following metrics:

- Average selling price (ASP) is defined as the average price of a product, inclusive of any discounts.
- CPU revenue is the portion of revenue derived from a system sale that is related to the value of the CPU.
- CPU shipment is defined as the number of CPUs delivered.
- CPU installed base is defined as the total number of CPUs in active, day-to-day use.
- Unit shipment is defined as the number of products delivered (that is, seats).
- Seats are defined as the number of possible simultaneous users.
- Installed seats are defined as the total number of seats in active, day-to-day use.
- Hardware revenue is defined as the sum of the revenue from the hardware system components: CPU revenue, terminal revenue, and peripherals revenue.
- Peripherals revenue is defined as the value of all the peripherals from turnkey sale. (Peripherals in this category typically are input and output devices.)
- Terminal revenue is defined as revenue derived from the sale of terminals used to graphically create, analyze, or manipulate designs. The term is applicable only to the host systems.
- Software revenue is revenue derived from the sale of application software.
- Service revenue is defined as revenue derived from the service and support of CAD/CAM/CAE or GIS systems. Service is followed as software service and hardware service.
- Total factory revenue is defined as the amount of money received for goods measured in U.S. dollars and is the sum of hardware, software, and service revenue.

Table 2
1994 CAD/CAM/CAE/GIS Software History and Forecast
All Applications

	History				Forecast				CAGR (%)
	1992	1993	1994	1995	1996	1997	1998	1999	1994-1999
Software Revenue ($M)									
Worldwide, All Operating Systems	4,662.5	5,036.7	5,567.4	6,254	6,932	7,696	8,605	9,677	11.7
Worldwide									
UNIX	3,193.9	3,485.3	3,936.2	4,374	4,846	5,350	5,930	6,568	10.8
NT	-	2.3	71.3	215	299	414	584	829	63.3
Personal Computer	1,076.7	1,195.1	1,306.0	1,470	1,632	1,805	1,987	2,196	11.0
Host/Proprietary	392.0	354.0	253.9	196	155	126	103	84	-19.8
All Operating Systems									
North America	1,616.0	1,829.1	2,061.6	2,312	2,600	2,953	3,364	3,808	13.1
Europe	1,669.8	1,634.0	1,776.5	2,026	2,231	2,441	2,693	3,002	11.1
Japan	1,189.1	1,305.6	1,417.6	1,562	1,700	1,844	2,012	2,209	9.3
Asia/Pacific	123.9	192.8	226.8	258	292	334	393	488	16.6
Rest of World	63.7	75.2	85.0	96	108	123	143	170	14.8
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		8.0	10.5	12.3	10.8	11.0	11.8	12.5	
Worldwide									
UNIX		9.1	12.9	11.1	10.8	10.4	10.9	10.7	
NT		NA	NA	201.6	38.9	38.7	41.1	41.8	
Personal Computer		11.0	9.3	12.5	11.1	10.6	10.1	10.5	
Host/Proprietary		-9.7	-28.3	-22.8	-20.8	-18.8	-18.5	-18.1	
All Operating Systems									
North America		13.2	12.7	12.1	12.5	13.6	13.9	13.2	
Europe		-2.1	8.7	14.0	10.1	9.4	10.3	11.5	
Japan		9.8	8.6	10.2	8.8	8.5	9.1	9.8	
Asia/Pacific		55.6	17.6	13.6	13.5	14.3	17.6	24.1	
Rest of World		18.0	13.0	13.5	12.2	13.5	16.3	18.7	

NA = Not applicable
Source: Dataquest (May 1995)

Table 3
1994 CAD/CAM/CAE/GIS Software History and Forecast
Mechanical

	History			Forecast					CAGR (%)
	1992	1993	1994	1995	1996	1997	1998	1999	1994-1999
Software Revenue ($M)									
Worldwide, All Operating Systems	2,104.7	2,296.2	2,520.3	2,765	3,025	3,291	3,583	3,910	9.2
Worldwide									
UNIX	1,393.1	1,600.8	1,847.6	2,082	2,325	2,562	2,809	3,065	10.7
NT	-	1.7	28.3	41	55	72	102	154	40.4
Personal Computer	435.7	450.7	469.1	499	526	556	585	617	5.6
Host/Proprietary	276.0	243.0	175.4	142	118	101	86	74	-15.9
All Operating Systems									
North America	582.4	736.4	837.5	923	1,030	1,140	1,259	1,387	10.6
Europe	844.8	783.4	835.5	937	1,028	1,112	1,198	1,299	9.2
Japan	607.2	686.5	742.0	790	840	898	968	1,047	7.1
Asia/Pacific	46.0	66.3	78.8	87	97	109	122	137	11.7
Rest of World	24.2	23.6	26.5	28	29	32	36	40	8.7
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		9.1	9.8	9.7	9.4	8.8	8.9	9.1	
Worldwide									
UNIX		14.9	15.4	12.7	11.7	10.2	9.6	9.1	
NT		NA	NA	46.1	32.5	31.9	41.7	50.8	
Personal Computer		3.4	4.1	6.4	5.5	5.5	5.3	5.4	
Host/Proprietary		-11.9	-27.8	-19.2	-16.7	-14.7	-14.1	-14.7	
All Operating Systems									
North America		26.4	13.7	10.2	11.6	10.7	10.4	10.2	
Europe		-7.3	6.7	12.2	9.7	8.2	7.8	8.4	
Japan		13.1	8.1	6.4	6.4	6.9	7.7	8.3	
Asia/Pacific		44.1	18.9	10.6	11.4	11.7	12.5	12.1	
Rest of World		-2.6	12.4	3.9	7.0	9.1	11.3	12.7	

NA = Not applicable
Source: Dataquest (May 1995)

Table 4
1994 CAD/CAM/CAE/GIS Software History and Forecast
AEC

	History				Forecast				CAGR (%)
	1992	1993	1994	1995	1996	1997	1998	1999	1994-1999
Software Revenue ($M)									
Worldwide, All Operating Systems	736.5	786.3	871.8	1,017	1,113	1,208	1,329	1,476	11.1
Worldwide									
UNIX	345.3	336.2	370.1	398	415	431	462	497	6.1
NT	-	-	27.0	92	113	138	169	207	50.3
Personal Computer	343.2	400.4	435.0	499	564	625	690	766	12.0
Host/Proprietary	48.0	49.7	39.6	29	21	14	9	5	-33.8
All Operating Systems									
North America	231.7	249.9	282.2	323	354	395	443	503	12.3
Europe	338.0	325.9	364.1	435	474	510	560	616	11.1
Japan	148.0	181.3	186.1	213	232	245	259	277	8.3
Asia/Pacific	9.7	19.9	27.5	32	37	42	49	58	16.0
Rest of World	8.9	9.2	11.8	14	15	17	19	22	13.7
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		6.8	10.9	16.7	9.4	8.6	10.0	11.0	
Worldwide									
UNIX		-2.6	10.1	7.5	4.4	4.0	7.1	7.6	
NT		NA	NA	239.8	23.2	21.7	22.5	22.9	
Personal Computer		16.7	8.6	14.7	13.1	10.8	10.3	11.1	
Host/Proprietary		3.5	-20.2	-28.0	-28.2	-30.5	-39.5	-41.5	
All Operating Systems									
North America		7.9	12.9	14.4	9.5	11.6	12.3	13.5	
Europe		-3.6	11.7	19.5	9.0	7.5	9.8	10.0	
Japan		22.5	2.7	14.4	9.1	5.3	6.0	6.8	
Asia/Pacific		104.3	38.2	17.9	14.6	14.2	15.0	18.4	
Rest of World		2.9	28.3	16.7	11.2	10.5	9.7	20.5	

NA = Not applicable
Source: Dataquest (May 1995)

Table 5
1994 CAD/CAM/CAE/GIS Software History and Forecast
GIS/Mapping

	History				Forecast				CAGR (%)
	1992	1993	1994	1995	1996	1997	1998	1999	1994-1999
Software Revenue ($M)									
Worldwide, All Operating Systems	553.6	652.6	728.1	845	920	1,012	1,119	1,240	11.2
Worldwide									
UNIX	380.0	439.1	469.3	481	489	503	524	546	3.1
NT	-	0	13.5	70	88	106	127	152	62.2
Personal Computer	126.3	159.1	211.5	273	330	397	465	540	20.6
Host/Proprietary	47.3	54.4	33.8	21	13	7	4	2	-42.1
All Operating Systems									
North America	218.9	245.8	277.6	315	341	378	418	467	11.0
Europe	212.2	239.7	263.7	311	338	369	408	450	11.3
Japan	82.3	89.4	100.1	117	125	133	141	150	8.4
Asia/Pacific	20.4	42.6	48.8	57	66	75	85	96	14.6
Rest of World	19.8	35.1	37.8	45	51	58	67	77	15.2
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		17.9	11.6	16.1	8.9	10.1	10.6	10.7	
Worldwide									
UNIX		15.6	6.9	2.6	1.6	2.8	4.2	4.2	
NT		NA	NA	418.3	26.2	20.0	20.2	19.2	
Personal Computer		26.0	32.9	28.9	21.2	20.1	17.1	16.3	
Host/Proprietary		14.8	-37.8	-37.5	-40.3	-41.4	-43.9	-46.7	
All Operating Systems									
North America		12.3	12.9	13.4	8.2	11.0	10.7	11.6	
Europe		13.0	10.0	17.9	8.8	9.1	10.5	10.4	
Japan		8.6	12.0	17.1	6.4	6.5	6.2	6.1	
Asia/Pacific		108.7	14.6	17.3	14.6	13.8	14.0	13.1	
Rest of World		77.6	7.7	18.6	13.7	13.9	15.6	14.4	

NA = Not applicable

Source: Dataquest (May 1995)

Table 6
1994 CAD/CAM/CAE/GIS Software History and Forecast
Electronic Design Automation

	History				Forecast				CAGR (%)
	1992	1993	1994	1995	1996	1997	1998	1999	1994-1999
Software Revenue ($M)									
Worldwide, All Operating Systems	1,267.8	1,301.6	1,447.3	1,628	1,875	2,184	2,574	3,051	16.1
Worldwide									
UNIX	1,075.5	1,109.2	1,249.2	1,412	1,616	1,854	2,136	2,459	14.5
NT	-	0.5	2.4	12	43	99	186	316	164.3
Personal Computer	171.5	184.9	190.6	199	212	228	248	273	7.5
Host/Proprietary	20.7	7.0	5.1	4	4	4	3	3	-9.5
All Operating Systems									
North America	582.9	596.9	664.3	751	875	1,040	1,243	1,451	16.9
Europe	274.8	285.0	313.1	343	391	451	528	638	15.3
Japan	351.6	348.4	389.4	443	503	569	644	735	13.5
Asia/Pacific	47.7	64.0	71.6	81	93	109	137	197	22.4
Rest of World	10.8	7.3	8.8	10	12	16	21	30	27.7
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		2.7	11.2	12.5	15.2	16.5	17.8	18.6	
Worldwide									
UNIX		3.1	12.6	13.0	14.5	14.7	15.2	15.1	
NT		NA	NA	386.1	258.2	131.5	89.0	69.4	
Personal Computer		7.8	3.1	4.5	6.3	7.7	8.7	10.2	
Host/Proprietary		-66.2	-27.3	-12.0	-11.6	-8.4	-5.3	-10.0	
All Operating Systems									
North America		2.4	11.3	13.0	16.6	18.8	19.6	16.7	
Europe		3.7	9.9	9.6	14.1	15.3	16.9	21.0	
Japan		-0.9	11.8	13.7	13.7	13.0	13.3	14.1	
Asia/Pacific		34.0	12.0	12.8	14.5	17.5	26.3	43.6	
Rest of World		-32.3	20.9	16.5	21.1	25.9	35.9	40.7	

NA = Not applicable
Source: Dataquest (May 1995)

Table 7
1994 CAD/CAM/CAE/GIS Software History and Forecast
Electronic CAE

	History				Forecast				CAGR (%)
	1992	1993	1994	1995	1996	1997	1998	1999	1994-1999
Software Revenue ($M)									
Worldwide, All Operating Systems	795.4	834.3	922.2	1,029	1,186	1,391	1,658	1,983	16.5
Worldwide									
UNIX	658.3	700.3	783.3	880	1,013	1,172	1,360	1,575	15.0
NT	-	0.1	1.7	7	24	61	129	224	166.8
Personal Computer	124.1	131.6	135.7	141	148	157	168	183	6.2
Host/Proprietary	13.0	2.3	1.6	1	1	1	1	1	-14.9
All Operating Systems									
North America	412.2	436.3	477.3	535	618	736	891	1,045	17.0
Europe	181.9	195.6	217.4	233	266	304	356	433	14.8
Japan	164.2	157.4	178.9	207	240	279	320	371	15.7
Asia/Pacific	30.1	39.9	43.3	48	54	63	80	120	22.7
Rest of World	7.0	5.1	5.3	6	7	9	11	14	20.8
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		4.9	10.5	11.6	15.2	17.3	19.2	19.7	
Worldwide									
UNIX		6.4	11.9	12.3	15.2	15.7	16.0	15.9	
NT		NA	NA	349.6	218.4	155.0	112.4	74.2	
Personal Computer		6.1	3.1	3.9	5.0	6.1	7.3	8.6	
Host/Proprietary		-82.4	-30.2	-25.5	-16.4	-12.6	-10.0	-9.1	
All Operating Systems									
North America		5.8	9.4	12.1	15.6	19.0	21.0	17.3	
Europe		7.5	11.1	7.3	14.0	14.5	16.8	21.8	
Japan		-4.1	13.7	15.6	16.2	16.0	14.8	15.9	
Asia/Pacific		32.8	8.5	10.6	12.6	16.2	27.8	50.3	
Rest of World		-27.5	4.8	14.6	17.8	19.1	24.4	28.4	

NA = Not applicable
Source: Dataquest (May 1995)

Table 8
1994 CAD/CAM/CAE/GIS Software History and Forecast
IC Layout

	History				Forecast				CAGR (%)
	1992	1993	1994	1995	1996	1997	1998	1999	1994-1999
Software Revenue ($M)									
Worldwide, All Operating Systems	215.5	198.2	240.9	284	337	398	474	561	18.4
Worldwide									
UNIX	211.1	196.1	239.1	282	335	396	472	559	18.5
NT	-	-	-	-	-	-	-	-	NA
Personal Computer	1.1	2.1	1.7	2	2	2	2	2	5.3
Host/Proprietary	3.4	0.1	0.1	0	0	0	0	0	14.1
All Operating Systems									
North America	95.8	88.6	110.3	130	154	183	218	257	18.5
Europe	37.2	37.0	44.0	52	62	73	86	101	18.1
Japan	68.1	56.7	66.2	78	93	109	130	156	18.7
Asia/Pacific	12.1	15.1	18.9	23	27	31	37	44	18.2
Rest of World	2.3	0.8	1.5	2	2	2	3	3	15.3
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		-8.0	21.5	18.1	18.4	18.2	19.0	18.4	
Worldwide									
UNIX		-7.1	22.0	18.1	18.5	18.3	19.1	18.5	
NT		NA	NA	NA	NA	NA	NA	NA	
Personal Computer		85.6	-15.6	8.4	7.0	5.9	3.0	2.1	
Host/Proprietary		-97.2	-39.1	93.1	0.0	0.0	0.0	0.0	
All Operating Systems									
North America		-7.5	24.4	17.9	18.4	18.9	19.3	17.9	
Europe		-0.4	18.8	18.3	18.4	18.5	18.0	17.4	
Japan		-16.7	16.8	18.0	18.8	17.3	19.7	20.0	
Asia/Pacific		24.3	25.5	19.0	17.8	17.3	17.9	18.9	
Rest of World		-66.8	93.6	16.4	14.9	13.9	14.4	17.1	

NA = Not applicable
Source: Dataquest (May 1995)

Table 9
1994 CAD/CAM/CAE/GIS Software History and Forecast
PCB/MCM/Hybrid

	History				Forecast				CAGR (%)
	1992	1993	1994	1995	1996	1997	1998	1999	1994-1999
Software Revenue ($M)									
Worldwide, All Operating Systems	256.8	269.1	284.1	314	352	395	442	507	12.3
Worldwide									
UNIX	206.2	212.8	226.8	250	269	286	305	325	7.5
NT	-	0.5	0.8	4	19	38	58	91	158.7
Personal Computer	46.3	51.2	53.1	56	62	69	77	88	10.6
Host/Proprietary	4.3	4.6	3.4	3	3	3	3	2	-8.0
All Operating Systems									
North America	74.9	72.0	76.8	86	103	121	134	149	14.2
Europe	55.7	52.3	51.7	58	64	74	86	104	15.0
Japan	119.3	134.3	144.3	158	170	181	194	208	7.6
Asia/Pacific	5.5	9.0	9.4	10	12	15	20	33	28.6
Rest of World	1.4	1.4	2.0	2	3	5	8	13	46.2
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		4.8	5.6	10.5	12.1	12.3	11.8	14.6	
Worldwide									
UNIX		3.2	6.6	10.3	7.4	6.5	6.6	6.7	
NT		NA	NA	463.1	325.1	101.7	51.6	58.4	
Personal Computer		10.6	3.7	6.1	9.7	11.5	12.3	13.9	
Host/Proprietary		6.6	-25.6	-7.5	-10.2	-7.3	-4.0	-10.7	
All Operating Systems									
North America		-3.8	6.5	11.7	20.1	17.3	11.0	11.1	
Europe		-6.0	-1.2	11.6	10.6	15.7	16.4	21.2	
Japan		12.6	7.4	9.3	7.7	6.6	7.1	7.1	
Asia/Pacific		62.1	4.5	10.6	16.3	23.5	37.0	61.5	
Rest of World		0.8	38.8	21.9	34.0	48.8	66.5	64.9	

NA = Not applicable
Source: Dataquest (May 1995)

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March 27, 1995

Dear Dataquest CAD/CAM/CAE/GIS Client,

With a new database for our CAD/CAM/CAE/GIS data, we have also instituted new formats for our market share tables. Each book contains three types of tables: A, B, and C. The GIS market also has one D table.

- Type-A tables focus on software growth and present three years' software revenue for the top 30 vendors in any given market segment.

- Type-B tables are an alphabetical list of all software vendors in a given application/region and present three years' software revenue.

- Type-C tables focus on the 1994 market and present both revenue and shipment data for the top 30 vendors based on total factory revenue in the given market segment. Using type-C tables requires a clear understanding of Dataquest definitions, but we believe this format presents information frequently requested by clients.

- Type-D tables, which exist only for the GIS market, present three years' software content revenue. While we now follow these data providers, we do not include their revenue in the total software revenue.

In past years we have published only end-user shipment and revenue data; OEM revenue and shipments were excluded from all statistics books. For example, for workstation vendors we listed only revenue and shipments made directly to end users. Where workstation vendors shipped to CAD vendors, we reported that shipment only for the CAD vendor. As a result, it was always possible to add line items in any given table to reach the total at the bottom. This practice continues with the type-A and type-B tables.

The disadvantage of this methodology is that it does not directly indicate the relative influence of the various workstation vendors; that is, those with significant OEM business appear to have smaller revenue. The type-C tables adopt our new approach of including OEM software revenue, CPU revenue, and shipments in market share tables. As a result, the sum of vendors appears greater than the total. In fact, we keep careful track of OEM versus end-user revenue, and we do not count shipment or revenue more than once when calculating any total. Thus, all total market statements are correct, while individual vendor's data may include OEM revenue and shipments.

We also caution that summing revenue columns across the page may calculate to less than total factory revenue. In addition to software, CPU, and service revenue, we count

revenue from host-dependent terminals and peripheral devices sold in a turnkey sale, neither of which are detailed in type-C tables.

We appreciate your patience as we evaluate table formats that serve you better. Please contact me at 408-437-8135 with any suggestion for improvements. As always, custom tables are available via inquiry by calling Suzanne Snygg at 408-437-8124.

Sincerely,

Linda Anderson

Linda Anderson

CAD/CAM/CAE/GIS Market Research Analyst

Dataquest

Perspective

Mechanical Applications Worldwide

Research Brief

STEP Moves Forward

Abstract: *In 1993 and 1994, the worldwide CAD/CAM industry anticipated approval of the international Standard for the Exchange of Product Data (STEP) for data exchange. Now that the groundwork has been completed and STEP is considered an international standard by the International Standards Organization (ISO), CAD vendors and end users alike are moving the standard forward. Dataquest believes that some form of the STEP standard will eventually be a necessary part of all CAD/CAM software. In this article, we update the status of STEP and provide a quick look at CAD vendor offerings in this field.*
By Sharon Tan

What Is STEP?

Product data exchange has been a thorn in the side of the designer for years. STEP is simply what the name implies—Standard for the Exchange of Product Data. STEP differs from previous data exchange standards in that it specifies a data sharing technology, not simply a data exchange format. Although IGES has been used industrywide as a file format for data exchange, STEP is not intended to be a replacement for IGES. There is some amount of overlap between STEP and IGES, but there are some constructs unique to STEP and some unique to IGES.

Why STEP?

In the perspective of the engineer or designer, file standards and data exchange are one of the more important issues. Because of the proliferation of systems, CAD/CAM vendors can no longer expect their users to be tied to their particular format; it is imperative that information be easily transferred from one system to another. Standards have not been keeping up as the capability of CAD systems increases, and there is no generalized way to move "new" data structures around. Yet engineers and designers must have

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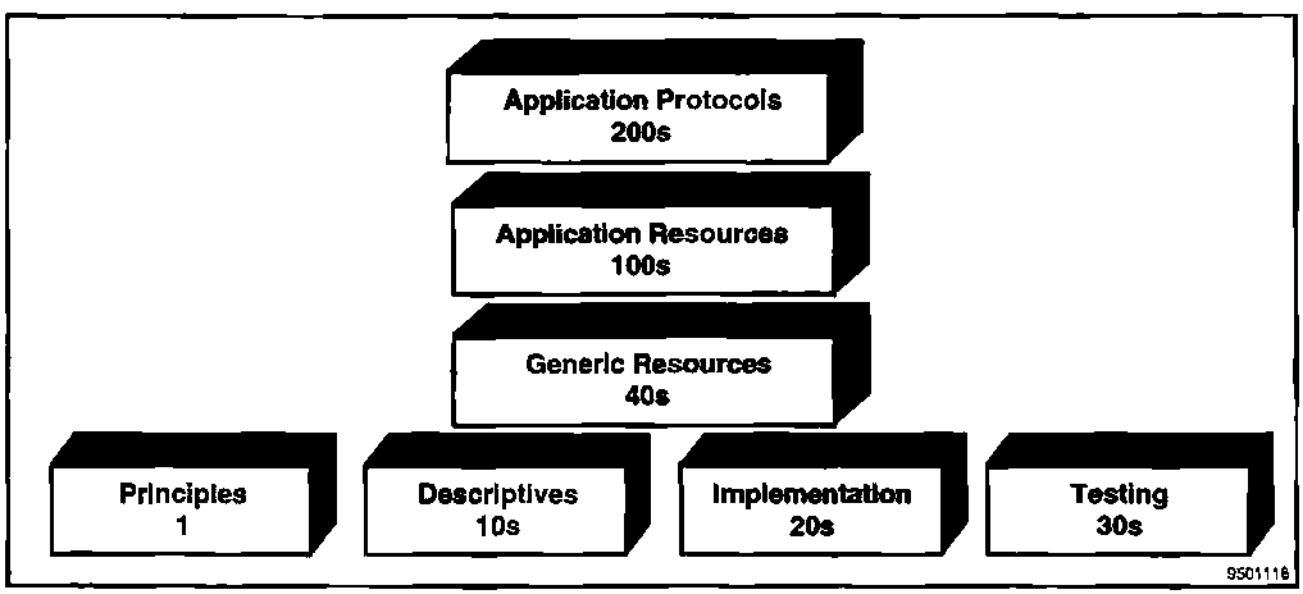
that ability – different CAD/CAM/CAE systems have different strengths, and a given company may have many systems, using each in its best application. From this arises the need to transfer data from one system to another without losing or altering the data's content or history.

Dataquest's end-user interviews with mechanical designers during the past two years have shown that a real need exists for a new industry standard like STEP. We asked end users to rate, on a scale of 0 to 4 (0 = not important and 4 = very important) the importance of new industry standards for file exchange. Worldwide, end users have rated new standards at the top of the scale in importance (ratings of 3.6 or 3.9, depending on the region).

STEP Architecture

In its most basic form, the STEP standard can be thought of as a number of building blocks, or parts, where each layer pulls pieces from the layer below it (see Figure 1). For instance, application protocols, the top layer in Figure 1, are "built" from application resources. Application resources, in turn, are composed of generic resources. This architecture lends itself to a robust, versatile working model intended to govern data exchange/sharing in not just the mechanical design world, but also in aspects of electrical design, plant design, and shipbuilding.

Figure 1
STEP Architecture



Source: NIPDE and Dataquest (March 1995)

Implementation of STEP is expected to take place at three levels, as described in the following bullets. Most of the vendors announcing STEP-based products are conforming at the first level at this point. We expect vendors to move directly from Level 1 to Level 3 and to not implement Level 2.

- Level 1—STEP is used as a neutral file format, where data is exchanged from one CAD system to another using STEP. The problems with this approach are:
  - The STEP data is only transient, and the STEP file cannot be processed directly.
  - Different translators need to be built for different application protocols (APs).
  - The data exists in a proprietary format within the database, not as a STEP format. Hence, when translating between two systems, the data ends up existing in two places and in two formats.
  - Data management must occur in a proprietary format.
- Level 2—STEP-based CAD/CAM applications are used, and STEP data is accessed from a proprietary database but resides in memory in STEP format. Problems with this approach include:
  - STEP data is only transient. The data exists in a proprietary format within the database, but in STEP format in memory.
  - Data management must occur in a proprietary format.
- Level 3—STEP-based applications are used, and data is stored in a STEP database. Advantages of this approach include:
  - STEP data is not transient. Data resides in STEP format and is translated in STEP format.
  - Data models are consistent across different systems.
  - Data management can now be STEP-based.

Current Status of STEP

Turning STEP into an international standard is being done on a part-by-part basis, with various committees hammering out the details of each part. Table 1 outlines STEP and which parts have been accepted as international standards.

STEP has seen much more activity in Europe than in North America or Asia. Standards are often incorporated into local laws in Europe, thus necessitating a greater need for STEP implementation. ProSTEP (Germany), GOSET (France), and CADDETC (United Kingdom) are the organizations heading up STEP activities in Europe. PDES Inc. is the primary proponent of STEP in North America. STEP centers also have been established in Asia, in particular China and Japan. The Japanese Automobile Manufacturers Association (JAMA) recently announced a partnership with ITI to develop a set of STEP translators that will work with four proprietary CAD/CAM systems.

Table 1
STEP Status as of January 1995

Part No.	Part Name	Status
1	Overview and Fundamental Principles	IS
Descriptives		
11	EXPRESS Language Reference Manual	IS
12	EXPRESS-I Language	In development
Implementation		
21	Physical File Exchange Structure	IS
22	Standard Data Access Interface (SDAI)	CD
23	C++ Binding to the SDAI	CD
24	C Binding to the SDAI	CD
25	FORTRAN Binding to the SDAI	CD
Testing		
31	Testing Concepts	IS
32	Test Lab Requirements	DIS
33	Abstract Test Suites	In development
34	Abstract Test Methods	In development
Generic Resources		
41	Product Description	IS
42	Geometric and Topologic Representation	IS
43	Representation Structures	IS
44	Product Structure Configuration	IS
45	Materials	CD
46	Visual Presentation	IS
47	Shape Tolerance	CD
48	Form Features	Inactive
49	Process Structure and Properties	CD
Application Resources		
101	Draughting Resources	IS
102	Ship Structures	In development
103	Electrical Connectivity Editor	In development
104	Finite Element Analysis	CD
105	Kinematics	DIS
Application Protocols		
201	Explicit Draughting	IS
202	Associative Draughting	CD
203	Configuration Controlled Design	IS
204	Mechanical Design Using B-Rep	CD
205	Mechanical Design Using Surface	CD
206	Mechanical Design Using Wireframe	Inactive

(Continued)

Table 1 (Continued)
STEP Status as of January 1995

Part No.	Part Name	Status
207	Sheet Metal Die Planning and Design	DIS
208	Life Cycle Change Process	CDC
209	Composite Structures	CD
210	Printed Card Assembly: Design and Manufacture	CD
211	Electronic Test, Diagnostics, and Remanufacture	In development
212	Electrotechnical Plants	CDC
213	Numerical Control Process Plans	CD
214	Core Data for Automotive Mechanical Design Processes	CD
215	Ship Arrangement	In development
216	Ship Molded Forms	In development
217	Ship Piping	In development
218	Ship Structures	In development
219	Inspection Process Plans	Inactive
220	Printed Card Assembly: Manufacturing Planning	CDC
221	Functional Data and Schematic Representation for Process Plants	In development
222	Exchange of Product Definition Data from Design Engineering to Manufacturing Engineering for Composite Structures	In development
223	Exchange of Design and Manufacturing Product Information for Cast Parts	CDC
224	Mechanical Products Definition for Process Planning Using Form Features	CDC
225	Structural Building Elements Using Explicit Shape Representation	CDC
226	Ship Mechanical Systems	In development
227	Plant Spatial Configuration	In development

Notes:
IS = International standard
DIS = Draft international standard
CD = Committee draft
CDC = Committee draft for comments only
Source: International TechneGroup Incorporated (ITI) and Dataquest (February 1995)

CAD/CAM Vendors and STEP

To date, the major CAD/CAM vendors have begun implementing those parts of STEP that have been accepted as international standard. Most of the activity has centered around Level 1 implementations. Some of the vendors have gone to third-party vendors (most notably ITI) for development of their STEP translators. Table 2 gives a brief rundown of the major mechanical CAD/CAM vendors and their STEP offerings.

Earlier this year, Computervision unveiled its next-generation software, Pelorus, an object-oriented development environment for design automation. With Pelorus, Computervision has put forth the industry's most clear picture of how it envisions STEP in its future products. Computervision expects to have ready a Level 3 implementation of STEP by the end of 1995.

Table 2
STEP Offerings from Major CAD/CAM Vendors

Vendor	Product	AP203	AP214
Computervision	CADDS5	X	X
	Pelorus	X	X
Dassault Systemes	CATIA Rev 4.1.4	X	-
EDS Unigraphics	UG V10.4	X	-
Hewlett-Packard	SolidDesigner 3.0	X	X
Intergraph	EMS	X	-
Matra Datavision	Euclid Designer	X	X
PTC	Pro/ENGINEER 14.0	X	X
SDRC	IDEAS Master Series 2	X	X

Source: Dataquest (February 1995)

Some non-CAD/CAM vendors also offer STEP-based tools. The more prominent ones include STEP Tools Inc., which offers STEP data and database management tools, and ITI, which offers STEP translators. Grumman Data Systems also offers translators for PTC and EDS Unigraphics, and Digital Equipment Corporation offers a Level 3 implementation kit that provides database and programming interfaces supporting AP203.

Dataquest Perspective

One criticism of STEP has been its inability to handle parametric information. Part 48, Form Features, under which parametrics falls, is inactive at this time. There is a working group looking at Part 48, and it is anticipated that it will be at least three years before Form Features becomes part of the STEP standard.

Nevertheless, the inability to transfer parametric information does not seem to be holding up STEP development. The STEP standard is clearly moving along. We expect to see many more STEP-related announcements throughout 1995 and 1996, as more parts of the standard are approved, as end users begin to use STEP for data translation, and as vendors add to their current STEP offerings. Although offering STEP will not immediately impact market share of the leading vendors, Dataquest believes that some form of the STEP standard eventually will be a necessary part of all mechanical CAD/CAM software.

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Perspective

Mechanical Applications Worldwide

Dataquest Predicts

Mechanical CAD/CAM/CAE—The Shape of Things to Come

Abstract: *The 25-year-plus history of mechanical CAD/CAM/CAE has witnessed an amazing progression of technologies and applications developed for the benefit of engineers, designers, and technicians. The earliest stage was focused on the drafting process. Since then, three-dimensional capabilities have become available, analysis tools have evolved, and the manufacturing process has become computer controlled. New technologies and market drivers are emerging, and we expect the mechanical CAD/CAM/CAE to look significantly different five years from now.*
Where are the high-growth areas in mechanical CAD/CAM? How will the new tools on the market change the way engineers work? In this article, we set the stage for growth in mechanical CAD/CAM/CAE for 1995 and beyond.
By Sharon Tan

Dataquest Predicts

Dataquest predicts that the heydays of revenue growth in documentation and drafting software are over. While documentation and drafting applications will continue to be fundamental requirements for mechanical design, other mechanical CAD/CAM/CAE applications, like system management tools, analysis software, and conceptual design software, will shape the future of things to come.

The mechanical CAD/CAM/CAE software market is expected to grow from approximately $2,329 million in 1993 to $3,125 million in 1998. While documentation and drafting applications will continue to provide a large but declining stream of revenue through 1998, high growth will come from evolving niche areas, like tools for styling and industrial design, product data management, and virtual reality applications.

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To provide a proper perspective for examining the changes we are predicting, it is necessary to briefly define the subapplications that make up the mechanical CAD/CAM/CAE market:

- System management and tools—This includes product structure or configuration management, engineering change management, network file management, user application tools, knowledge-based tools, and training tool applications.
- Documentation and drafting—This comprises a related set of applications that together define the documentation and drafting application. These include detail drafting, schematics, technical illustration, and charting applications.
- Conceptual design—This includes industrial layout, design layout, and styling applications.
- Functional design—This includes component design, assembly verification, and linkage/mechanism design applications.
- Analysis—This includes mass properties calculations; stack-up, fatigue, structural, thermal, vibration, magnetic, and composite analysis; and quality control.
- Manufacturing engineering—This includes tool design, fixture design, and part processing design applications.
- Manufacturing process simulation—This includes numerical control part programming, coordinate measuring machines, and offline robotics applications.

Figure 1 shows our predicted growth in software revenue for each of these subapplications. While documentation and drafting was the largest subapplication in 1993, and we expect it to still be the largest subapplication in 1994, we anticipate that analysis will become the leading subapplication by 1998. Figure 2 illustrates this shift in revenue distribution. In the following sections, we examine the drivers behind our forecast and look at the top vendors in each subapplication.

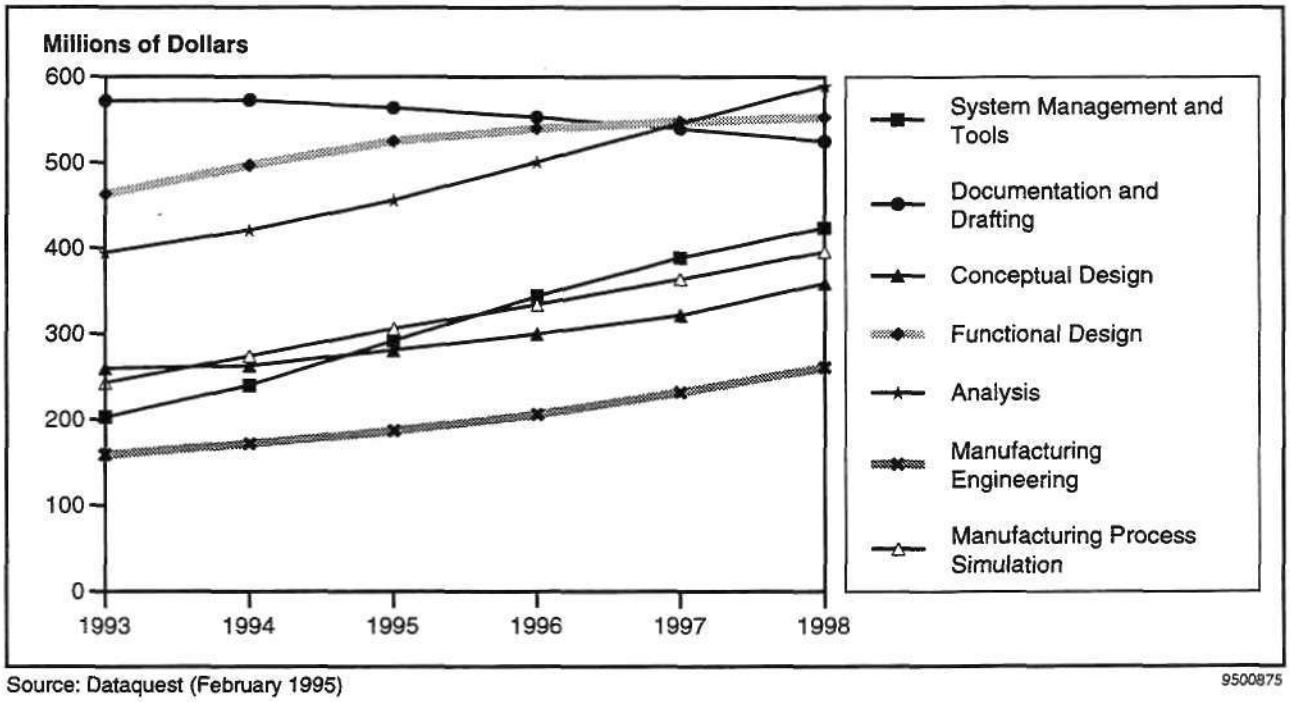
The Growth Areas

System Management and Tools

Of all of the subapplications that make up mechanical CAD/CAM/CAE, system management and tools will lead the way in growth. We anticipate that system management and tools will nearly double in size to reach $425 million in 1998. This area will grow significantly over the next four years (see Figure 3), with much of the growth coming in 1995 and 1996. Two of the biggest drivers behind this subapplication are the deployment of product data management (PDM) systems and the growing use of knowledge-based engineering (KBE) tools in the engineering environment.

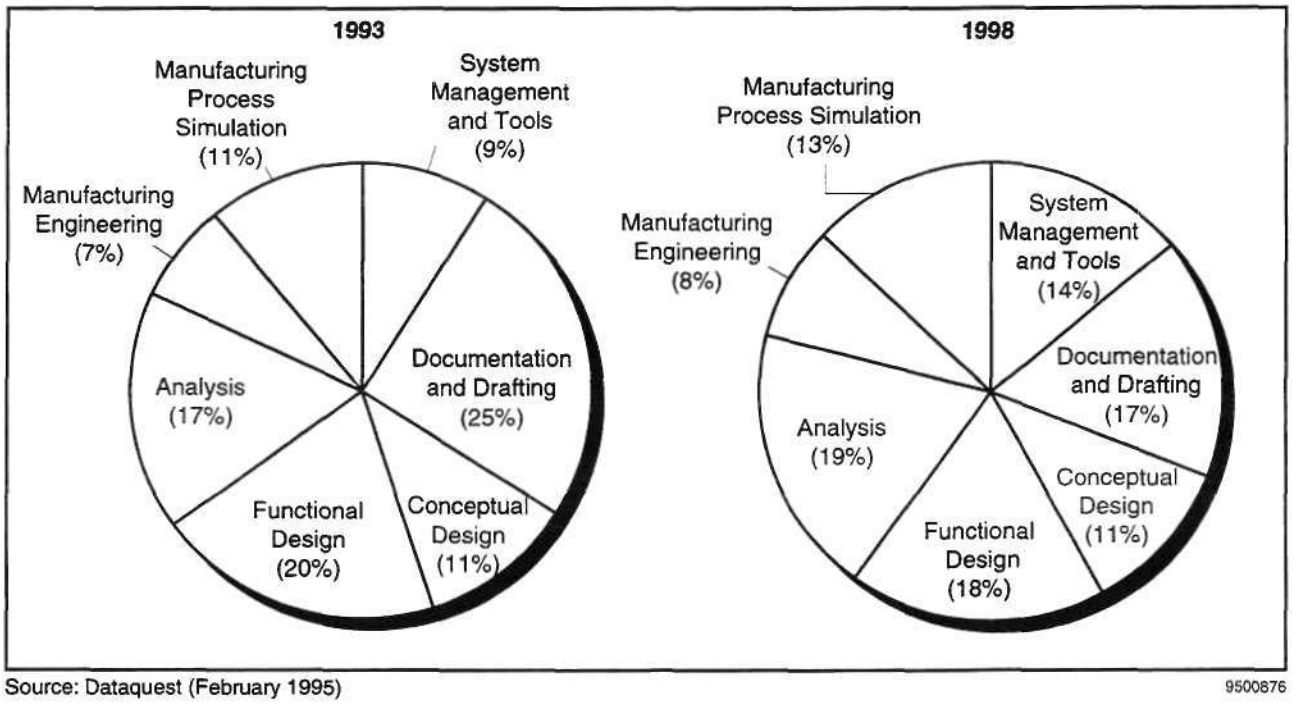
PDM is finally gaining momentum. Historically, PDM has been expensive, complex to install, and hard to maintain. PDM systems have been evolving, and there is now a critical mass of end users in need of some sort of data management system. The movement toward client/server computing and the ability to transfer files among disparate systems and applications (CAD systems and business applications) have opened the way for commercial

Figure 1
Mechanical CAD/CAM/CAE Software Revenue Forecast



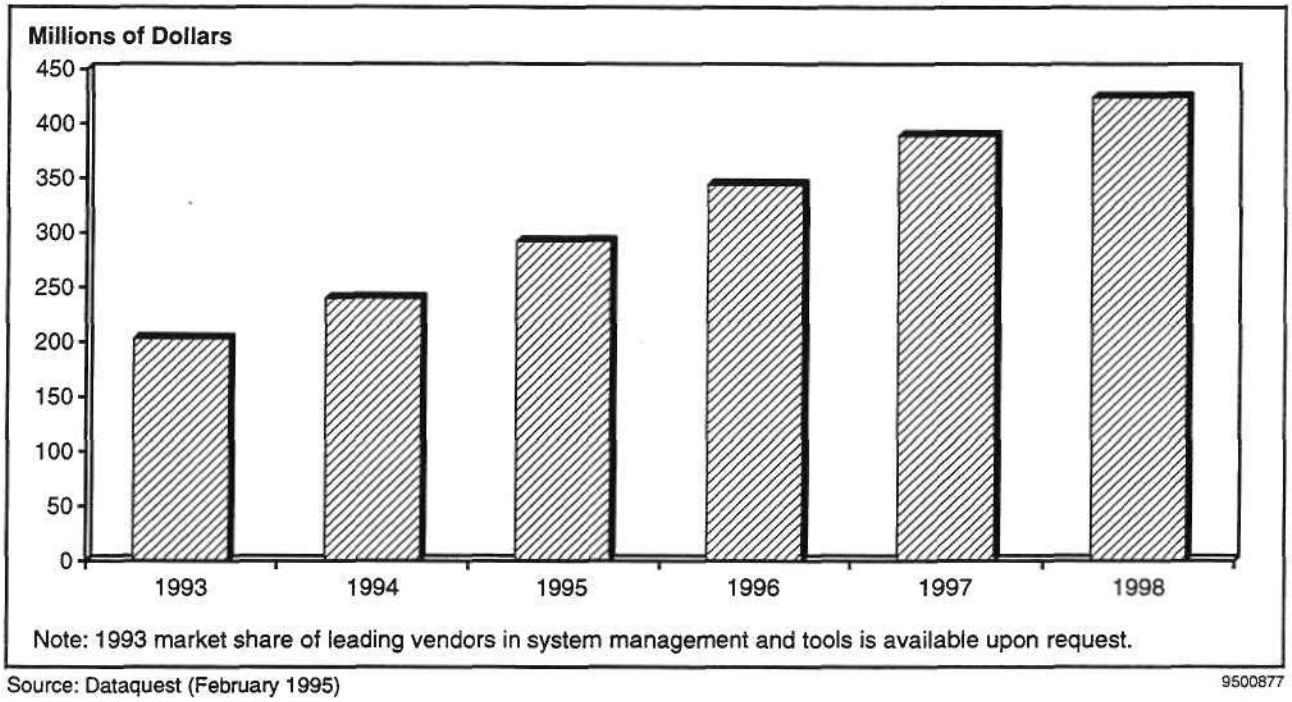
Source: Dataquest (February 1995) 9500875

Figure 2
Distribution of Subapplication Revenue, 1993 versus 1998



Source: Dataquest (February 1995) 9500876

Figure 3
System Management and Tools Forecast



Source: Dataquest (February 1995) 9500877

deployment of PDM technology. Moreover, concurrent engineering projects, company downsizing, and the increasing volume of CAD files at a given site (our research shows that there are, on average, 19,000 active CAD files per site) necessitate the use of PDM as a tactical weapon in reducing cost and gaining control.

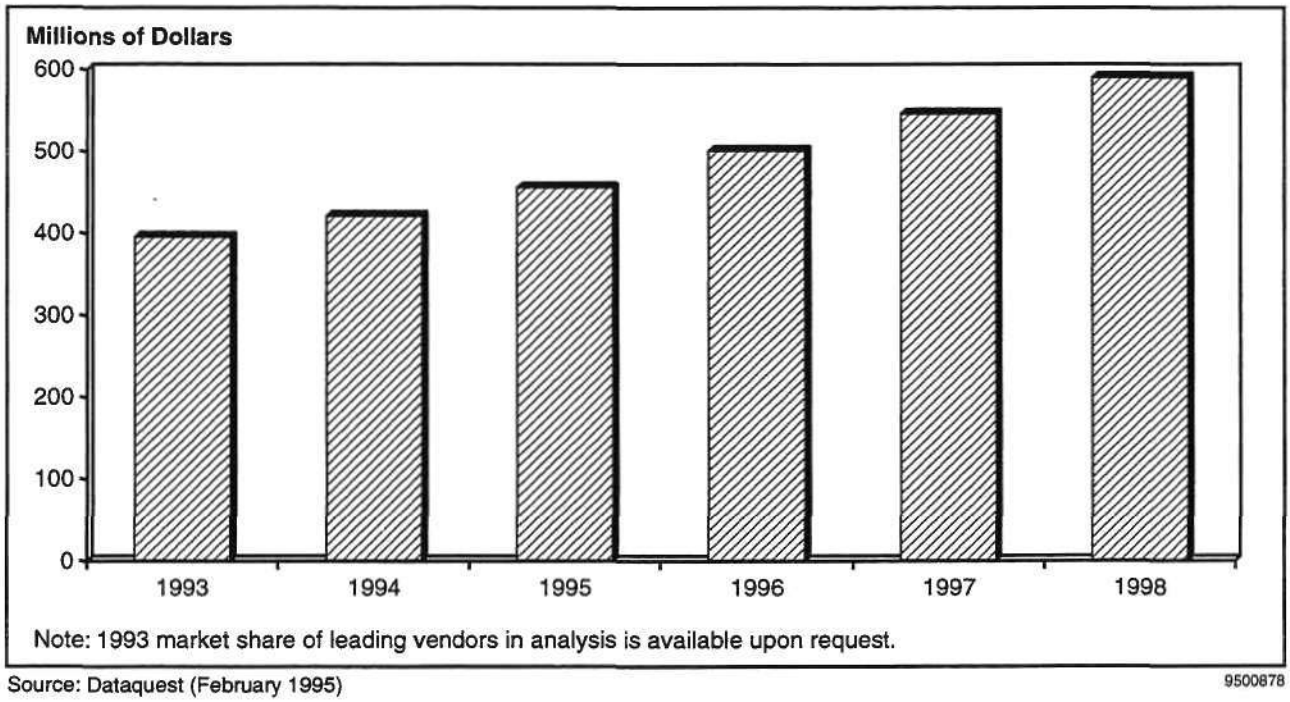
KBE is a smaller but important driver for future growth in system management and tools. A well-developed implementation of KBE can drive automated applications, capture design intent, and automate sharing of data between applications or departments. Pioneering users have reported significant, sometimes amazing productivity improvements with KBE. We expect the remaining early adopters and leading-edge mainstream users to start pilot projects within the next few years.

Analysis

By 1998, analysis tools are expected to be the largest subapplication in mechanical CAD/CAM. In 1994, analysis software generated over $400 million in revenue, and it is expected to reach $590 million by 1998 (see Figure 4). Analysis has begun, and will continue, to move from the hands of seasoned analysis experts to designers and engineers for two reasons: a need to improve product quality, and time-to-market pressures.

Analysis vendors have responded to designers' needs in the last two years by developing better user interfaces, error checking code, and automatic mesh-generation features. We are still several years away from truly automatic analysis engines, but major improvements have been made. While the expertise of seasoned analysts will still be needed in complex jobs,

Figure 4
Analysis Forecast



Source: Dataquest (February 1995)

9500878

more designers are now able to use the technology. We anticipate that analysis will be used in a number of different scenarios and at different points in the product development cycle, from quick, what-if evaluations of an initial conceptual design to more rigorous, detailed analysis and design optimization.

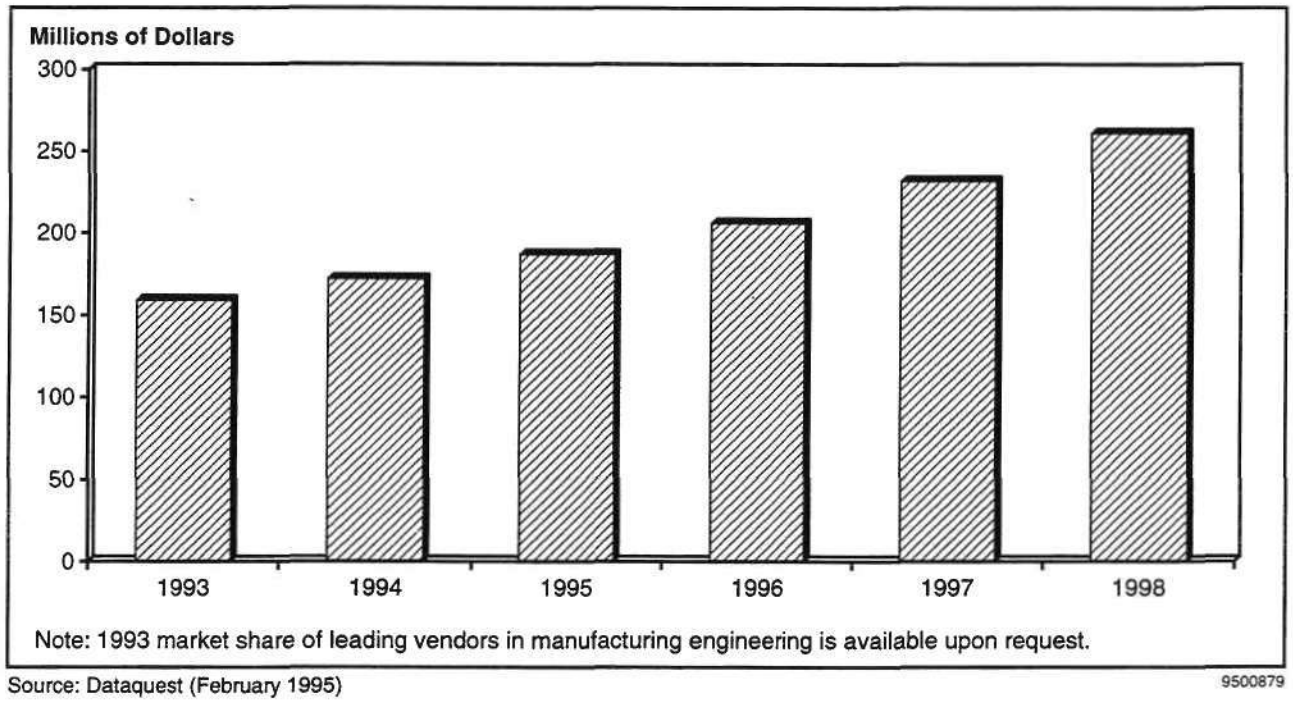
Manufacturing Engineering

Manufacturing engineering applications are expected to reach $260 million in 1998, with higher growth rates expected in 1996 and beyond (see Figure 5). Demand for manufacturing applications stems partly from the mix of different systems and computers within the design and manufacturing environment. As applications are developed that can work with disparate systems, we will see growth in manufacturing engineering software revenue. Also, as better design and analysis tools become available to the engineering design environments, we expect that some of these tools will filter over to the manufacturing environment. Shipping materials, in-process fixturing, tools, and fixtures used in the fabrication process can all benefit from faster and high-quality design and analysis.

Manufacturing Process Simulation

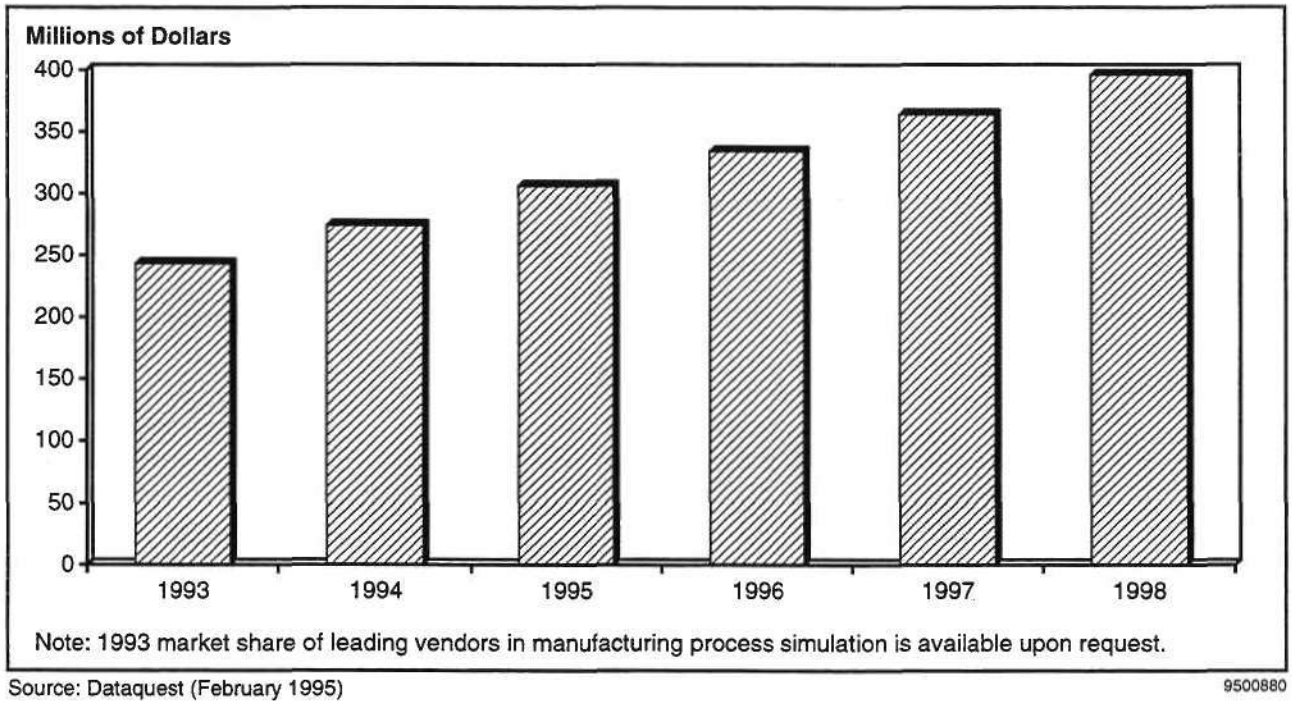
Manufacturing process simulation will grow to nearly $400 million in 1998, with high growth expected for 1995 and 1996 (see Figure 6). This subapplication has traditionally been a sleepy application area with little growth activity. However, an exception to this trend has been numerical control (NC) part programming, which has been growing significantly since 1992. Tighter integration between engineering and manufacturing will pave the way for more widespread use of generative NC programs and offline robotics applications. Retrofitting of new NC controls on older machine tools will help growth of this market as well.

Figure 5
Manufacturing Engineering Forecast



Source: Dataquest (February 1995) 9500879

Figure 6
Manufacturing Process Simulation Forecast



Source: Dataquest (February 1995) 9500880

Conceptual Design

Conceptual design, which includes industrial layout, design layout, and styling software, is expected to grow to $360 million in 1998 (see Figure 7). In previous years, design layout and styling have accounted for most of the revenue in this subapplication, but this is beginning to change. Industrial design has high growth potential because the use of computer-aided tools for conceptual design is so low. Also, the use of parametric design with solid models for conceptual design is a relatively new concept beginning to see some interest from end users.

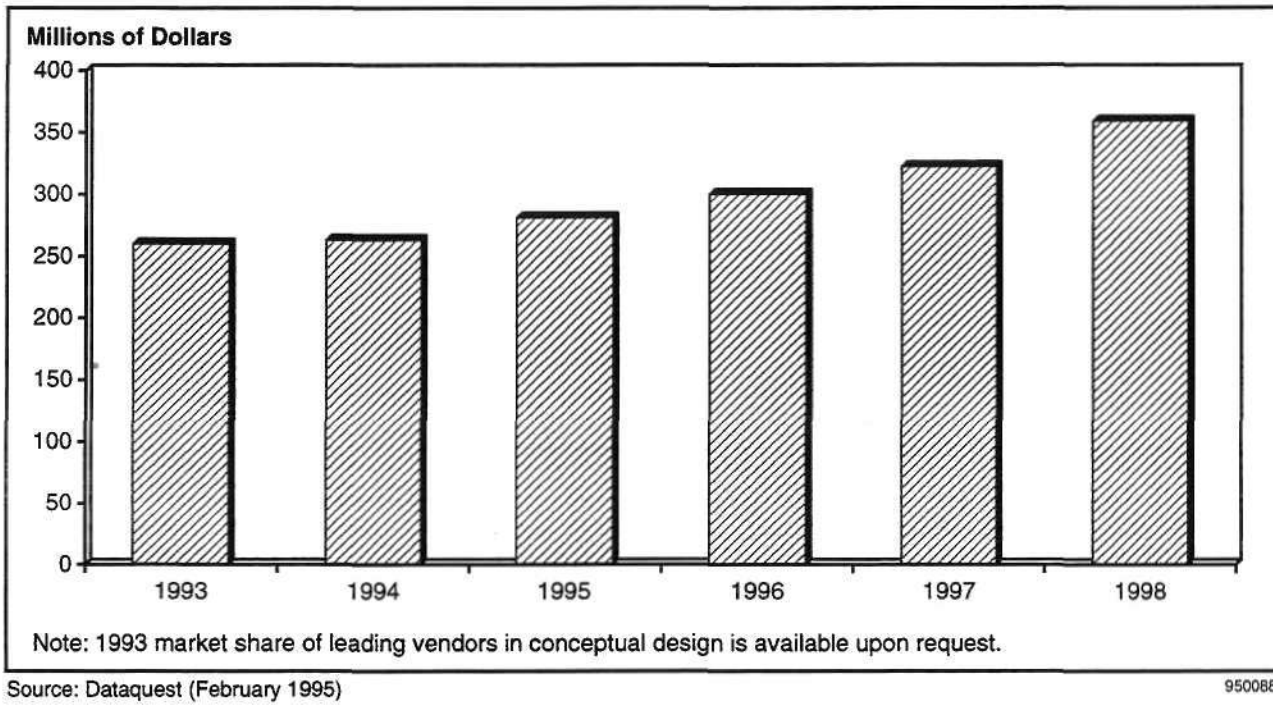
It is worth mentioning that the expected high growth in this application area is based on continued pressure to quickly create better products that cost less. The only way to reliably accomplish this feat is to increase the number of design starts and then quickly refine, combine, and improve the designs until the best solution is found. This will be accomplished in a collaborative environment among conceptual design, functional design, and analysis.

Slow Movers

Documentation and Drafting

Documentation and drafting, the largest subapplication in 1993 (and expected to be in 1994), will post minimal or declining growth over the next five years, as illustrated in Figure 8. While this is not an area of rapid change, its large market share confirms that even after 25 years of mechanical CAD development, this application is still a fundamental requirement. It is the most widely used and the most mature subapplication.

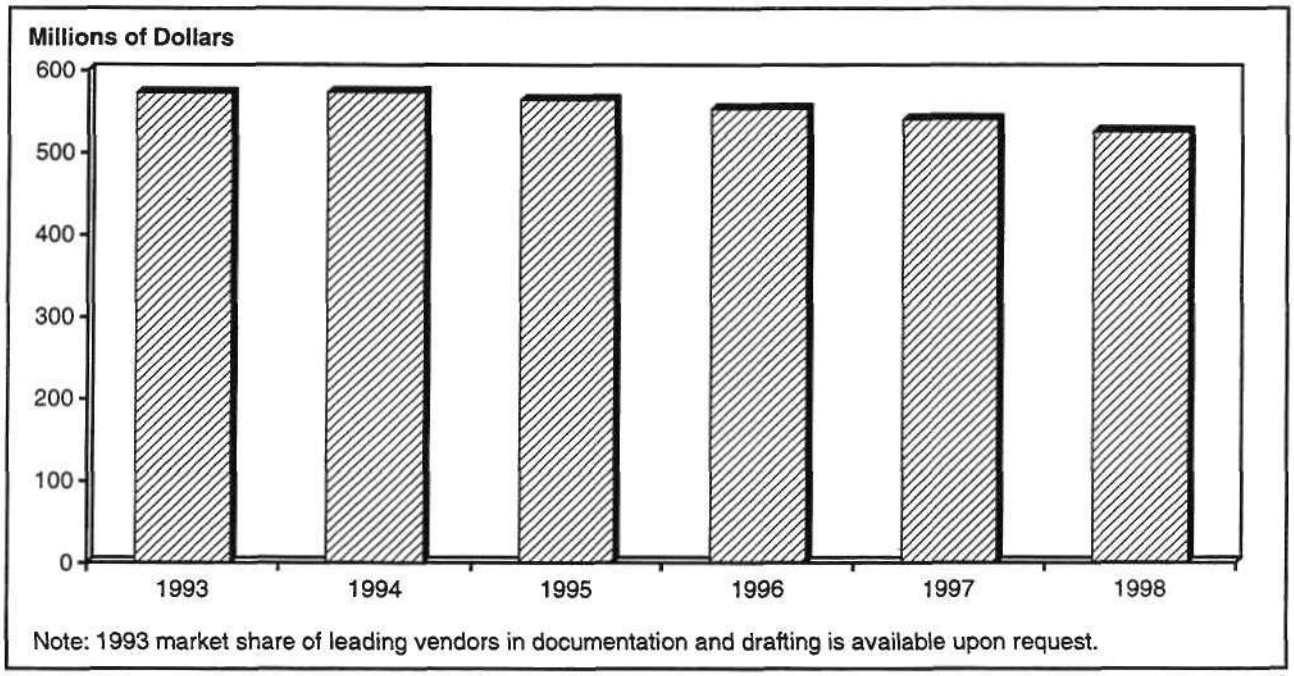
Figure 7
Conceptual Design Forecast



Source: Dataquest (February 1995)

9500881

Figure 8
Documentation and Drafting Forecast



Source: Dataquest (February 1995)

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The mainstream mechanical CAD/CAM/CAE market is evolving toward a replacement market worldwide. We have passed a transition point where more than half of the new sales are being used to replace older software. As with many software applications, as an application becomes more mature, price, and consequently revenue, declines. We are seeing this phenomenon occur with drafting software. Innovation in drafting applications will come from localization of the software, because most drafting packages offer the same basic set of features.

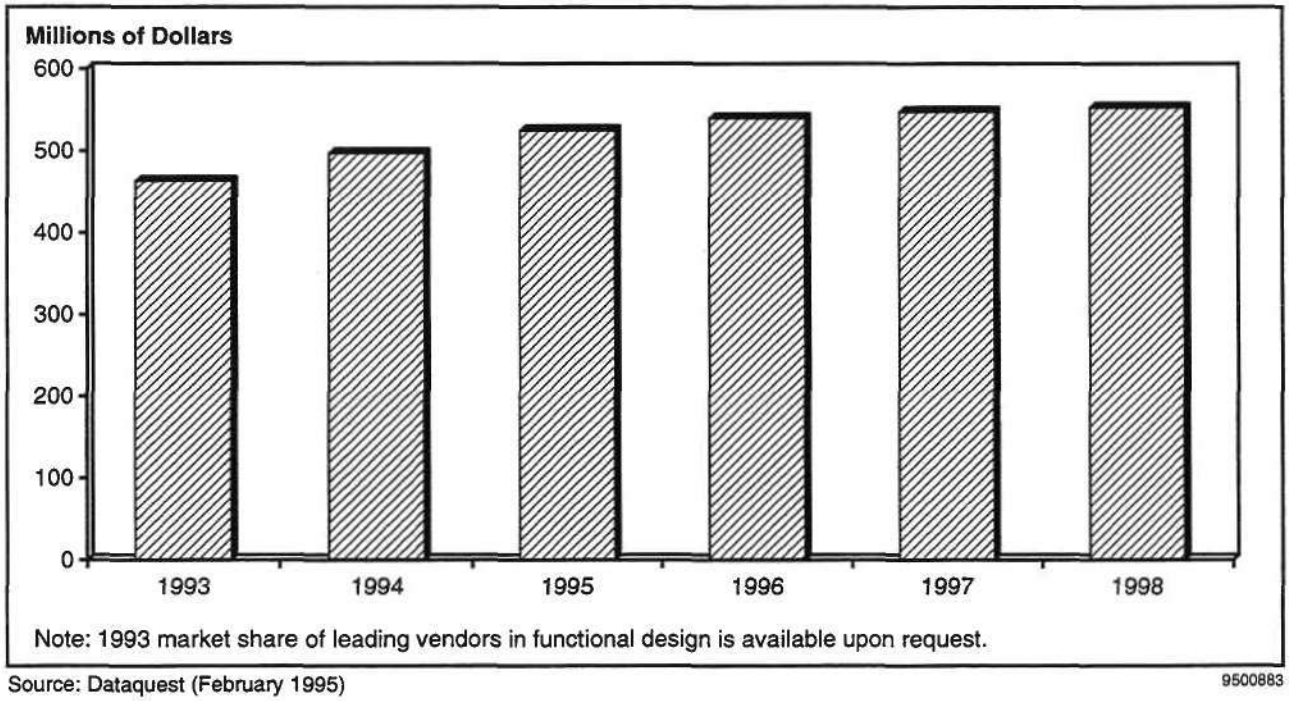
Functional Design

Functional design software is expected to grow slowly over the next five years, as illustrated in Figure 9. Like documentation and drafting, functional design is one of the more mature mechanical subapplications. In a collaborative engineering environment, conceptual design, functional design, and analysis will become more tightly integrated. Because functional design is well defined, and good applications are available, growth in this area will be somewhat limited while users concentrate on the conceptual design and analysis segments of the design process.

What Does All of This Mean?

Manufacturing and engineering companies have proven the value of using mechanical CAD/CAM/CAE technology. Many users across organizations are working on second- or third-generation CAD systems. As a result, growth in traditional, well-defined CAD applications, like drafting, is starting to slow.

Figure 9
Functional Design Forecast



Source: Dataquest (February 1995) 9500883

Nevertheless, there are opportunities in the replacement market for mechanical CAD/CAM/CAE software, and there are opportunities in niche applications.

Many companies produce 100 percent of their drawings using CAD-generated drafting. One way to bring growth to this market is to attack the replacement market, where application integration and automated operation are key issues for increasing designer productivity.

Additionally, there are areas within mechanical CAD/CAM/CAE that will grow rapidly, including:

- System management and tools; in particular, product data management and knowledge-based engineering
- Analysis software
- Manufacturing engineering applications
- Manufacturing process simulators
- Conceptual design software

End-user needs are changing, and rapid communication of information will characterize the next-generation tools for productivity improvement in the world of mechanical design.

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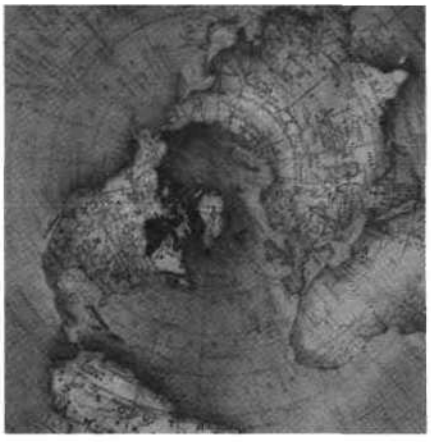

Dataquest

1994 CAD/CAM/CAE/GIS Mechanical Market Share Update

Market Statistics

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Note: All tables show estimated data.

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Note: All tables show estimated data.

1994 CAD/CAM/CAE/GIS Mechanical Market Share Update

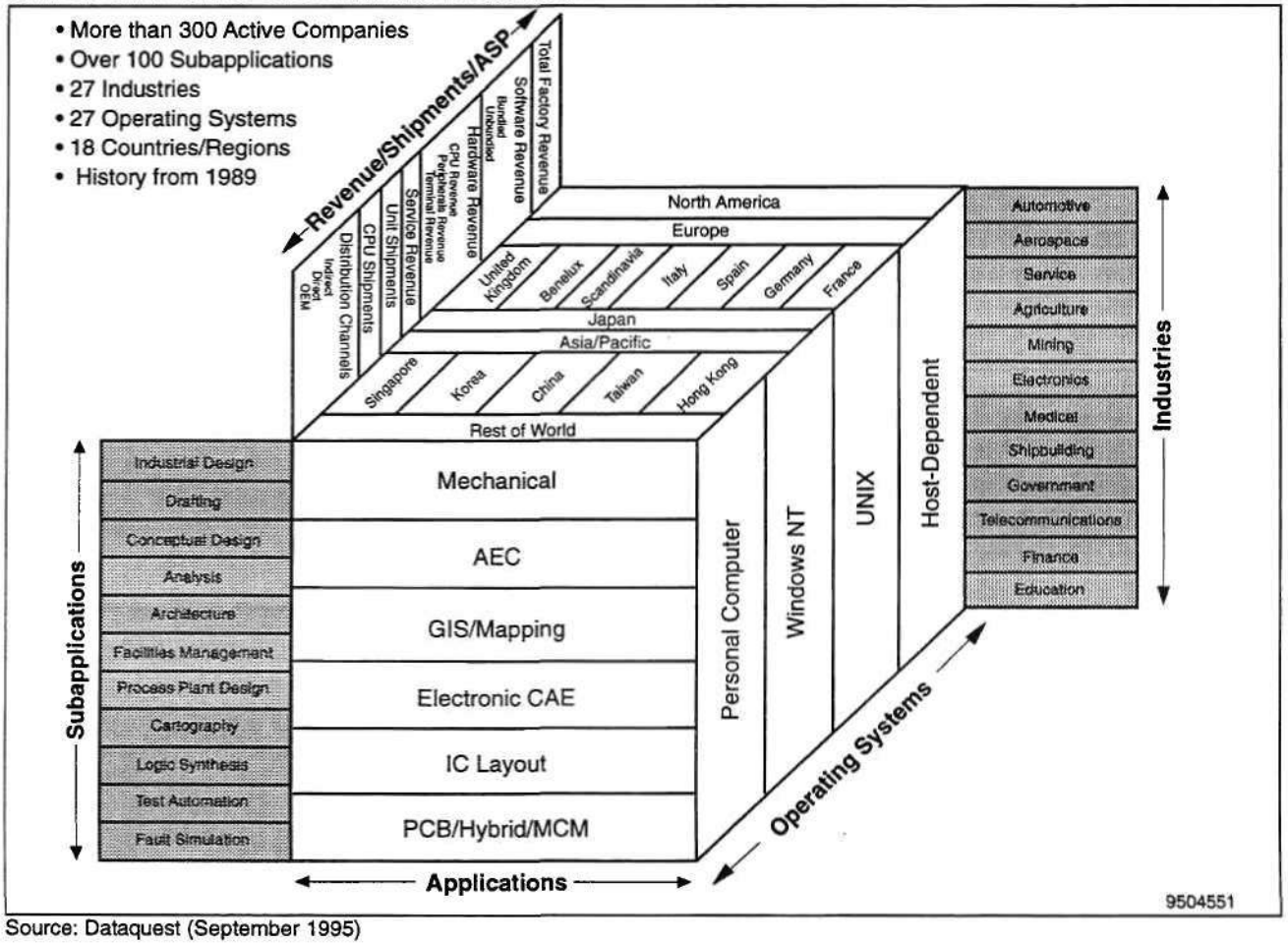
Introduction

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

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

Table 1 summarizes the performance in various segments of the CAD/CAM/CAE/GIS markets in 1994 versus 1993.

Figure 1
CAD/CAM/CAE/GIS Market Database



Source: Dataquest (September 1995)

Table 1
CAD/CAM/CAE/GIS Market Summary, 1993 to 1994

	Software Revenue		1993-1994	Total Factory Revenue		1993-1994	Seat Shipments		1993-1994
	1993	1994	Growth (%)	1993	1994	Growth (%)	1993	1994	Growth (%)
Applications									
Mechanical	2,248.9	2,455.5	9.2	7,374.9	7,968.8	8.1	279,480	298,442	6.8
AEC	752.3	849.0	12.9	2,204.7	2,401.1	8.9	198,114	211,550	6.8
GIS/Mapping	793.1	917.2	15.7	2,129.2	2,420.9	13.7	88,672	108,107	21.9
Electronic CAE	803.3	886.3	10.3	2,297.0	2,482.2	8.1	94,651	108,019	14.1
IC Layout	180.8	216.9	20.0	601.0	721.7	20.1	10,911	12,740	16.8
PCB/MCM/Hybrid	244.0	252.1	3.3	789.8	788.3	-0.2	29,042	27,766	-4.4
Electronic Design Automation	1,228.0	1,355.2	10.4	3,687.8	3,992.2	8.3	134,604	148,525	10.3
All Applications	5,022.3	5,577.0	11.0	15,396.6	16,782.9	9.0	700,869	766,623	9.4
Region									
North America	1,856.7	2,045.6	10.2	5,614.9	6,189.1	10.2	312,240	343,290	9.9
Europe	1,660.3	1,864.4	12.3	5,272.8	5,750.2	9.1	237,945	258,480	8.6
Japan	1,203.4	1,315.8	9.3	3,728.1	3,909.9	4.9	99,963	102,239	2.3
Asia/Pacific	208.0	255.4	22.8	538.2	676.9	25.8	33,753	44,643	32.3
Rest of World	93.9	95.8	2.0	242.6	256.9	5.9	16,968	17,971	5.9
Worldwide	5,022.3	5,577.0	11.0	15,396.6	16,782.9	9.0	700,869	766,623	9.4
Operating System									
UNIX	3,466.6	3,874.3	11.8	10,861.7	11,946.9	10.0	192,244	221,152	15.0
Host	301.4	197.9	-34.3	1,616.0	1,269.4	-21.5	27,091	21,566	-20.4
Windows NT	5.5	106.4	1,845.3	10.3	282.7	2,644.1	226	6,764	2,892.9
PC	1,248.9	1,398.3	12.0	2,908.5	3,283.9	12.9	481,308	517,141	7.4
									9.4
All Operating Systems	5,022.3	5,577.0	11.0	15,396.6	16,782.9	9.0	700,869	766,623	

Note: This table includes software content (data) companies for GIS/mapping. However, the AEC and GIS market share book (*1994 CAD/CAM/CAE/GIS AEC and GIS Market Share*, CAEC-WW-MS-9501) does not.
Source: Dataquest (September 1995)

About This Document

This document contains Dataquest's detailed market share information on the CAD/CAM/CAE/GIS industry. The following list contains descriptions of the companies included in the Market Share books. See Tables 2, 3, 4, and 5 for changes from our 1993 report.

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

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

We no longer publish data by hardware platform; instead we report by four major operating systems: UNIX, host, Windows NT, and PC.

This document represents our final estimates of 1994 shipments and revenue.

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

Table 2
Companies Renamed Since 1993

Original Company Name	New Company Name
ACDS Graphic System	Geomax International
Genrad	VEDA
GeoVision	SHL Systemhouse
Graphisoft Software Dev	Graphisoft Group
ICAD	Concentra
Kohns & Poppenhaeger	Poppenhaeger Grips GmbH
Microway	M.O.C.
Scientific & Engineering Software	SES Inc.
Silvar-Lisco	SVRI (Silicon Valley Research Inc.)
Smallworld Systems	SmallworldWide
Swanson Analysis	Ansys
Tactics International	Tactician Corporation

Source: Dataquest (September 1995)

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

Company Name	Acquired by/Merged with
Aries Technology	MacNeal-Schwendler
ANACAD-EES	Mentor Graphics
Betronex & Visionics	Norlinvest Ltd.
Cisigraph	Matra
Digital—Mechanical Software	PROCAD GmbH
Chronological Simulation	Viewlogic
Computervision—GIS	Unisys
Control Data—Mechanical Software	ICEM Technologies
Foresight Resources	Softdesk
Generation 5 Technology	Geo/SQL Corporation
Gerber Systems (CAD portion)	Matra
Kork Systems	Autometric
LandCadd	Eagle Point
Logic Modeling Corp.	Synopsys
Massteck	OrCAD
Model Technology	Mentor Graphics
NeoCAD	Xilinx
PDA Engineering	MacNeal-Schwendler
Point Control	CAMAX Manufacturing
Racal-Redac	Zuken-Redac
Sunrise	Viewlogic
Syscan	Sysdeco Innovation

Source: Dataquest (September 1995)

Table 4
Companies Deleted from Database Since 1993

Region/Company	
North American	European
A.I. Systems	Aplein*
Apple Computer	Aucos elektronische
Aura CAD/CAM Systems	BATISOFT
CAE-link	CAD-Capture
Claris	CAD TECH Iberica*
Compact Software	CAMTEK
Control Data—Hardware	Caroline Informatique
Data General	Contract Data Research
ECOM Associates	Data Technology/DATECH*
Georgia Tech Research	Datagraphic
GEOVISION Inc.	DELTA CAD*
Infinite Graphics	EME

(Continued)

Table 4
Companies Deleted from Database Since 1993 (Continued)

Region/Company	
North American (Continued)	European (Continued)
Innovative Data Design	FEA
Intrinsix	FEGS
Land Innovation	ItalCad
Maptech	Kreon
MC2 Engineering Software	Lamp Software
Moda CAD	Logic Systems Designers*
Phase Three Logic	Macao Systems
Synercom	MEDESIGN
Teradyne	Mucke Software
Understanding Systems	S.T.L.D.s.r.l.
Asian	Soft*
Kanematsu Semiconductor*	

*Distributors
Source: Dataquest (September 1995)

Table 5
Companies Added to Database Since 1993

Region/Company	
North American	European
3Soft	Abstract Hardware
Access Corp.	ACA Ltd.
ArcSys	Cimtel Ltd.
B.A. Intelligence Networks	Eigner + Partner GmbH
Boothroyd Dewhurst	HoSoft CAD
Cadis Software	Speed
CGTech	Spot Image Corp.
Chronology	ULTimate Technology
Cimplex	WiN Technology
Claritas/NPDC	
CMstat	
CSAR Corp.	
Database Applications Inc.	
Deneb Robotics	
DB Technology	
Design Acceleration	
Eagle Point	
EOSAT	
Equifax/NDS	
Fintronic	
Formtek	
Geographic Data Technology	
Gibbs and Assoc.	

(Continued)

Table 5
Companies Added to Database Since 1993 (Continued)

Region/Company
North American (Continued)
Integrity Engineering
InterHDL
Intusoft
Livermore Software Tech. Corp.
Nextwave DA
NOVASOFT Systems
OEA International
Optem Engineering
Rebis (merger of EDA and ADev)
Sherpa Corp.
Simulation Technology
SRAC
Surfware
T D Technology
Tecnomatics Tech.
UniCAD
Variation Systems Analysis
Veritools
VISTA Environmental Inf.
Workgroup Tech

*Distributors
Source: Dataquest (September 1995)

Segmentation Definitions

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

Applications

Mechanical

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

Architecture, Engineering, and Construction (AEC)

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

Geographic Information Systems (GIS)/Mapping

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

Electronic Design Automation (EDA)

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

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

Regions

The following paragraphs define the regions.

North America

North America includes the United States, Mexico, and Canada.

Europe

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

Japan

Asia/Pacific

Asia includes Singapore, Taiwan, Korea, China, and Hong Kong.

Rest of World

Rest of World includes all other countries including Australia, New Zealand, India, Africa, Central America, South America, and the Middle East.

Operating Systems

Dataquest defines the operating systems as follows:

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

Metrics

The following paragraphs define measurements:

- Total factory revenue is defined as the amount of money received by a manufacturer for its goods and services measured in U.S. dollars. Total factory revenue does not include revenue that a company may receive from products that are sold to another company for resale (OEM revenue). Total factory revenue is the sum of software revenue, hardware revenue, and service revenue.
- Unit shipment is defined as the number of seats delivered (number of possible simultaneous users of product delivered) excluding OEM shipments.
- Hardware revenue is revenue derived from sales of CPUs (including operating systems), terminals (for host-dependent systems), and peripherals.
- Software revenue is revenue derived from the sale of application software that exists on a company's standard price list.
- Service revenue is defined as all revenue derived from the service and support of CAD/CAM/CAE/GIS systems. Service revenue can be calculated in the tables by subtracting hardware and software revenue from total revenue. A split by hardware service and software service is available through inquiry.
  - Maintenance fees for hardware and software
  - Management and operations services—help desk, education and training, disaster recovery, vaulting, and configuration management

- Service bureau—project work, including construction of database, data conversion, product design, analysis, or manufacturing
- Application development—design and development of customized software applications or the modification, enhancement of customization of existing software applications, adding new functionality
- Consulting revenue—assessment of CAD/CAM/CAE/GIS business and information technology needs and the formulation of a plan based on needs identification
- Implementation and integration services—planning, implementation, migration, and integration of software products (software network support and integration, account integration management, data center design, and construction)

Market Share Methodology

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

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

The Audit Process

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

- Revenue published by major industry participants
- Estimates made by knowledgeable and reliable industry spokespersons
- Government data or trade association data
- Published product literature and price lists

- Interviews with knowledgeable manufacturers, distributors, and users
- Relevant economic data
- Information and data from online data banks
- Articles in both the general and trade press
- Annual reports, SEC documents, credit reports
- Company publications and press releases
- Reports from financial analysts
- User studies
- Reseller and supplier reports and reports from a vendor's competitors

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

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

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

Publishing Schedule

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

- Market share will be published and distributed to clients by March 31.
- Forecasting from the market share tables provides a five-year forecast period, available after April 30. The books will be shipped by May 31.
- Final updated market share tables, based on additional data collection and analysis, will be completed by June 30. At this point, the market share database is frozen and will not be changed until the end of the year. For the next six months, supplementary market data will be based on this final market data. Books will be shipped by July 31. (Unfortunately, because of our database changes, updated market share table delivery was delayed beyond this date.)

- We provide complete final forecast tables by July 31. These tables take into consideration changes in the market share during the previous six months. Books will be shipped by September 31.

Table A-1
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Worldwide, All Operating Systems

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	296.7	332.7	363.7	9.3	14.8
2	Parametric Technology	81.2	150.2	205.0	36.4	8.3
3	Autodesk	142.3	159.4	176.8	10.9	7.2
4	EDS Unigraphics	114.6	148.9	169.8	14.0	6.9
5	Computervision	193.5	148.6	148.9	0.2	6.1
6	SDRC	83.7	85.6	111.4	30.1	4.5
7	MacNeal-Schwendler	105.5	115.9	95.0	-18.1	3.9
8	Matra Datavision	63.4	63.0	75.5	19.8	3.1
9	Hewlett-Packard	72.8	70.0	71.6	2.3	2.9
10	Hitachi	54.8	61.8	66.4	7.5	2.7
11	NEC	50.4	54.3	61.7	13.7	2.5
12	Intergraph	71.9	71.0	61.1	-14.0	2.5
13	Toshiba—No Dist	41.9	45.3	49.0	8.2	2.0
14	Nihon Unisys	38.0	51.5	48.1	-6.5	2.0
15	Hitachi Zosen Info Systems	34.0	38.7	34.5	-10.7	1.4
16	Ansys	24.1	28.7	32.5	13.3	1.3
17	Alias Research	23.5	24.4	29.6	21.3	1.2
18	Applicon	40.2	29.4	29.6	0.6	1.2
19	Sharp System Products—No Dist	14.3	22.3	26.3	17.7	1.1
20	Fujitsu	14.1	20.6	24.9	20.9	1.0
21	Siemens Nixdorf Info systeme	30.9	26.2	24.7	-5.8	1.0
22	Straessle Informationssysteme	24.8	15.7	18.6	18.7	0.8
23	ADRA Systems	13.4	16.1	18.0	11.5	0.7
24	Formtek	6.2	9.6	17.3	80.3	0.7
25	Rasna Corporation	8.8	13.6	15.8	16.1	0.6
26	MARC	11.8	13.1	15.5	18.2	0.6
27	Sherpa Corp.	9.0	12.0	15.0	25.0	0.6
28	Tokyo Electron—No Dist	16.0	12.6	14.3	13.5	0.6
29	PROCAD GmbH	4.6	4.7	14.3	204.3	0.6
30	Cimatron	8.0	9.7	13.5	39.9	0.6
	All N.A. Companies	1,443.8	1,584.1	1,737.9	9.7	70.8
	All European Companies	328.3	282.6	311.5	10.2	12.7
	All Asian Companies	353.0	382.3	406.1	6.2	16.5
	All Companies	2,125.1	2,248.9	2,455.5	9.2	100.0

Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-2
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Worldwide, UNIX

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	109.5	193.0	232.4	20.4	12.8
2	Parametric Technology	81.2	143.5	184.5	28.6	10.1
3	EDS Unigraphics	103.1	123.5	169.8	37.5	9.3
4	Computervision	179.6	139.7	142.0	1.7	7.8
5	SDRC	80.8	84.7	111.4	31.4	6.1
6	Matra Datavision	61.8	62.0	73.8	19.1	4.1
7	Hewlett-Packard	72.8	70.0	66.8	-4.7	3.7
8	MacNeal-Schwendler	58.5	64.2	66.6	3.7	3.7
9	Hitachi	39.5	47.1	52.9	12.3	2.9
10	Nihon Unisys	13.3	40.7	43.8	7.8	2.4
11	NEC	30.8	36.3	42.0	15.6	2.3
12	Intergraph	60.8	58.7	37.9	-35.5	2.1
13	Toshiba—No Dist	25.1	31.7	35.6	12.3	2.0
14	Hitachi Zosen Info Systems	34.0	38.7	34.5	-10.7	1.9
15	Alias Research	23.5	24.4	29.6	21.3	1.6
16	Applicon	40.2	29.4	28.6	-2.6	1.6
17	Sharp System Products—No Dist	14.0	22.3	26.3	17.7	1.4
18	Ansys	14.8	17.5	22.1	26.3	1.2
19	Siemens Nixdorf Info systeme	30.9	22.5	21.2	-5.8	1.2
20	Straessle Informationssysteme	24.8	15.7	18.6	18.7	1.0
21	Fujitsu	7.7	9.7	16.7	72.3	0.9
22	MARC	9.0	11.1	15.5	39.1	0.9
23	Sherpa Corp.	9.0	12.0	15.0	25.0	0.8
24	Tokyo Electron—No Dist	16.0	12.6	14.3	13.5	0.8
25	Rasna Corporation	7.3	11.7	14.3	22.1	0.8
26	ADRA Systems	11.1	11.6	12.9	11.5	0.7
27	PROCAD GmbH	4.6	4.7	12.8	173.8	0.7
28	Mitsui Engineering	4.9	16.3	12.4	-24.3	0.7
29	Formtek	4.4	6.7	12.1	80.3	0.7
30	ISD Software	9.7	10.5	11.1	5.1	0.6
	All N.A. Companies	960.8	1,099.5	1,262.1	14.8	69.4
	All European Companies	230.4	197.2	224.3	13.7	12.3
	All Asian Companies	239.4	299.7	332.3	10.9	18.3
	All Companies	1,430.6	1,596.4	1,818.7	13.9	100.0

Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-3
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Worldwide, NT/Hybrid

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Parametric Technology	-	-	20.5	NA	55.5
2	Intergraph	-	-	13.6	NA	36.8
3	PROCAD GmbH	-	-	1.5	NA	4.0
4	Rasna Corporation	-	1.8	1.3	-28.6	3.4
5	CAD Distribution	-	-	0.1	NA	0.2
	All N.A. Companies	-	1.8	35.4	1,897.8	95.8
	All European Companies	-	-	1.6	NA	4.2
	All Asian Companies	-	-	-	NA	-
	All Companies	-	1.8	36.9	1,986.4	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-4
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Worldwide, Personal Computer

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	133.7	149.9	166.3	11.0	35.6
2	IBM	78.2	49.8	48.6	-2.2	10.4
3	NEC	10.6	11.8	19.7	67.2	4.2
4	Toshiba—No Dist	13.8	13.6	13.4	-1.5	2.9
5	Investronica SA	10.1	10.4	10.5	1.2	2.3
6	Intergraph	7.6	9.4	9.7	2.9	2.1
7	Hitachi	9.9	9.8	9.7	-1.5	2.1
8	MCS	4.0	6.1	9.0	48.6	1.9
9	Cimatron	3.3	5.0	8.2	64.0	1.8
10	Wiechers Datentechnik	6.5	7.7	8.1	5.6	1.7
11	Ansys	4.7	6.3	7.2	13.3	1.5
12	Computervision	11.9	8.9	6.9	-22.0	1.5
13	CNC Software	6.0	6.1	6.7	10.1	1.4
14	Design Automation	7.6	6.5	6.7	3.1	1.4
15	CADKEY	7.6	7.2	6.6	-7.3	1.4
16	Fujitsu	2.1	9.3	6.2	-32.8	1.3
17	Tebis	10.1	6.5	6.2	-3.9	1.3
18	ASHLAR	3.4	4.0	5.2	30.7	1.1
19	Formtek	1.9	2.9	5.2	80.3	1.1
20	American Small Business Comp.	3.1	4.6	5.1	10.9	1.1
21	ADRA Systems	2.3	4.5	5.1	11.5	1.1
22	Serbi	4.3	4.5	5.0	12.0	1.1
23	Ziegler Informatics	5.8	6.1	5.0	-17.5	1.1
24	CAMAX Manufacturing	5.0	5.6	5.0	-10.6	1.1
25	Hewlett-Packard	-	-	4.9	NA	1.0
26	Wacom	5.3	4.7	4.7	0.6	1.0
27	Algor Interactive Systems	3.5	4.1	4.6	12.6	1.0
28	SRAC	1.0	0.6	4.4	642.9	0.9
29	CAD Lab	2.5	2.5	4.2	64.7	0.9
30	Micrografx	3.1	3.6	3.9	7.5	0.8
	All N.A. Companies	299.1	303.7	323.8	6.6	69.3
	All European Companies	76.3	77.4	81.8	5.6	17.5
	All Asian Companies	65.3	56.4	61.6	9.2	13.2
	All Companies	440.7	437.5	467.2	6.8	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-5
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Worldwide, Host/Proprietary

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	109.0	90.0	82.7	-8.2	62.3
2	MacNeal-Schwendler	45.3	50.6	28.4	-44.0	21.4
3	Nihon Unisys	24.7	10.8	4.3	-60.5	3.2
4	Hitachi	5.5	4.9	3.8	-21.2	2.9
5	Ansys	4.6	4.9	3.3	-33.4	2.5
6	Exapt	3.1	2.7	2.0	-23.9	1.5
7	Fujitsu	4.2	1.6	2.0	20.9	1.5
8	Mechanical Dynamics	1.0	0.9	1.1	18.0	0.8
9	Toyo Information Systems—No Dist	1.3	1.2	0.9	-20.3	0.7
10	Kubota Computer	-	1.1	0.9	-19.4	0.7
11	Computational Mechanics	1.5	0.6	0.5	-13.6	0.4
12	Whessoe Computing Systems	0.8	0.5	0.5	-13.5	0.3
13	Access Corp.	0.4	0.5	0.5	-	0.3
14	GRAFTEK	0.5	0.5	0.4	-11.1	0.3
15	Framasoft	0.4	0.5	0.4	-6.8	0.3
16	Century Research Center	0.6	0.5	0.4	-22.2	0.3
17	debis Systemhaus	0.2	0.3	0.3	11.1	0.2
18	NOVASOFT Systems	0.2	0.2	0.3	33.3	0.2
19	Rasna Corporation	-	-	0.1	NA	0.1
20	Cimtel	-	-	0	NA	0
21	EDS Unigraphics	11.5	25.5	-	-100.0	-
22	NEC	9.0	6.1	-	-100.0	-
23	ICEM Technologies	13.4	3.0	-	-100.0	-
24	Intergraph	3.5	2.9	-	-100.0	-
25	MARC	2.8	2.0	-	-100.0	-
26	SDRC	2.9	0.9	-	-100.0	-
27	Han Dataport	0.3	0.2	-	-100.0	-
28	Georgia Tech Research Corp.	0.1	0.2	-	-100.0	-
29	FEA	0.1	0.1	-	-100.0	-
30	Accugraph	0	0	-	-100.0	-
	All N.A. Companies	183.9	179.1	116.6	-34.9	87.9
	All European Companies	21.6	8.0	3.8	-52.2	2.9
	All Asian Companies	48.3	26.2	12.3	-53.2	9.2
	All Companies	253.8	213.2	132.7	-37.8	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-6
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, North America, All Operating Systems

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	EDS Unigraphics	70.5	97.3	110.4	13.5	14.1
2	Parametric Technology	52.5	95.9	108.6	13.3	13.9
3	IBM	65.8	73.6	84.1	14.3	10.7
4	Autodesk	65.2	76.5	84.0	9.8	10.7
5	MacNeal-Schwendler	55.6	59.5	53.1	-10.8	6.8
6	SDRC	27.6	26.5	45.7	72.1	5.8
7	Intergraph	39.1	41.3	33.1	-19.7	4.2
8	Computervision	27.8	23.2	30.9	33.1	4.0
9	Alias Research	15.3	15.9	19.5	23.0	2.5
10	Ansys	9.8	14.7	17.2	17.7	2.2
11	Applicon	14.4	12.1	14.2	17.7	1.8
12	Rasna Corporation	7.3	10.2	11.4	11.4	1.5
13	Hewlett-Packard	14.6	11.3	11.2	-1.4	1.4
14	ADRA Systems	8.1	8.5	9.4	11.5	1.2
15	Formtek	3.3	5.1	9.2	80.3	1.2
16	MCS	6.6	7.9	8.3	5.0	1.1
17	Sherpa Corp.	5.9	7.2	8.3	14.6	1.1
18	CAMAX Manufacturing	8.9	8.1	7.4	-9.0	0.9
19	Concentra	6.7	5.4	6.7	24.0	0.9
20	Gerber Systems	4.7	6.8	6.4	-5.9	0.8
21	Engineering Mechanics	4.7	5.3	6.1	15.0	0.8
22	Deneb Robotics	4.0	5.0	5.6	12.5	0.7
23	CIMLINC	4.5	4.7	5.5	16.2	0.7
24	Algor Interactive Systems	3.6	4.8	5.4	12.6	0.7
25	Matra Datavision	4.7	4.8	5.3	9.3	0.7
26	CADKEY	6.8	6.0	5.2	-11.9	0.7
27	SRAC	3.5	4.0	4.6	14.3	0.6
28	American Small Business Comp.	2.8	4.1	4.6	10.9	0.6
29	CNC Software	4.0	4.1	4.5	10.1	0.6
30	ICEM Technologies	9.6	3.6	3.8	5.8	0.5
	All N.A. Companies	583.3	689.5	764.9	10.9	97.7
	All European Companies	19.2	14.3	16.6	16.1	2.1
	All Asian Companies	-	1.2	1.5	17.7	0.2
	All Companies	602.5	705.0	783.0	11.1	100.0

Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-7
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, North America, UNIX

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	EDS Unigraphics	60.5	80.6	110.4	36.9	19.8
2	Parametric Technology	52.5	91.5	97.8	6.8	17.5
3	IBM	27.4	37.0	47.9	29.5	8.6
4	SDRC	26.7	26.3	45.7	73.8	8.2
5	MacNeal-Schwendler	33.8	34.8	37.4	7.7	6.7
6	Computervision	21.9	20.1	29.4	46.2	5.3
7	Intergraph	32.0	34.6	20.6	-40.6	3.7
8	Alias Research	15.3	15.9	19.5	23.0	3.5
9	Applicon	14.4	12.1	13.7	14.0	2.5
10	Ansys	5.2	8.9	11.7	31.2	2.1
11	Hewlett-Packard	14.6	11.3	10.4	-7.9	1.9
12	Rasna Corporation	5.8	8.8	10.3	17.2	1.8
13	Sherpa Corp.	5.9	7.2	8.3	14.6	1.5
14	ADRA Systems	5.9	6.1	6.8	11.5	1.2
15	Concentra	6.7	5.4	6.7	24.0	1.2
16	Formtek	2.3	3.6	6.4	80.3	1.2
17	Gerber Systems	4.7	6.8	6.4	-5.9	1.2
18	Deneb Robotics	4.0	5.0	5.6	12.5	1.0
19	CIMLINC	4.5	4.7	5.5	16.2	1.0
20	Matra Datavision	4.5	4.8	5.2	8.6	0.9
21	Autodesk	3.9	4.6	5.0	9.8	0.9
22	CAMAX Manufacturing	4.3	4.4	4.4	-0.8	0.8
23	ICEM Technologies	3.8	2.5	3.8	50.1	0.7
24	Engineering Mechanics	2.5	2.8	3.4	18.7	0.6
25	Auto-Trol	4.3	2.5	3.3	36.5	0.6
26	Workgroup Tech.	1.5	2.0	3.0	50.0	0.5
27	MCS	3.7	4.0	2.5	-37.7	0.5
28	GRAFTEK	1.9	2.0	2.2	10.6	0.4
29	Mechanical Dynamics	2.7	1.8	2.1	20.6	0.4
30	MARC	1.2	1.6	2.1	30.3	0.4
	All N.A. Companies	381.6	462.1	543.5	17.6	97.5
	All European Companies	11.2	10.3	12.9	25.5	2.3
	All Asian Companies	-	1.0	1.3	22.3	0.2
	All Companies	392.8	473.4	557.7	17.8	100.0

Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-8
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, North America, NT/Hybrid

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Parametric Technology	-	-	10.9	NA	56.8
2	Intergraph	-	-	7.3	NA	38.4
3	Rasna Corporation	-	1.3	0.9	-31.4	4.8
	All N.A. Companies	-	1.3	19.1	1,340.1	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	1.3	19.1	1,340.1	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-9
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, North America, Personal Computer

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	61.3	71.9	79.0	9.8	51.0
2	MCS	3.0	3.9	5.8	49.3	3.7
3	CADKEY	6.1	5.7	5.2	-7.3	3.4
4	Intergraph	4.0	5.1	5.2	2.9	3.4
5	American Small Business Comp.	2.8	4.1	4.6	10.9	2.9
6	CNC Software	4.0	4.1	4.5	10.1	2.9
7	Algor Interactive Systems	3.5	3.9	4.4	12.6	2.9
8	IBM	7.8	2.7	4.0	48.8	2.6
9	Ansys	2.7	3.2	3.8	17.7	2.4
10	ASHLAR	3.2	3.3	3.1	-4.4	2.0
11	CAMAX Manufacturing	4.6	3.7	3.0	-18.8	1.9
12	SRAC	0.7	0.4	3.0	642.9	1.9
13	Formtek	1.0	1.5	2.8	80.3	1.8
14	Engineering Mechanics	2.2	2.4	2.7	10.7	1.7
15	ADRA Systems	2.1	2.4	2.7	11.5	1.7
16	Micrografx	1.7	2.1	2.3	10.6	1.5
17	Gibbs and Assoc.	1.5	1.7	1.9	10.0	1.2
18	Surfware	-	1.5	1.7	11.1	1.1
19	DP Technology	1.1	1.4	1.6	13.5	1.0
20	Computervision	5.7	3.1	1.5	-51.0	1.0
21	Pathtrace Engineering Systems	0.5	1.1	1.2	10.4	0.8
22	Cimatron	0.2	0.5	1.1	95.6	0.7
23	CGTech	0.9	1.0	1.1	8.7	0.7
24	GRAPHSOFT	0.7	1.2	1.0	-13.3	0.6
25	Softdesk	2.1	3.2	1.0	-68.5	0.6
26	Variation Systems Analysis	0.6	0.7	1.0	30.6	0.6
27	Boothroyd Dewhurst	0.8	0.9	0.9	6.3	0.6
28	Evolution Computing	0.9	1.1	0.8	-31.1	0.5
29	Hewlett-Packard	-	-	0.7	NA	0.5
30	Investronica SA	0.5	0.6	0.6	8.6	0.4
	All N.A. Companies	132.5	145.2	151.4	4.3	97.7
	All European Companies	1.6	2.7	3.5	28.0	2.2
	All Asian Companies	-	0.1	0.1	20.0	0
	All Companies	134.1	147.9	154.9	4.7	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-10
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, North America, Host/Proprietary

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	30.7	33.9	32.2	-5.1	62.7
2	MacNeal-Schwendler	20.5	24.3	15.7	-35.4	30.6
3	Ansys	1.9	2.5	1.7	-30.8	3.4
4	Access Corp.	0.4	0.5	0.4	-4.0	0.8
5	Mechanical Dynamics	0.5	0.3	0.4	18.0	0.7
6	GRAFTEK	0.4	0.4	0.3	-11.1	0.7
7	NOVASOFT Systems	0.1	0.1	0.2	33.3	0.4
8	Computational Mechanics	0.5	0.2	0.2	-9.8	0.3
9	Kubota Computer	-	0.2	0.1	-12.5	0.3
10	Rasna Corporation	-	-	0.1	NA	0.1
11	Framasoft	-	-	0	NA	0
12	EDS Unigraphics	10.0	16.6	-	-100.0	-
13	Intergraph	3.0	1.6	-	-100.0	-
14	ICEM Technologies	5.8	1.1	-	-100.0	-
15	MARC	0.4	0.3	-	-100.0	-
16	SDRC	1.0	0.3	-	-100.0	-
17	Georgia Tech Research Corp.	0.1	0.2	-	-100.0	-
18	Accugraph	0	0	-	-100.0	-
19	PROCAD GmbH	-	0	-	-100.0	-
	All N.A. Companies	69.1	80.9	51.0	-37.0	99.4
	All European Companies	6.4	1.3	0.2	-86.1	0.3
	All Asian Companies	-	0.2	0.1	-12.5	0.3
	All Companies	75.6	82.3	51.3	-37.7	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-11
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Europe, All Operating Systems

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	118.4	132.8	163.3	23.0	18.5
2	Computervision	126.8	92.3	91.4	-1.0	10.3
3	Parametric Technology	18.1	40.4	69.7	72.4	7.9
4	Matra Datavision	54.3	52.5	63.4	20.7	7.2
5	Autodesk	53.1	52.6	60.1	14.3	6.8
6	EDS Unigraphics	33.6	37.7	44.1	17.2	5.0
7	Hewlett-Packard	42.2	38.3	37.3	-2.7	4.2
8	SDRC	26.0	24.8	27.8	12.2	3.1
9	MacNeal-Schwendler	28.9	34.2	27.7	-19.1	3.1
10	Siemens Nixdorf Info systeme	30.3	25.7	24.2	-5.8	2.7
11	Intergraph	27.1	21.4	21.2	-0.9	2.4
12	Straessle Informationssysteme	22.7	14.3	15.8	10.8	1.8
13	PROCAD GmbH	4.6	4.6	14.3	211.6	1.6
14	Applicon	24.6	16.2	14.2	-12.2	1.6
15	ISD Software	13.4	12.2	13.2	8.2	1.5
16	CAD Lab	15.2	11.4	12.9	13.3	1.5
17	ASCAD	8.4	8.7	11.4	30.7	1.3
18	Wiechers Datentechnik	8.1	8.5	8.9	4.6	1.0
19	Ansys	9.1	7.8	8.5	9.1	1.0
20	Radan Computational	7.9	8.1	8.1	-0.2	0.9
21	Sherpa Corp.	3.2	4.8	6.8	40.6	0.8
22	Tebis	10.1	6.3	6.4	1.6	0.7
23	ICEM Technologies	10.7	5.7	6.2	9.2	0.7
24	Investronica SA	6.2	6.2	6.2	-1.0	0.7
25	Han Dataport	5.4	4.4	5.5	26.3	0.6
26	Delcam International	9.5	4.8	5.5	13.0	0.6
27	Serbi	4.3	4.5	5.0	12.0	0.6
28	Cimatron	6.0	5.6	5.0	-10.1	0.6
29	Ziegler Informatics	5.7	6.0	4.9	-18.1	0.6
30	PAFEC	6.0	4.9	4.9	-0.6	0.5
	All N.A. Companies	554.6	546.4	619.4	13.4	70.0
	All European Companies	289.7	246.2	265.0	7.7	30.0
	All Asian Companies	-	-	-	NA	-
	All Companies	844.3	792.5	884.4	11.6	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-12
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Europe, UNIX

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	55.0	91.8	120.5	31.2	18.1
2	Computervision	119.2	87.3	86.9	-0.5	13.0
3	Parametric Technology	18.1	38.6	62.7	62.5	9.4
4	Matra Datavision	53.2	51.7	62.0	20.0	9.3
5	EDS Unigraphics	33.6	31.2	44.1	41.3	6.6
6	Hewlett-Packard	42.2	38.3	34.8	-9.0	5.2
7	SDRC	25.0	24.6	27.8	13.3	4.2
8	Siemens Nixdorf Info systeme	30.3	22.0	20.8	-5.8	3.1
9	MacNeal-Schwendler	13.7	19.1	19.5	2.1	2.9
10	Straessle Informationssysteme	22.7	14.3	15.8	10.8	2.4
11	Applicon	24.6	16.2	13.7	-15.0	2.1
12	Intergraph	24.0	17.1	13.0	-23.6	2.0
13	PROCAD GmbH	4.6	4.6	12.8	179.1	1.9
14	ISD Software	9.7	10.5	11.1	5.1	1.7
15	ASCAD	8.2	8.5	10.8	27.6	1.6
16	CAD Lab	12.7	8.9	8.8	-1.3	1.3
17	Radan Computational	7.8	8.0	7.9	-0.9	1.2
18	Sherpa Corp.	3.2	4.8	6.8	40.6	1.0
19	ICEM Technologies	4.2	4.0	6.2	55.0	0.9
20	Ansys	5.3	4.7	5.8	21.6	0.9
21	Han Dataport	4.8	3.8	5.5	44.2	0.8
22	Delcam International	8.6	4.7	5.2	11.1	0.8
23	Alias Research	3.8	3.7	4.0	10.1	0.6
24	Framasoft	3.5	3.6	4.0	10.5	0.6
25	MARC	2.4	2.6	3.8	45.2	0.6
26	Autodesk	3.2	3.2	3.6	14.3	0.5
27	PAFEC	4.5	3.8	3.6	-4.0	0.5
28	CIMLINC	2.7	3.0	3.5	17.3	0.5
29	ICL	3.6	3.4	3.2	-5.5	0.5
30	ADRA Systems	2.7	2.8	3.2	11.5	0.5
	All N.A. Companies	402.8	409.5	473.9	15.7	71.1
	All European Companies	208.3	172.9	192.8	11.5	28.9
	All Asian Companies	-	-	-	NA	-
	All Companies	611.1	582.4	666.7	14.5	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-13
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Europe, NT/Hybrid

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Parametric Technology	-	-	7.0	NA	51.5
2	Intergraph	-	-	4.8	NA	35.2
3	PROCAD GmbH	-	-	1.5	NA	11.0
4	Rasna Corporation	-	0.2	0.2	-8.2	1.7
5	CAD Distribution	-	-	0.1	NA	0.6
	All N.A. Companies	-	0.2	12.0	4,725.0	88.4
	All European Companies	-	-	1.6	NA	11.6
	All Asian Companies	-	-	-	NA	-
	All Companies	-	0.2	13.5	5,357.8	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-14
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Europe, Personal Computer

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	49.9	49.5	56.5	14.3	36.7
2	Wiechers Datentechnik	6.5	7.7	8.0	4.5	5.2
3	Investronica SA	6.2	6.2	6.2	-1.0	4.0
4	Tebis	10.1	6.3	5.7	-8.8	3.7
5	IBM	11.7	7.1	5.3	-25.3	3.5
6	Serbi	4.3	4.5	5.0	12.0	3.3
7	Ziegler Informatics	5.7	6.0	4.9	-18.1	3.2
8	Computervision	5.9	5.0	4.5	-9.4	2.9
9	CAD Lab	2.5	2.5	4.2	64.7	2.7
10	CAD Distribution	4.1	3.4	3.6	4.9	2.3
11	Siemens Nixdorf Info systeme	-	3.6	3.4	-5.8	2.2
12	Intergraph	3.0	3.3	3.4	2.9	2.2
13	RoboCAD Solutions	2.9	3.0	3.2	5.6	2.1
14	Cimatron	2.5	2.9	3.0	5.4	2.0
15	Whessoe Computing Systems	2.2	2.5	2.8	12.7	1.8
16	Hewlett-Packard	-	-	2.4	NA	1.6
17	ISD Software	3.7	1.7	2.2	27.6	1.4
18	Anilam Electronics	1.6	1.8	2.0	14.6	1.3
19	Kloeckner-Moeller	1.9	1.9	1.9	-1.6	1.2
20	Ansys	2.0	1.7	1.9	9.1	1.2
21	MCS	1.0	1.3	1.8	40.3	1.2
22	Micrografx	1.4	1.5	1.6	3.2	1.0
23	Vero International Software	2.0	1.0	1.4	45.3	0.9
24	Matra Datavision	-	0.8	1.4	64.0	0.9
25	Technische Computer Systeme	-	1.2	1.3	7.4	0.9
26	Pathtrace Engineering Systems	1.3	1.0	1.3	30.9	0.8
27	PAFEC	1.5	1.1	1.3	10.6	0.8
28	Formtek	0.4	0.7	1.2	80.3	0.8
29	ADRA Systems	-	1.1	1.2	11.5	0.8
30	Superdraft	1.1	1.0	1.2	12.6	0.8
	All N.A. Companies	79.6	78.0	86.4	10.7	56.2
	All European Companies	68.0	67.2	67.4	0.2	43.8
	All Asian Companies	-	-	-	NA	-
	All Companies	147.6	145.3	153.8	5.9	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-15
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Europe, Host/Proprietary

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	51.7	33.9	37.6	10.8	74.5
2	MacNeal-Schwendler	15.1	14.9	8.2	-44.6	16.4
3	Exapt	3.1	2.7	2.0	-23.9	4.0
4	Ansys	1.8	1.3	0.8	-35.8	1.7
5	Framasoft	0.4	0.4	0.4	-8.4	0.8
6	Mechanical Dynamics	0.2	0.3	0.3	18.0	0.7
7	debis Systemhaus	0.2	0.3	0.3	11.1	0.6
8	Whessoe Computing Systems	0.6	0.3	0.3	-15.2	0.6
9	Computational Mechanics	1.1	0.3	0.2	-13.9	0.5
10	NOVASOFT Systems	0	0	0.1	33.3	0.1
11	Cimtel	-	-	0	NA	0.1
12	GRAFTEK	0	0	0	-11.1	0
13	Rasna Corporation	-	-	0	NA	0
14	Access Corp.	-	-	0	NA	0
15	EDS Unigraphics	-	6.4	-	-100.0	-
16	ICEM Technologies	6.4	1.7	-	-100.0	-
17	Intergraph	-	1.0	-	-100.0	-
18	MARC	0.8	0.5	-	-100.0	-
19	SDRC	0.9	0.2	-	-100.0	-
20	Han Dataport	0.3	0.2	-	-100.0	-
21	FEA	0.1	0.1	-	-100.0	-
22	Georgia Tech Research Corp.	0	0	-	-100.0	-
	All N.A. Companies	72.2	58.6	47.1	-19.7	93.4
	All European Companies	13.4	6.0	3.3	-45.3	6.6
	All Asian Companies	-	-	-	NA	-
	All Companies	85.6	64.6	50.4	-22.1	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-16
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Japan, All Operating Systems

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	97.9	108.7	92.3	-15.0	13.7
2	Hitachi	54.8	61.8	66.4	7.5	9.8
3	NEC	50.4	54.3	61.7	13.7	9.1
4	Toshiba—No Dist	41.9	45.3	49.0	8.2	7.3
5	Nihon Unisys	38.0	51.5	48.1	-6.5	7.1
6	Hitachi Zosen Info Systems	33.7	38.3	34.2	-10.7	5.1
7	SDRC	28.3	26.7	29.5	10.5	4.4
8	Parametric Technology	10.6	14.0	26.6	90.7	3.9
9	Sharp System Products—No Dist	14.3	22.3	26.3	17.7	3.9
10	Fujitsu	14.1	20.6	24.9	20.9	3.7
11	Computervision	21.7	23.5	22.4	-4.6	3.3
12	Hewlett-Packard	14.6	19.8	22.4	12.6	3.3
13	Tokyo Electron—No Dist	16.0	12.6	14.3	13.5	2.1
14	Mitsui Engineering	5.3	16.7	12.9	-22.9	1.9
15	MacNeal-Schwendler	14.6	17.2	11.0	-35.9	1.6
16	Autodesk	20.9	12.4	10.8	-13.3	1.6
17	Toshiba Engineering—No Dist	8.8	8.9	9.8	10.8	1.5
18	MARC	6.4	8.2	9.6	18.0	1.4
19	Graphtec Engineering	6.9	7.0	7.9	12.4	1.2
20	Toyo Information Systems—No Dist	6.0	6.9	7.6	10.0	1.1
21	Kubota Computer	7.3	6.1	7.1	15.3	1.0
22	Adam Net	1.6	3.6	6.9	90.6	1.0
23	Design Automation	7.5	5.8	5.9	2.2	0.9
24	Wacom	6.2	5.7	5.9	3.7	0.9
25	Alias Research	4.0	4.3	5.2	22.2	0.8
26	Omron	5.8	4.6	5.2	12.4	0.8
27	CADIX	3.5	4.1	4.6	12.3	0.7
28	Ansys	4.1	4.3	4.6	5.7	0.7
29	Matra Datavision	3.8	3.6	4.2	16.0	0.6
30	EDS Unigraphics	2.8	3.7	3.6	-4.2	0.5
	All N.A. Companies	242.2	263.2	261.4	-0.7	38.7
	All European Companies	9.1	8.9	11.0	23.6	1.6
	All Asian Companies	352.4	379.8	403.4	6.2	59.7
	All Companies	603.7	652.0	675.8	3.7	100.0

Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-17
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Japan, UNIX

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Hitachi	39.5	47.1	52.9	12.3	10.0
2	IBM	22.0	54.4	49.4	-9.1	9.3
3	Nihon Unisys	13.3	40.7	43.8	7.8	8.3
4	NEC	30.8	36.3	42.0	15.6	7.9
5	Toshiba—No Dist	25.1	31.7	35.6	12.3	6.7
6	Hitachi Zosen Info Systems	33.7	38.3	34.2	-10.7	6.4
7	SDRC	27.3	26.4	29.5	11.6	5.6
8	Sharp System Products—No Dist	14.0	22.3	26.3	17.7	5.0
9	Parametric Technology	10.6	13.3	24.0	79.7	4.5
10	Computervision	21.7	23.1	21.7	-6.1	4.1
11	Hewlett-Packard	14.6	19.8	20.9	5.3	3.9
12	Fujitsu	7.7	9.7	16.7	72.3	3.1
13	Tokyo Electron—No Dist	16.0	12.6	14.3	13.5	2.7
14	Mitsui Engineering	4.9	16.3	12.4	-24.3	2.3
15	Toshiba Engineering—No Dist	8.8	8.9	9.8	10.8	1.9
16	MARC	4.9	6.9	9.6	38.9	1.8
17	Graphtec Engineering	6.9	7.0	7.9	12.4	1.5
18	MacNeal-Schwendler	7.4	7.9	7.5	-4.9	1.4
19	Toyo Information Systems—No Dist	4.7	5.8	6.7	16.2	1.3
20	Adam Net	1.6	3.6	6.7	83.8	1.3
21	Kubota Computer	7.3	4.9	6.0	22.9	1.1
22	Alias Research	4.0	4.3	5.2	22.2	1.0
23	Omron	5.8	4.6	5.2	12.4	1.0
24	CADIX	3.5	4.1	4.6	12.3	0.9
25	Matra Datavision	3.6	3.5	4.1	14.5	0.8
26	EDS Unigraphics	2.4	3.1	3.6	15.5	0.7
27	Ansys	3.6	2.6	3.1	17.8	0.6
28	ADRA Systems	2.0	2.0	2.3	11.5	0.4
29	Ricoh—No Dist	3.6	1.5	1.9	23.3	0.3
30	Intergraph	1.6	3.0	1.8	-37.9	0.3
	All N.A. Companies	133.4	178.0	191.0	7.3	36.0
	All European Companies	6.6	7.2	8.7	20.7	1.6
	All Asian Companies	238.9	298.2	330.6	10.9	62.3
	All Companies	378.9	483.3	530.3	9.7	100.0

Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-18
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Japan, NT/Hybrid

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Parametric Technology	-	-	2.7	NA	78.1
2	Intergraph	-	-	0.6	NA	19.0
3	Rasna Corporation	-	0.1	0.1	-18.4	3.0
	All N.A. Companies	-	0.1	3.4	2,655.0	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	0.1	3.4	2,655.0	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-19
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Japan, Personal Computer

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	54.7	36.6	33.4	-8.6	28.8
2	NEC	10.6	11.8	19.7	67.2	17.0
3	Toshiba—No Dist	13.8	13.6	13.4	-1.5	11.5
4	Autodesk	19.7	11.7	10.2	-12.3	8.8
5	Hitachi	9.9	9.8	9.7	-1.5	8.3
6	Fujitsu	2.1	9.3	6.2	-32.8	5.4
7	Design Automation	7.5	5.8	5.9	2.2	5.1
8	Wacom	5.3	4.7	4.7	0.6	4.1
9	Hewlett-Packard	-	-	1.5	NA	1.3
10	ASHLAR	-	0.3	1.0	226.6	0.9
11	Ansys	-	0.9	1.0	5.7	0.9
12	Cimatron	0.1	0.3	1.0	189.5	0.9
13	ADRA Systems	-	0.8	0.9	11.5	0.8
14	Anilam Electronics	1.0	0.8	0.8	2.1	0.7
15	Formtek	0.3	0.4	0.8	80.3	0.7
16	Computervision	-	0.4	0.7	85.8	0.6
17	CADKEY	0.8	0.6	0.6	-7.3	0.5
18	CAMAX Manufacturing	-	0.6	0.6	2.8	0.5
19	SRAC	0.1	0.1	0.6	642.9	0.5
20	MCS	-	0.3	0.5	57.1	0.5
21	Mitsui Engineering	0.4	0.4	0.5	38.5	0.4
22	Intergraph	0.2	0.4	0.5	2.9	0.4
23	CNC Software	0.4	0.4	0.3	-21.3	0.3
24	Kubota Computer	-	0.3	0.3	3.2	0.3
25	Adam Net	-	-	0.2	NA	0.2
26	GRAPHSOFT	-	-	0.1	NA	0.1
27	Boothroyd Dewhurst	0.1	0.1	0.1	21.2	0.1
28	American Small Business Comp.	0.1	0.1	0.1	38.8	0.1
29	Matra Datavision	-	0	0.1	197.1	0.1
30	Superdraft	0.1	0.1	0.1	-29.5	0.1
	All N.A. Companies	76.7	55.0	53.2	-3.3	45.8
	All European Companies	1.2	1.3	2.2	61.6	1.9
	All Asian Companies	65.2	55.7	60.8	9.2	52.3
	All Companies	143.1	112.0	116.1	3.7	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-20
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Japan, Host/Proprietary

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	21.2	17.7	9.4	-46.7	36.3
2	Nihon Unisys	24.7	10.8	4.3	-60.5	16.5
3	Hitachi	5.5	4.9	3.8	-21.2	14.7
4	MacNeal-Schwendler	7.0	9.1	3.5	-61.6	13.5
5	Fujitsu	4.2	1.6	2.0	20.9	7.7
6	Toyo Information Systems—No Dist	1.3	1.2	0.9	-20.3	3.6
7	Kubota Computer	-	0.9	0.7	-20.7	2.8
8	Ansys	0.6	0.7	0.5	-37.8	1.8
9	Century Research Center	0.6	0.5	0.4	-22.2	1.3
10	Mechanical Dynamics	0.3	0.2	0.2	18.0	0.9
11	Whessoe Computing Systems	0.1	0.1	0.1	-17.0	0.3
12	GRAFTEK	0.1	0.1	0.1	-11.1	0.3
13	Computational Mechanics	-	0.1	0.1	-24.3	0.2
14	Framasoft	0.1	0	0	31.4	0.1
15	Rasna Corporation	-	-	0	NA	0
16	NEC	9.0	6.1	-	-100.0	-
17	MARC	1.4	1.2	-	-100.0	-
18	EDS Unigraphics	0.4	0.6	-	-100.0	-
19	SDRC	1.0	0.3	-	-100.0	-
20	ICEM Technologies	0.9	0.2	-	-100.0	-
21	Intergraph	0.2	0.1	-	-100.0	-
22	Georgia Tech Research Corp.	0	0	-	-100.0	-
	All N.A. Companies	32.1	30.1	13.7	-54.4	52.7
	All European Companies	1.3	0.4	0.2	-55.4	0.7
	All Asian Companies	48.3	26.0	12.1	-53.4	46.6
	All Companies	81.7	56.5	26.0	-54.0	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-21
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Asia/Pacific, All Operating Systems

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	1.4	11.5	16.1	40.2	19.9
2	IBM	9.3	13.0	15.1	15.7	18.6
3	EDS Unigraphics	5.8	7.7	8.8	14.0	10.9
4	SDRC	1.8	7.5	8.4	10.9	10.3
5	Investronica SA	3.1	3.2	3.3	1.6	4.0
6	Computervision	12.5	6.1	2.8	-54.2	3.5
7	Matra Datavision	0.6	2.1	2.6	26.7	3.3
8	Intergraph	2.1	2.9	2.4	-17.2	2.9
9	Cimatron	0.2	0.7	2.3	249.8	2.8
10	Delcam International	0.4	2.0	2.3	16.5	2.8
11	MacNeal-Schwendler	4.4	3.6	1.9	-47.6	2.3
12	Ansys	0.7	1.1	1.3	13.3	1.6
13	MCS	0.1	1.2	1.3	8.1	1.6
14	CAMAX Manufacturing	0.3	0.8	1.2	45.5	1.4
15	Straessle Informationssysteme	0.3	0.1	1.1	686.3	1.4
16	Gerber Systems	0	0.5	1.0	91.3	1.2
17	Alias Research	0.4	0.6	0.9	37.3	1.1
18	Hewlett-Packard	0.6	0.6	0.8	43.8	1.0
19	Design Automation	0.2	0.7	0.8	9.9	1.0
20	ADRA Systems	0.4	0.7	0.7	11.5	0.9
21	Formtek	0.2	0.4	0.7	80.3	0.9
22	Mechanical Dynamics	0.3	0.5	0.7	20.0	0.8
23	Tebis	-	0.2	0.6	185.7	0.7
24	CNC Software	0.4	0.4	0.5	10.1	0.6
25	B.A.Intelligence Networks	0.1	0.2	0.4	66.7	0.5
26	Hitachi Zosen Info Systems	0.3	0.4	0.3	-10.7	0.4
27	CADKEY	-	0.4	0.3	-11.9	0.4
28	Applicon	0.3	0.3	0.3	10.6	0.4
29	Whessoe Computing Systems	0.2	0.2	0.2	16.8	0.3
30	DP Technology	0.1	0.2	0.2	13.5	0.3
	All N.A. Companies	43.2	61.4	66.4	8.2	82.0
	All European Companies	5.9	9.4	13.4	42.9	16.5
	All Asian Companies	0.6	1.2	1.2	1.5	1.5
	All Companies	49.7	72.0	81.0	12.6	100.0

Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-22
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Asia/Pacific, UNIX

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	EDS Unigraphics	5.0	6.4	8.8	37.5	19.3
2	SDRC	1.7	7.5	8.4	12.0	18.3
3	IBM	2.7	6.9	7.4	7.9	16.2
4	Computervision	12.3	5.9	2.7	-54.4	5.9
5	Matra Datavision	0.6	2.0	2.6	27.3	5.7
6	Delcam International	0.4	1.9	2.2	14.5	4.8
7	Intergraph	1.7	2.4	1.5	-38.1	3.2
8	MacNeal-Schwendler	2.3	1.8	1.3	-25.0	2.9
9	Straessle Informationssysteme	0.3	0.1	1.1	686.3	2.4
10	Autodesk	0.1	0.7	1.0	40.2	2.1
11	Gerber Systems	0	0.5	1.0	91.3	2.1
12	Cimatron	0.1	0.3	0.9	184.6	2.0
13	Ansys	0.6	0.7	0.9	26.3	1.9
14	Alias Research	0.4	0.6	0.9	37.3	1.9
15	CAMAX Manufacturing	0.1	0.6	0.7	19.8	1.5
16	Hewlett-Packard	0.6	0.6	0.6	1.0	1.3
17	Mechanical Dynamics	0.2	0.4	0.5	20.6	1.2
18	ADRA Systems	0.3	0.5	0.5	11.5	1.2
19	Formtek	0.2	0.3	0.5	80.3	1.1
20	MCS	0.1	0.6	0.4	-37.1	0.9
21	Hitachi Zosen Info Systems	0.3	0.4	0.3	-10.7	0.8
22	Applicon	0.3	0.3	0.3	7.1	0.7
23	B.A.Intelligence Networks	0.1	0.1	0.2	66.7	0.5
24	DP Technology	0.1	0.1	0.1	13.5	0.2
25	Toshiba Engineering—no Dist	0.1	0.1	0.1	-8.3	0.2
26	Concentra	0.2	0.1	0.1	24.0	0.2
27	CAD Centre	0.1	0.1	0.1	37.3	0.2
28	ICEM Technologies	0.1	0.1	0.1	-47.5	0.2
29	Computational Mechanics	-	0.1	0.1	17.3	0.2
30	SRAC	0.1	0.2	0.1	-55.6	0.2
	All N.A. Companies	29.8	37.4	38.1	1.7	83.3
	All European Companies	1.8	4.8	7.2	50.4	15.7
	All Asian Companies	0.5	0.5	0.5	-10.2	1.0
	All Companies	32.0	42.7	45.7	7.0	100.0

Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-23
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Asia/Pacific, NT/Hybrid

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Intergraph	-	-	0.5	NA	100.0
2	Rasna Corporation	-	0	-	-100.0	-
	All N.A. Companies	-	0	0.5	1,374.8	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	0	0.5	1,374.8	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-24
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Asia/Pacific, Personal Computer

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	1.3	10.8	15.1	40.2	47.1
2	IBM	3.9	3.3	5.9	75.5	18.2
3	Investronica SA	3.1	3.2	3.3	1.6	10.2
4	Cimatron	0.1	0.3	1.4	310.1	4.4
5	MCS	-	0.6	0.9	57.1	2.8
6	Design Automation	0.2	0.7	0.8	9.9	2.4
7	Tebis	-	0.2	0.5	156.4	1.5
8	CAMAX Manufacturing	0.2	0.2	0.5	112.2	1.5
9	CNC Software	0.4	0.4	0.5	10.1	1.5
10	Intergraph	0.2	0.4	0.4	2.9	1.2
11	CADKEY	-	0.4	0.3	-7.3	1.0
12	Ansys	-	0.3	0.3	13.3	0.9
13	Hewlett-Packard	-	-	0.2	NA	0.8
14	Vero International Software	0.4	0.1	0.2	45.3	0.7
15	Formtek	0.1	0.1	0.2	80.3	0.6
16	ADRA Systems	0.1	0.2	0.2	11.5	0.6
17	Anilam Electronics	0.1	0.2	0.2	14.5	0.6
18	B.A.Intelligence Networks	0.1	0.1	0.2	66.7	0.5
19	Whessoe Computing Systems	0.1	0.1	0.2	22.6	0.5
20	Computervision	0.1	0.3	0.1	-48.0	0.4
21	SRAC	0	0	0.1	642.9	0.4
22	Delcam International	-	0.1	0.1	68.2	0.4
23	DP Technology	0.1	0.1	0.1	13.5	0.3
24	CADWORKS	0.3	0.1	0.1	-24.7	0.3
25	Superdraft	0.1	0.1	0.1	20.1	0.3
26	RoboCAD Solutions	-	-	0.1	NA	0.2
27	Matra Datavision	-	0.1	0.1	5.0	0.2
28	GRAPHSOFT	-	-	0	NA	0.1
29	Mechanical Dynamics	-	0	0	16.7	0.1
30	Algor Interactive Systems	0	0	0	12.6	0.1
	All N.A. Companies	7.1	17.5	25.3	44.3	78.6
	All European Companies	3.9	4.4	6.1	37.9	19.0
	All Asian Companies	0.2	0.7	0.8	9.9	2.4
	All Companies	11.1	22.6	32.1	42.0	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-25
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Asia/Pacific, Host/Proprietary

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	2.7	2.8	1.8	-36.2	67.1
2	MacNeal-Schwendler	2.1	1.8	0.6	-68.6	21.2
3	Ansys	0.2	0.2	0.1	-33.4	4.9
4	Mechanical Dynamics	0.1	0.1	0.1	18.0	3.6
5	Whessoe Computing Systems	0	0	0	-5.4	1.6
6	Computational Mechanics	-	0	0	-11.3	1.2
7	GRAFTEK	0	0	0	-11.1	0.3
8	Framasoft	0	0	0	-56.2	0.2
9	EDS Unigraphics	0.8	1.3	-	-100.0	-
10	Intergraph	0.2	0.1	-	-100.0	-
11	SDRC	0.1	0.1	-	-100.0	-
12	ICEM Technologies	0.1	0.1	-	-100.0	-
13	Georgia Tech Research Corp.	0	0	-	-100.0	-
	All N.A. Companies	6.4	6.4	2.6	-59.5	97.1
	All European Companies	0.2	0.2	0.1	-48.2	2.9
	All Asian Companies	-	-	-	NA	-
	All Companies	6.6	6.6	2.7	-59.3	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-26
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Rest of World, All Operating Systems

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	5.2	4.7	8.9	91.4	28.5
2	Autodesk	1.7	6.4	5.8	-8.5	18.7
3	EDS Unigraphics	1.9	2.5	2.9	14.0	9.2
4	Cimatron	1.3	1.7	2.8	64.2	9.1
5	Intergraph	1.7	2.0	1.5	-25.3	4.7
6	Computervision	4.7	3.4	1.4	-58.9	4.5
7	MacNeal-Schwendler	2.0	1.3	1.2	-10.0	3.8
8	Delcam International	0.6	0.5	1.1	104.9	3.5
9	Ansys	0.4	0.9	1.0	13.3	3.1
10	Formtek	0.2	0.4	0.7	80.3	2.2
11	Siemens Nixdorf Info systeme	0.6	0.5	0.5	-5.8	1.6
12	Investronica SA	0.2	0.4	0.5	19.7	1.5
13	CNC Software	0.4	0.4	0.4	10.1	1.3
14	CAMAX Manufacturing	0.3	0.4	0.4	-1.1	1.2
15	Rasna Corporation	0.2	0.3	0.3	16.1	1.0
16	Whessoe Computing Systems	0.2	0.3	0.3	18.6	1.0
17	CADKEY	-	0.3	0.3	-11.9	0.8
18	ADRA Systems	0.3	0.2	0.2	11.5	0.7
19	NOVASOFT Systems	0.1	0.2	0.2	33.3	0.6
20	American Small Business Comp.	0.1	0.1	0.2	83.3	0.5
21	SRAC	0.1	0.1	0.1	14.3	0.4
22	B.A.Intelligence Networks	0	0	0.1	233.3	0.4
23	Computational Mechanics	-	0.1	0.1	2.0	0.4
24	Mechanical Dynamics	-	0.1	0.1	20.0	0.2
25	Ziegler Informatics	0	0	0	66.6	0.2
26	Superdraft	0.1	0.1	0	-50.8	0.1
27	CAD Centre	-	0	0	83.1	0.1
28	Algor Interactive Systems	0	0	0	12.6	0.1
29	GRAFTEK	0	0	0	7.1	0.1
30	GRAPHSOFT	-	-	0	NA	0.1
	All N.A. Companies	20.5	23.6	25.8	9.1	82.4
	All European Companies	4.4	3.9	5.5	41.7	17.6
	All Asian Companies	-	-	-	NA	-
	All Companies	24.9	27.5	31.3	13.7	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-27
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Rest of World, UNIX

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	2.4	2.9	7.2	148.4	39.0
2	EDS Unigraphics	1.6	2.1	2.9	37.5	15.7
3	Computervision	4.5	3.3	1.3	-59.0	7.3
4	Cimatron	0.7	0.8	1.1	33.5	6.0
5	Delcam International	0.6	0.5	1.0	101.5	5.6
6	Intergraph	1.4	1.7	0.9	-45.2	5.0
7	MacNeal-Schwendler	1.3	0.7	0.8	16.8	4.5
8	Ansys	0.3	0.5	0.7	26.3	3.6
9	Formtek	0.2	0.3	0.5	80.3	2.6
10	Siemens Nixdorf Info systeme	0.6	0.4	0.4	-5.8	2.3
11	Autodesk	0.1	0.4	0.4	-8.5	1.9
12	Rasna Corporation	0.1	0.2	0.3	22.1	1.6
13	CAMAX Manufacturing	0	0	0.2	482.4	1.2
14	ADRA Systems	0.2	0.1	0.2	11.5	0.8
15	NOVASOFT Systems	0	0.1	0.1	33.3	0.7
16	B.A.Intelligence Networks	0	0	0.1	233.3	0.4
17	Computational Mechanics	-	0.1	0.1	14.9	0.4
18	Mechanical Dynamics	-	0	0.1	20.6	0.3
19	SRAC	0.1	0.1	0	-55.6	0.3
20	CAD Centre	-	0	0	83.1	0.2
21	Whessoe Computing Systems	0	0	0	20.0	0.2
22	GRAFTEK	0	0	0	10.6	0.2
23	Accugraph	-	-	0	NA	0
24	Algor Interactive Systems	-	0	0	12.6	0
25	Access Corp.	-	-	0	NA	0
26	ICEM Technologies	0.1	0.1	-	-100.0	-
27	CADKEY	-	0	-	-100.0	-
	All N.A. Companies	13.2	12.5	15.6	24.8	85.2
	All European Companies	2.5	2.0	2.7	34.6	14.8
	All Asian Companies	-	-	-	NA	-
	All Companies	15.7	14.6	18.4	26.1	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-28
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Rest of World, NT/Hybrid

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Intergraph	-	-	0.3	NA	92.8
2	Rasna Corporation	-	0	0	-28.6	7.2
	All N.A. Companies	-	0	0.4	893.1	100.0
	All European Companies	-	-	-	NA	-
	All Asian Companies	-	-	-	NA	-
	All Companies	-	0	0.4	893.1	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-29
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Rest of World, Personal Computer

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	1.6	6.0	5.5	-8.5	53.8
2	Cimatron	0.5	0.9	1.7	92.5	17.0
3	Investronica SA	0.2	0.4	0.5	19.7	4.6
4	CNC Software	0.4	0.4	0.4	10.1	3.9
5	CADKEY	-	0.3	0.3	-7.3	2.6
6	Intergraph	0.2	0.2	0.2	2.9	2.3
7	Whessoe Computing Systems	0.2	0.2	0.2	22.6	2.2
8	Ansys	-	0.2	0.2	13.3	2.1
9	Formtek	0.1	0.1	0.2	80.3	2.0
10	American Small Business Comp.	0.1	0.1	0.2	83.3	1.5
11	CAMAX Manufacturing	0.2	0.3	0.2	-55.3	1.5
12	SRAC	0	0	0.1	642.9	0.9
13	Siemens Nixdorf Info systeme	-	0.1	0.1	-5.8	0.7
14	Computervision	0.2	0.2	0.1	-56.6	0.7
15	ADRA Systems	0.1	0.1	0.1	11.5	0.6
16	Delcam International	-	0	0.1	196.0	0.6
17	B.A.Intelligence Networks	0	0	0.1	233.3	0.5
18	Ziegler Informatics	0	0	0	66.6	0.5
19	Superdraft	0.1	0.1	0	-50.8	0.4
20	Algor Interactive Systems	0	0	0	12.6	0.3
21	GRAPHSOFT	-	-	0	NA	0.3
22	Computational Mechanics	-	0	0	-14.3	0.2
23	NOVASOFT Systems	0	0	0	33.3	0.2
24	Vero International Software	0.5	0	0	45.3	0.2
25	Pathtrace Engineering Systems	0.2	0	0	-	0.1
26	Softdesk	0	0	0	20.0	0.1
27	Graphisoft Group	-	0	0	217.3	0.1
28	CADWORKS	-	0	0	-24.7	0.1
29	Rasna Corporation	0	0	0	16.1	0
30	Mechanical Dynamics	-	0	0	16.7	0
	All N.A. Companies	3.1	8.0	7.5	-6.1	73.4
	All European Companies	1.7	1.7	2.7	55.8	26.6
	All Asian Companies	-	-	-	NA	-
	All Companies	4.8	9.7	10.2	5.0	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-30
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
Top 30 Mechanical Software Companies, Rest of World, Host/Proprietary

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	2.8	1.8	1.7	-1.7	73.8
2	MacNeal-Schwendler	0.7	0.6	0.4	-39.5	15.4
3	Ansys	0.1	0.1	0.1	-33.4	4.1
4	NOVASOFT Systems	0	0	0.1	33.3	2.5
5	Whessoe Computing Systems	0	0	0	-	1.8
6	Computational Mechanics	-	0	0	-10.8	1.4
7	Mechanical Dynamics	-	0	0	18.0	0.5
8	Access Corp.	-	-	0	NA	0.2
9	GRAFTEK	0	0	0	-11.1	0.2
10	Rasna Corporation	-	-	0	NA	0.1
11	EDS Unigraphics	0.3	0.4	-	-100.0	-
12	Intergraph	0.1	0.1	-	-100.0	-
13	ICEM Technologies	0.2	0	-	-100.0	-
	All N.A. Companies	4.1	3.1	2.3	-25.9	96.9
	All European Companies	0.2	0.1	0.1	-40.0	3.1
	All Asian Companies	-	-	-	NA	-
	All Companies	4.3	3.2	2.4	-26.4	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table B-1
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
All Mechanical Software Companies, Worldwide, All Operating Systems

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	A.I. Systems	0.7	0.5	-	-100.0	-
2	Access Corp.	0.7	0.8	0.8	-	0
3	Accugraph	0.2	0.3	0.4	49.9	0
4	Adam Net	1.6	3.6	6.9	90.6	0.3
5	ADRA Systems	13.4	16.1	18.0	11.5	0.7
6	Algor Interactive Systems	3.6	5.0	5.6	12.6	0.2
7	Alias Research	23.5	24.4	29.6	21.3	1.2
8	American Small Business Comp.	3.1	4.6	5.1	10.9	0.2
9	Anilam Electronics	2.6	2.8	3.1	10.9	0.1
10	Ansys	24.1	28.7	32.5	13.3	1.3
11	Applicon	40.2	29.4	29.6	0.6	1.2
12	ASCAD	8.4	8.7	11.4	30.7	0.5
13	ASHLAR	3.4	4.0	5.2	30.7	0.2
14	Aura CAD/CAM Systems	0.6	0.8	-	-100.0	-
15	Auto-Trol	6.4	3.5	4.4	27.5	0.2
16	Autodesk	142.3	159.4	176.8	10.9	7.2
17	B.A.Intelligence Networks	1.3	2.0	2.6	33.3	0.1
18	Boothroyd Dewhurst	1.2	1.3	1.4	9.1	0.1
19	CAD Centre	1.7	0.7	1.0	37.3	0
20	CAD Distribution	4.1	3.6	3.8	6.0	0.2
21	CAD Lab	15.2	11.4	12.9	13.3	0.5
22	CAD-Capture	0.2	0.1	-	-100.0	-
23	Cadis Software	0.1	0.3	0.4	66.7	0
24	CADIX	3.5	4.1	4.6	12.3	0.2
25	CADKEY	8.5	7.5	6.6	-11.9	0.3
26	CADSI	2.9	2.9	3.2	12.2	0.1
27	CADWORKS	0.6	0.3	0.2	-24.7	0
28	CAMAX Manufacturing	11.3	12.4	12.3	-0.6	0.5
29	CAMTEK	1.1	1.2	-	-100.0	-
30	Caroline Informatique	1.2	1.4	-	-100.0	-
31	CATALPA groupe Missler	1.5	1.2	1.1	-10.3	0
32	Century Research Center	1.3	1.1	1.1	-1.9	0
33	CGTech	1.7	2.0	2.1	8.7	0.1
34	Cimatron	8.0	9.7	13.5	39.9	0.6
35	CIMLINC	7.8	8.5	10.0	17.3	0.4
36	Cimplex	1.3	1.5	1.5	-	0.1
37	Cimtel	1.0	1.0	0.8	-15.4	0

(Continued)

Table B-1 (Continued)
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
All Mechanical Software Companies, Worldwide, All Operating Systems

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
38	CLARIS	2.7	1.2	-	-100.0	-
39	CMstat	-	1.0	1.4	40.0	0.1
40	CNC Software	6.0	6.1	6.7	10.1	0.3
41	Computational Mechanics	2.4	2.0	2.1	5.0	0.1
42	Computervision	193.5	148.6	148.9	0.2	6.1
43	Concentra	9.1	8.1	10.0	24.0	0.4
44	CSAR Corp.	0.9	1.1	1.2	7.7	0
45	Database Applications	-	0.4	0.5	28.6	0
46	debis Systemhaus	1.7	2.0	2.1	6.1	0.1
47	Delcam International	12.6	9.3	11.4	21.7	0.5
48	Deneb Robotics	4.3	5.5	8.0	44.6	0.3
49	Design Automation	7.6	6.5	6.7	3.1	0.3
50	DP Technology	2.5	3.3	3.7	13.5	0.2
51	EDS Unigraphics	114.6	148.9	169.8	14.0	6.9
52	Eigner + Partner	0.3	0.4	0.5	33.3	0
53	EME	0.4	0.3	-	-100.0	-
54	Engineered Software	0.1	0.5	0.6	7.8	0
55	Engineering Mechanics	5.5	6.2	7.2	15.0	0.3
56	Evolution Computing	1.2	1.5	1.0	-31.1	0
57	Exapt	4.2	3.8	3.2	-17.4	0.1
58	FEA	0.7	0.9	-	-100.0	-
59	FEGS	1.0	0.9	-	-100.0	-
60	Formtek	6.2	9.6	17.3	80.3	0.7
61	Framasoft	4.6	4.4	4.8	8.7	0.2
62	Fujitsu	14.1	20.6	24.9	20.9	1.0
63	Georgia Tech Research Corp.	0.2	0.5	-	-100.0	-
64	Gerber Systems	8.6	11.4	10.9	-4.3	0.4
65	Gibbs and Assoc.	1.5	1.7	1.9	10.0	0.1
66	GRAFTEK	2.9	3.1	3.4	7.1	0.1
67	Graphisoft Group	0.5	0.1	0.2	61.8	0
68	GRAPHSOFT	0.7	1.2	1.5	26.6	0.1
69	Graphtec Engineering	6.9	7.0	7.9	12.4	0.3
70	Han Dataport	5.4	4.4	5.5	26.3	0.2
71	Hewlett-Packard	72.8	70.0	71.6	2.3	2.9
72	Hitachi	54.8	61.8	66.4	7.5	2.7
73	Hitachi Zosen Info Systems	34.0	38.7	34.5	-10.7	1.4
74	HoSoft CAD	-	1.0	1.3	25.0	0.1

(Continued)

Table B-1 (Continued)
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
All Mechanical Software Companies, Worldwide, All Operating Systems

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
75	IBM	296.7	332.7	363.7	9.3	14.8
76	ICEM Technologies	22.2	10.3	10.9	5.8	0.4
77	ICL	3.6	3.4	3.2	-5.5	0.1
78	IMSI	0.4	0.5	0.5	-	0
79	Innovative Data Design	0.2	0.2	-	-100.0	-
80	Intergraph	71.9	71.0	61.1	-14.0	2.5
81	Investronica SA	10.1	10.4	10.5	1.2	0.4
82	ISD Software	13.4	12.2	13.2	8.2	0.5
83	Isicad	10.2	4.6	-	-100.0	-
84	ISKA	0.9	0.9	0.9	-1.7	0
85	ItalCad	6.7	3.5	-	-100.0	-
86	Kloeckner-Moeller	1.9	1.9	1.9	-1.6	0.1
87	Kreon	0.2	0.2	-	-100.0	-
88	Kubota Computer	7.3	7.2	8.3	15.6	0.3
89	Lamp Software	0.1	0.1	-	-100.0	-
90	Livermore Software Tech.	0.7	0.9	1.1	30.0	0
91	MacNeal-Schwendler	105.5	115.9	95.0	-18.1	3.9
92	MARC	11.8	13.1	15.5	18.2	0.6
93	Marcus Computer Systeme	6.8	3.1	1.6	-48.9	0.1
94	Matra Datavision	63.4	63.0	75.5	19.8	3.1
95	MC2 Engineering Software	0.3	0.3	-	-100.0	-
96	MCS	9.8	12.5	13.0	4.0	0.5
97	Mechanical Dynamics	6.8	6.1	7.3	20.0	0.3
98	Micrografx	3.1	3.6	3.9	7.5	0.2
99	Mitsui Engineering	5.3	16.7	12.9	-22.9	0.5
100	NEC	50.4	54.3	61.7	13.7	2.5
101	Nihon Unisys	38.0	51.5	48.1	-6.5	2.0
102	NOVASOFT Systems	0.5	0.8	1.0	33.3	0
103	Omron	5.8	4.6	5.2	12.4	0.2
104	PAFEC	6.1	4.9	4.9	-0.6	0.2
105	Parametric Technology	81.2	150.2	205.0	36.4	8.3
106	Pathtrace Engineering Systems	2.2	2.1	2.5	19.5	0.1
107	PROCAD GmbH	4.6	4.7	14.3	204.3	0.6
108	Radan Computational	7.9	8.7	8.7	0.7	0.4
109	Rasna Corporation	8.8	13.6	15.8	16.1	0.6
110	Ricoh—No Dist	3.6	1.7	2.1	23.4	0.1
111	RoboCAD Solutions	2.9	3.0	3.2	7.7	0.1

(Continued)

Table B-1 (Continued)
1994 CAD/CAM/CAE/GIS Software Market Share Update Table (Revenue in $M)
All Mechanical Software Companies, Worldwide, All Operating Systems

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
112	S.T.L.D. s.r.l.	0.5	0.4	-	-100.0	-
113	SDRC	83.7	85.6	111.4	30.1	4.5
114	Serbi	4.3	4.5	5.0	12.0	0.2
115	Sharp System Products—No Dist	14.3	22.3	26.3	17.7	1.1
116	Sherpa Corp.	9.0	12.0	15.0	25.0	0.6
117	Siemens Nixdorf Info systeme	30.9	26.2	24.7	-5.8	1.0
118	Softdesk	2.3	3.4	1.2	-66.2	0
119	Softronics	1.7	1.3	0.9	-26.6	0
120	SRAC	5.2	6.0	6.8	14.3	0.3
121	Straessle Informationssysteme	24.8	15.7	18.6	18.7	0.8
122	Superdraft	1.4	1.3	1.4	5.1	0.1
123	Surfware	-	1.5	1.7	11.1	0.1
124	Tebis	10.1	6.5	6.9	7.2	0.3
125	Technische Computer Systeme	2.3	3.3	3.6	10.1	0.1
126	Tokyo Electron—No Dist	16.0	12.6	14.3	13.5	0.6
127	Toshiba Engineering—No Dist	8.9	9.0	9.9	10.6	0.4
128	Toshiba—No Dist	41.9	45.3	49.0	8.2	2.0
129	Toyo Information Systems—No Dist	6.0	6.9	7.6	10.0	0.3
130	Uchida Yoko	0.7	0.7	0.8	11.3	0
131	Variation Systems Analysis	1.2	1.5	2.0	33.3	0.1
132	Vero International Software	2.9	1.1	1.6	45.3	0.1
133	Wacom	6.2	5.7	5.9	3.7	0.2
134	Whessoe Computing Systems	3.8	3.8	4.2	10.2	0.2
135	Wiechers Datentechnik	8.1	8.5	9.0	5.7	0.4
136	WiN Technology	-	0.3	0.4	50.0	0
137	Workgroup Tech.	1.5	2.0	3.0	50.0	0.1
138	Yokogawa Digital Computer	-	-	0.2	NA	0
139	Ziegler Informatics	5.8	6.1	5.0	-17.5	0.2
140	Zuken-Redac	0.4	0.5	0.8	76.5	0
	All N.A. Companies	1,443.8	1,584.1	1,737.9	9.7	70.8
	All European Companies	328.3	282.6	311.5	10.2	12.7
	All Asian Companies	353.0	382.3	406.1	6.2	16.5
	All Companies	2,125.1	2,248.9	2,455.5	9.2	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table C-1
1994 CAD/CAM/CAE/GIS Total Vendor Market Share Update Table
(Revenue in $M, Actual Units)
Top 30 Mechanical Software Companies, Worldwide, All Operating Systems

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Factory Revenue	1994 Share of Market (%)
1	IBM	42,919	363.7	720.8	291.8	1,470.8	18.5
2	Hewlett-Packard	35,849	71.6	623.3	152.7	847.6	10.6
3	Digital Equipment	51,129	-	681.0	96.8	777.7	9.8
4	Sun Microsystems	37,296	-	602.9	80.5	683.4	8.6
5	Silicon Graphics	12,432	-	339.6	42.8	382.4	4.8
6	Computervision	-	148.9	-	181.8	330.8	4.2
7	EDS Unigraphics	4,907	172.9	69.7	63.7	306.3	3.8
8	Parametric Technology	-	205.0	-	57.8	262.8	3.3
9	NEC	14,501	61.7	107.4	27.7	249.3	3.1
10	Fujitsu	9,730	24.9	143.2	37.9	206.0	2.6
11	Nihon Unisys	1,475	48.1	88.7	43.2	198.0	2.5
12	Intergraph	5,014	61.1	46.9	58.1	177.0	2.2
13	Autodesk	-	176.8	-	-	176.8	2.2
14	SDRC	-	111.4	-	56.1	167.5	2.1
15	Hitachi	4,184	66.4	53.3	15.3	149.8	1.9
16	Matra Datavision	2,683	75.5	39.2	12.3	135.0	1.7
17	Toshiba—No Dist	3,605	49.0	46.0	12.2	118.7	1.5
18	MacNeal-Schwendler	-	95.0	-	21.7	116.7	1.5
19	Hitachi Zosen Info Systems	700	34.5	27.0	14.9	84.9	1.1
20	Applicon	757	29.6	12.3	19.2	69.2	0.9
21	Siemens Nixdorf Info systeme	1,317	24.7	17.4	17.7	61.2	0.8
22	Sharp System Products—No Dist	451	26.3	12.5	-	47.8	0.6
23	Kubota Computer	544	8.3	33.5	3.8	45.6	0.6
24	Mitsui Engineering	168	12.9	6.3	16.3	45.0	0.6
25	Delcam International	705	12.2	16.4	11.5	42.9	0.5
26	Investronica SA	1,368	10.5	10.5	7.7	42.1	0.5
27	ASCAD	537	12.1	15.8	3.8	37.2	0.5
28	Ansys	-	32.5	-	1.4	33.9	0.4
29	Alias Research	-	29.6	-	2.2	32.2	0.4
30	ICEM Technologies	474	10.9	10.0	9.8	31.3	0.4
	Other Companies	116,062	-	312.6	11.8	493.4	6.2
	All N.A. Companies	147,074	1,737.9	2,427.7	1,231.7	5,515.5	69.2
	All European Companies	12,295	311.5	167.2	114.8	634.2	8.0
	All Asian Companies	39,455	406.1	581.5	187.8	1,325.6	16.6
	All Companies	314,885	2,455.5	3,489.0	1,546.0	7,968.8	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
Source: Dataquest (August 1995)

Table C-2
1994 CAD/CAM/CAE/GIS Total Vendor Market Share Update Table
(Revenue in $M, Actual Units)
Top 30 Mechanical Software Companies, Worldwide, UNIX

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Factory Revenue	1994 Share of Market (%)
1	IBM	18,140	232.4	509.5	196.2	987.8	17.1
2	Hewlett-Packard	24,169	66.8	586.9	148.7	802.3	13.9
3	Sun Microsystems	37,296	-	602.9	80.5	683.4	11.8
4	Silicon Graphics	12,432	-	339.6	42.8	382.4	6.6
5	Computervision	-	142.0	-	181.8	323.8	5.6
6	Digital Equipment	13,900	-	267.5	43.6	311.1	5.4
7	EDS Unigraphics	4,907	172.9	69.7	63.7	306.3	5.3
8	Parametric Technology	-	184.5	-	52.0	236.5	4.1
9	SDRC	-	111.4	-	56.1	167.5	2.9
10	Nihon Unisys	1,404	43.8	66.3	36.1	162.4	2.8
11	Fujitsu	4,241	16.7	110.3	26.4	153.3	2.7
12	NEC	3,424	42.0	52.1	17.2	149.0	2.6
13	Matra Datavision	2,407	73.8	38.3	12.3	132.3	2.3
14	Hitachi	2,471	52.9	42.4	12.1	118.8	2.1
15	Intergraph	1,025	37.9	19.7	32.1	95.6	1.7
16	Toshiba—No Dist	1,025	35.6	33.2	8.8	85.9	1.5
17	Hitachi Zosen Info Systems	700	34.5	27.0	14.9	84.9	1.5
18	MacNeal-Schwendler	-	66.6	-	14.9	81.6	1.4
19	Applicon	757	28.6	12.3	19.1	68.2	1.2
20	Siemens Nixdorf Info systeme	714	21.2	15.3	17.5	55.1	1.0
21	Sharp System Products—No Dist	451	26.3	12.5	-	47.8	0.8
22	Mitsui Engineering	124	12.4	5.7	16.1	42.7	0.7
23	Delcam International	627	11.6	16.0	11.4	41.7	0.7
24	Kubota Computer	381	7.1	27.8	3.2	38.1	0.7
25	ASCAD	514	11.5	15.6	3.7	36.1	0.6
26	Alias Research	-	29.6	-	2.2	32.2	0.6
27	ICEM Technologies	474	10.9	10.0	9.8	31.3	0.5
28	Tokyo Electron—No Dist	141	14.3	7.0	6.2	29.7	0.5
29	Gerber Systems	403	12.1	9.4	5.5	29.1	0.5
30	Straessle Informationssysteme	192	18.6	2.5	6.4	27.8	0.5
	All N.A. Companies	82,865	1,262.1	1,913.4	1,022.0	4,265.4	73.8
	All European Companies	7,253	224.3	135.1	91.0	472.6	8.2
	All Asian Companies	17,719	332.3	437.4	149.4	1,043.5	18.0
	All Companies	107,837	1,818.7	2,485.9	1,262.5	5,781.5	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
Source: Dataquest (August 1995)

Table C-3
1994 CAD/CAM/CAE/GIS Total Vendor Market Share Update Table
(Revenue in $M, Actual Units)
Top 30 Mechanical Software Companies, Worldwide, NT/Hybrid

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Factory Revenue	1994 Share of Market (%)
1	Intergraph	968	13.6	12.7	13.6	42.5	47.4
2	Parametric Technology	-	20.5	-	5.8	26.3	29.3
3	Digital Equipment	518	-	6.1	1.7	7.8	8.7
4	Hewlett-Packard	340	-	3.4	0.4	3.8	4.2
5	SPATIAL Technology	-	2.0	-	0.5	2.5	2.8
6	Rasna Corporation	-	1.6	-	0.6	2.1	2.4
7	PROCAD GmbH	20	1.5	0.2	0.3	2.0	2.3
8	CAD Distribution	-	0.1	-	0	0.1	0.1
9	Sun Microsystems	-	-	-	-	-	-
	Other Companies	452	-	4.8	-	4.8	5.4
	All N.A. Companies	1,826	35.4	22.2	22.5	82.6	92.3
	All European Companies	20	1.6	0.2	0.3	2.1	2.3
	All Asian Companies	-	-	-			-
	All Companies	2,297	36.9	27.2	22.8	89.6	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
Source: Dataquest (August 1995)

Table C-4
1994 CAD/CAM/CAE/GIS Total Vendor Market Share Update Table
(Revenue in $M, Actual Units)
Top 30 Mechanical Software Companies, Worldwide, Personal Computer

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Factory Revenue	1994 Share of Market (%)
1	Autodesk	-	166.3	-	-	166.3	13.9
2	IBM	24,232	48.6	87.3	2.6	138.5	11.6
3	NEC	11,077	19.7	55.2	10.1	99.8	8.4
4	Digital Equipment	32,525	-	90.1	3.2	93.3	7.8
5	Fujitsu	5,489	6.2	32.9	9.3	48.4	4.1
6	Investronica SA	1,368	10.5	10.5	7.7	42.1	3.5
7	Hewlett-Packard	11,340	4.9	33.0	3.7	41.5	3.5
8	Intergraph	3,021	9.7	14.5	8.9	35.4	3.0
9	Toshiba—No Dist	2,581	13.4	12.8	3.4	32.8	2.7
10	Hitachi	1,156	9.7	8.0	2.3	22.0	1.8
11	Cimatron	751	8.6	3.7	1.5	15.1	1.3
12	Tebis	137	6.2	1.8	3.8	13.1	1.1
13	Wiechers Datentechnik	244	8.1	2.5	1.9	12.5	1.0
14	Design Automation	333	8.7	0.4	0.4	10.9	0.9
15	MCS	43	9.0	0.2	1.1	10.6	0.9
16	Formtek	181	5.2	0.3	2.3	7.9	0.7
17	CAD Lab	256	4.2	1.7	2.0	7.8	0.7
18	CNC Software	-	7.6	-	-	7.6	0.6
19	Ansys	-	7.2	-	0.3	7.5	0.6
20	Computervision	-	6.9	-	-	6.9	0.6
21	CADKEY	-	6.8	-	-	6.8	0.6
22	Wacom	237	4.7	1.3	0.8	6.7	0.6
23	Serbi	472	5.0	1.4	-	6.5	0.5
24	ADRA Systems	-	5.1	-	1.3	6.3	0.5
25	Siemens Nixdorf Info systeme	603	3.5	2.1	0.2	6.1	0.5
26	ASHLAR	-	5.8	-	0.3	6.1	0.5
27	CAMAX Manufacturing	-	5.0	-	0.7	5.7	0.5
28	American Small Business Comp.	-	5.5	-	-	5.5	0.5
29	Anilam Electronics	47	4.1	0.4	0.4	5.4	0.5
30	Algor Interactive Systems	-	4.6	-	0.7	5.3	0.4
	Other Companies	115,376	-	262.7	-	262.7	22.0
	All N.A. Companies	59,736	323.8	196.7	33.4	556.6	46.6
	All European Companies	4,950	81.8	30.1	21.8	151.1	12.7
	All Asian Companies	21,044	61.6	112.9	26.6	223.7	18.7
	All Companies	201,106	467.2	602.4	81.8	1,194.1	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
Source: Dataquest (August 1995)

Table C-5
1994 CAD/CAM/CAE/GIS Total Vendor Market Share Update Table
(Revenue in $M, Actual Units)
Top 30 Mechanical Software Companies, Worldwide, Host/Proprietary

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Factory Revenue	1994 Share of Market (%)
1	Digital Equipment	4,186	-	317.3	48.3	365.5	40.5
2	IBM	547	82.7	124.0	93.0	344.5	38.1
3	Nihon Unisys	71	4.3	22.5	7.1	35.6	3.9
4	MacNeal-Schwendler	-	28.4	-	6.8	35.1	3.9
5	Hitachi	557	3.8	3.0	0.9	8.9	1.0
6	Exapt	70	2.0	1.7	1.0	5.9	0.6
7	Kubota Computer	45	0.9	4.1	0.4	5.4	0.6
8	Fujitsu	-	2.0	-	2.2	4.2	0.5
9	Intergraph	-	-	-	3.5	3.5	0.4
10	Ansys	-	3.3	-	0.1	3.4	0.4
11	Toyo Information Systems—No Dist	17	0.9	1.3	0.4	2.9	0.3
12	Mechanical Dynamics	-	1.3	-	1.2	2.4	0.3
13	GRAFTEK	13	0.4	0.4	0.2	1.2	0.1
14	Century Research Center	2	0.4	0.3	0.1	0.9	0.1
15	Access Corp.	-	0.5	-	0.5	0.9	0.1
16	Framasoft	-	0.4	-	0.4	0.9	0.1
17	Whessoe Computing Systems	-	0.6	-	-	0.6	0.1
18	NOVASOFT Systems	-	0.3	-	0.3	0.6	0.1
19	Computational Mechanics	-	0.5	-	-	0.5	0.1
20	NEC	-	-	-	0.5	0.5	0.1
21	debis Systemhaus	1	0.3	0	0	0.4	0
22	Cimtel	1	0	0.1	0.2	0.3	0
23	Rasna Corporation	-	0.1	-	0	0.1	0
24	Sun Microsystems	-	-	-	-	-	-
	Other Companies	234	-	45.1	11.8	225.9	25.0
	All N.A. Companies	2,647	116.6	295.5	153.8	610.9	67.6
	All European Companies	72	3.8	1.8	1.6	8.4	0.9
	All Asian Companies	692	12.3	31.1	11.7	58.4	6.5
	All Companies	3,645	132.7	373.6	178.9	903.6	100.0

Note: Vendor data includes OEM revenue and shipments, so sum of vendors is greater than total.
Source: Dataquest (August 1995)

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Market Analysis

Dataquest

Competitive Dynamics

Mechanical Applications Worldwide

Competitive Analysis

Product Data Management Systems—Ready to Take Off

Abstract: *Product data management (PDM) has been waiting to take off for the past few years. The time has finally come, and PDM is now in full swing. The market is quickly taking shape, with many industries and companies deploying some type of document or data management system in a pilot project or full-scale implementation. In this article we take a look at the PDM market, including Dataquest's definition of PDM, its boundaries, and vendor offerings.*
By Sharon Tan

PDM Systems Are Poised to Grow

Product data management (PDM) is finally gaining momentum. The engineering environment has reached the point where the number of CAD files at a given site is monumental. Dataquest end-user research shows that there are an average of 19,000 active CAD files per site. There is now a critical mass of users in need of some sort of PDM system to reduce costs and gain control of the work environment.

In the early 1990s, PDM systems posted slow growth, mainly because these systems have traditionally been expensive to deploy, complex to install, and hard to maintain. But there has been a new evolution in user-friendliness for PDM systems, and this has added to the recent surge of pilot projects in several companies.

End-user studies conducted in Europe, the United States, and Japan indicate a need for some sort of data management system. In a survey conducted in Europe and the United States in 1993 and in Japan in 1994, we asked mechanical CAD users to rate the importance of PDM software to their work and their satisfaction with the available products. The results, shown in Table 1, indicate the need, from a user perspective, for PDM within the engineering and manufacturing work environments. Both surveys showed little variation by industry in terms of PDM importance ratings.

Dataquest

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Table 1
Importance and Satisfaction Ratings for PDM System

	Importance	Satisfaction
Europe and United States (1993)	3.8	3.0
Japan (1994)	4.3	2.4

Note: Ratings are on a scale of 1 to 5, 1 = not important or not satisfied, 5 = very important or very satisfied.
Source: Dataquest (May 1995)

PDM Market Size

PDM tools form the basis for what Dataquest calls "system management and tools." Earlier in 1995, Dataquest stated that the system management and tools market was approximately $200 million at the beginning of 1994 and that it will nearly double in size by 1998. However, Dataquest now believes that the PDM market is larger than we originally projected. An updated market size and forecast for the PDM market will appear in Dataquest's Mechanical CAD/CAM/CAE Market Trends report, to be published later this year. In the meantime, we will be further investigating this market to get a clearer picture of the size and revenue potential of the PDM market, all within the context of our larger worldwide CAD/CAM/CAE database.

Dataquest still anticipates that this market will grow significantly over the next four years, posting one of the highest growth rates of all mechanical CAD/CAM/CAE subapplications. Much of the growth in the next few years will come from Europe and North America; Japan and Asia/Pacific will adopt PDM later, on a much smaller scale and at a slower pace.

Dataquest's Definition of PDM

The boundaries of a full-fledged PDM system are at times distinct and at other times unclear, with vendors claiming varying degrees of capabilities, functionality, and features. The market has seen many new entrants over the past few years, including both niche PDM players and traditional document management companies. A PDM system, according to the Dataquest definition, consists of the following three elements: vault management, workflow, and product structure management. Key system functionality and capabilities within each element are as follows:

- Vault management—This involves the control and access of product data files (for example, CAD files, technical files, and documents) and the meta-data associated with them. Vault management refers to such features as document/file security, check in/check out, user access privileges, backup, and archiving.
- Workflow—This includes change management capabilities, workflow routing, notification, audit trail histories, project status, revision control, and electronic sign-off.
- Product structure management—This includes relationships between parts or products, including options and versions, search mechanisms, bill-of-materials creation, modification and viewing capabilities, and report generation for product information.

Other Differentiators for PDM Systems

While PDM systems may differ in the degree to which they support the elements discussed previously, these are not the only differentiators. Other capabilities and features of a PDM system may include the following:

- Graphical user interface (GUI)—The acceptance of PDM systems by the end user can depend greatly on the systems' user-friendliness and look. GUIs, for both the user and the system administrator, are steadily becoming more common in PDM systems.
- Database management system—Most systems rely on a commercially available relational database such as Oracle, Ingres, and Sybase. Some products, such as Adra's Matrix, are using an object-oriented database management system.
- Architecture—PDM systems are typically administered in a client/server arrangement, with many PDM systems now offering PCs as clients.
- Encapsulation—Encapsulation refers to the ability to launch a CAD application from within the PDM system. Most PDM software today offers some encapsulation abilities.
- Integration—Some PDM software offers application integration capabilities, whereby users can access the PDM system directly from the CAD application in which they work.
- Enterprise or workgroup focus—Most vendors are touting scalability, such that a given system can work on both a workgroup and enterprise-wide level. At a true enterprise level, other issues become relevant, including distributed databases, support for different platforms, support across many geographies, and more data generation and management. Full-scale, enterprisewide PDM implementations are still rare, with most companies choosing to start with smaller, workgroup-focused pilot projects.

The Market

The PDM market consists of essentially three groups of players, each of which approaches the market with a different perspective and background. The first group consists of mechanical CAD/CAM vendors. These players have a strong history in mechanical CAD and understand the needs of the user from an engineering or manufacturing perspective. These vendors' products are often integrated tightly within the company's mechanical CAD/CAM product line but are independent enough to run without the CAD/CAM software. The second group consists of those vendors coming from the document management realm; they offer systems originally aimed at other industries, such as pharmaceuticals or process industries. This group of vendors has found an interest in their systems from the technical/engineering worlds, especially from those companies whose primary interests are in vault management or workflow capabilities. The third group consists of the specialty niche vendors whose flagship product is a PDM system. Some of these vendors also come from a strong mechanical CAD background.

From a worldwide perspective, Dataquest sees strong technology developments coming from both the United States and Europe, particularly Germany and the United Kingdom.

Table 2 provides an overview of the players in the PDM market. This table contains vendors from all three groups discussed earlier (CAD companies, document management players, and specialty PDM providers). We include some traditional document management vendors in Table 2 because PDM vendors are seeing some, albeit limited, competition from this group. Furthermore, these players have the potential to enter the PDM market with a stronger offering at a future date. Additionally, there are some CAD vendors that offer a PDM product primarily for use by their own end users. These vendors include Dassault Systemes and Matra Datavision, which do not appear in Table 2.

Table 2
PDM Vendors

Vendor	Product Name	Product Structure Management	Workflow	Vault Management	Concentration
ACCESS Corporation	TDMS	NA	X	X	Workgroup
Adra Systems	Matrix	X	X	X	Enterprise
Applicon	BravoFRAME	X	X	X	Enterprise
Autodesk	WorkCenter	NA	X	X	Workgroup
Auto-trol Technology	CENTRA 2000	X	X	X	Enterprise
B.A. Intelligence (BAIN)	MANTA	X	X	X	Enterprise
Cimtel Ltd.	CIM-EDM	X	X	X	Workgroup
CMstat	CMstat	X	X	X	Enterprise
Computervision	Optegra	X	X	X	Enterprise
Database Applications	CADEXnet	X	X	X	Workgroup
Digital	EDCS II	NA	X	X	Enterprise
Documentum	EDMS	NA	X	X	Enterprise
EDS	IMAN	X	X	X	Enterprise
Eigner + Partner	CADIM/EDB	X	X	X	Enterprise
FORMTEK	TDM	X	X	X	Enterprise
Hewlett-Packard	WorkManager	X	X	X	Enterprise
HoSoft CAD	CORA II	X	X	X	Enterprise
IBM	ProductManager	X	X	X	Enterprise
Intergraph	DM2	X	X	X	Enterprise
Metaphase	Metaphase	X	X	X	Enterprise
Mystic Management	DCS-PowerNET	X	X	X	Workgroup
Network Imaging Systems	OneView	NA	X	X	Enterprise
NovaSoft	NovaManage	(1)	X	X	Enterprise
Odesta Systems	Odesta Livelink	NA	X	X	Workgroup
PAFEC	PAFEC EDM	(2)	X	X	Enterprise
PROCAD	PRO*FILE	X	X	X	Enterprise
Sherpa	PIMS	X	X	X	Enterprise
VW-Gedas	priamos	X	X	X	Workgroup
WiN Technology	WiN/PROCube	X	X	X	Workgroup
Workgroup Technology	CMS	X	X	X	Enterprise

NA = Functionality not available
(1) Can be customized for product structure management functionality through NovaWorkbench
(2) Can be customized for product structure management functionality through PAFEC EDM
Source: Dataquest (May 1995)

Component Information Systems

Closely related to PDM are component information systems (CIS). We have excluded CIS from our PDM definition, and we will follow the CIS market as another market within the larger mechanical CAD/CAM/CAE marketplace.

CISs are used to integrate and manage component suppliers within a design or manufacturing environment. A CIS typically consists of a database or repository of parts or components and associated information (like tolerance information, specifications, or part numbers). In an ideal working scenario, different functions in an organization (such as engineering, manufacturing, or purchasing) have access to a CIS database, which can be used to choose both customized and noncustomized parts based on various criteria (such as preferred supplier, previously used parts, or part cost). Implementation of a CIS can involve transferring a company's parts legacy data to the system as well as putting in place new component information and suppliers. We envision that a CIS system can be tightly linked to (or possibly overlap with the functionality of) a PDM system or the CAD environment.

In the past year, we have seen a number of companies enter this market, including Aspect Development, Autodesk, and CADIS. Aspect Development is a new entrant to the CIS market. The company, which was founded in 1991, has traditionally played in the electronic design automation (EDA) market, where it concentrated on components for electronic designs (for example, integrated circuits, microelectronics, and associated datasheets). It has announced plans to enter the mechanical design market later this year. While the company does offer some legacy data conversion, its primary strategy is to source data directly from component manufacturers and to create a database of commercially available parts, complemented by a part search/navigation system, which it then sells. Aspect offers its product on a relational database management system in a client/server arrangement (PC or workstation clients with a UNIX server) for the electronic design market.

CADIS offers a solution to parts management called CADIS-PMX. This product, which is focusing on the mechanical design realm, was launched in late 1994. CADIS is approaching the CIS market from a slightly different angle than Aspect. The company's main strategy is to concentrate on legacy data conversion and the tools needed to manage a database of existing components that are unique to a given company. Also, CADIS-PMX is built on a database based on object-oriented principles, but it does not use a commercial, off-the-shelf object-oriented database. CADIS-PMX works in a client/server arrangement (PC or workstation clients with a UNIX server).

Autodesk is also entering the CIS market at the low end with Mechanical Library, a product focused on delivering data for mechanical design via CD-ROM. While Autodesk's Mechanical Library is a rudimentary product with limited capabilities, it could be a boon for Autodesk. AutoCAD, with its huge installed base, is one of the more popular and well-known CAD software products on the market. Although Mechanical Library, in its present form, will not face competition from Aspect Development or CADIS, it will give Autodesk a comfortable niche in the lower end of the CIS market.

Dataquest Perspective

All of the elements are finally falling into place, and the PDM market is poised for some fast and furious growth. Engineers and designers now see a need for some sort of data management system, and the technology that vendors are offering is finally capable of solving data management problems. The PDM market has over 30 players, each offering a solution with varying degrees of capabilities and functions. Dataquest fully expects this market to consolidate over time, but for now we expect to see a rich mix of vendors, products, features, and customer stories.

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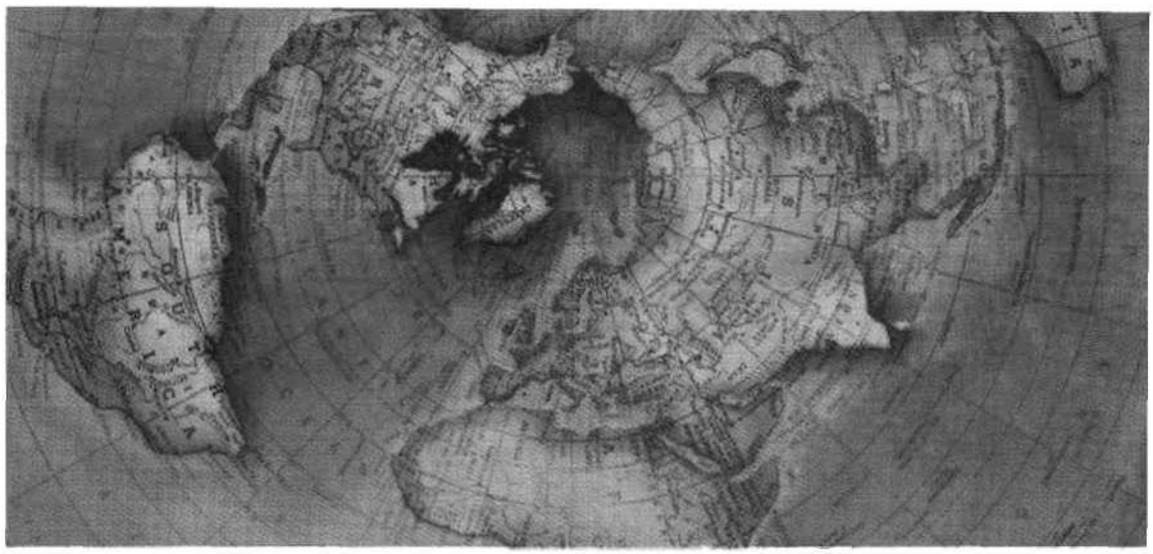
Perspective



Mechanical Applications Worldwide

Dataquest Predicts

It's an Uphill Battle for Windows NT and Mechanical CAD

Abstract: *The world of mechanical CAD/CAM/CAE is still highly entrenched in UNIX. Microsoft's Windows NT operating system is trying to encroach on the mechanical CAD world from the UNIX end or the DOS/Windows end. In this newsletter, we examine the hurdles that Windows NT faces in getting on the desktops of the mechanical engineers and designers.*
By Sharon Tan

The Issue at Hand

While Windows and DOS applications are increasing in use, the UNIX operating system continues to dominate the mechanical CAD/CAM/CAE marketplace. Microsoft's Windows NT is still trying to find a niche, be it at the low end, the high end, or somewhere in between.

Dataquest Predicts

In the world of mechanical CAD, demand for Windows NT operating systems will have to come from the users, and right now, it is slow going for Microsoft and Windows NT. Microsoft and its Windows NT-only allies will have to fight for every seat they get, especially at the high end.

The Confusion with Windows NT

The topic of Microsoft's Windows NT has come up in many discussions with CAD/CAM/CAE software vendors and workstation and PC manufacturers. To date, CAD/CAM applications on Windows NT have not matched Microsoft's hype or the CAD/CAM/CAE industry's expectations. Some of the confusion with Windows NT centers around whether Windows NT is really competing at the low end (facing DOS or Windows competition) or at the high end (facing UNIX competition), and at what price point Windows NT-based products will sell.

Dataquest

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Product Code: CMEC-WW-PD-9502
Publication Date: May 22, 1995
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Windows NT Market in CAD/CAM/CAE/GIS in 1994

While Windows NT-based CAD/CAM/CAE products have been available since late 1993/early 1994, few CAD software vendors have sold products on this platform. To date, Dataquest has seen Windows NT-based products sell in the architecture/engineering/construction (AEC) arena and geographic information systems (GIS) and, to a smaller extent, the mechanical CAD/CAM/CAE arena. Windows NT-based software sales have yet to make a dent in the electronic design automation (EDA) world. Moreover, only one or two vendors sold Windows NT-based products in each of these areas: PTC generated the bulk of the mechanical CAD/CAM/CAE Windows NT-based sales in 1994, and Intergraph and Bentley Systems generated nearly all of the AEC and GIS Windows NT-based sales in 1994 (see Table 1).

Table 1
Windows NT Sales in CAD/CAM/CAE/GIS for 1994
(Millions of Dollars)

	Market Size ($M)	Percentage of Sales That Were Windows NT-Based
Mechanical CAD/CAM/CAE	2,426	1
AEC	877	4
GIS	728	2
EDA	1,435	<1

Source: Dataquest (May 1995)

It's an Uphill Battle for Windows NT in Mechanical CAD

Despite the fact that PTC sold some Windows NT-based software in 1994, it is an uphill battle for Windows NT in the world of mechanical CAD. The CAD/CAM/CAE industry has been around long enough for several operating systems to have emerged, been implemented, and been absorbed into the framework of the end-user environment. Each one along the way has offered some benefit in improved middleware support, performance, or graphics support. The market has been eager to embrace anything that provides a relative performance improvement, significant price benefit, or ease-of-use enhancement. The bottom line opportunity for Windows NT is to address all of these issues.

When examining the market for Windows NT-based products in mechanical CAD/CAM/CAE, it is necessary to divide the market into two camps: the high-end, workstation-based users, and the lower-end, PC-based users. In either case, the challenges for Windows NT deployment are significant. We have seen vendors approach both ends of the market with Windows NT offerings. So far, any Windows NT-based application software that is brought to the market is also available on UNIX or DOS/Windows platforms for the same price. The result is little or no cost savings at the application level.

The users must also consider the lack of understanding of the CAD/CAM/CAE world exhibited by Microsoft. The performance of Windows NT is an indication of Microsoft's failure to understand the complexity of handling large design files in an interactive, high-speed network. There is also the fact that in the real world, most of the equipment cost is in memory,

high-end displays, and accelerator boards. To fully take advantage of Windows NT, users have to add these peripherals and accessories to their PCs, bringing the price of PC hardware much closer to the price of a UNIX workstation. Therefore, Windows NT must at least match UNIX performance to have any chance of replacing UNIX in the high-end mechanical CAD market. So far, Windows NT has not matched UNIX's performance.

UNIX and Windows NT

The mechanical CAD/CAM/CAE market is still largely UNIX based, with UNIX-based software accounting for approximately 73 percent of the mechanical software sold in 1994. Windows NT has generated much hype but not much porting activity among the top mechanical CAD/CAM/CAE vendors, who sell their software primarily on the UNIX operating system (with the exception of Autodesk). The mechanical CAD market share leaders do not seem to be actively pursuing the Windows NT platform (see Table 2).

There are two exceptions to this story. One is PTC. The company reports that $18 million, or slightly under 10 percent, of its 1994 revenue was generated from Windows NT sales. PTC states that these sales were at the same average selling price (ASP) as its UNIX-based sales. The other exception is Rasna, which plays in the analysis market. Rasna reported some sales, albeit small, on the Windows NT platform in 1994. Despite these two exceptions, the other major mechanical CAD vendors are employing a wait-and-see attitude before fully backing Windows NT.

The bottom line for Microsoft and Windows NT in terms of mechanical CAD is that UNIX users are comfortable in a workstation environment and that they cannot be expected to risk networking problems, added security problems, and possible performance limitations with Windows NT. This situation will remain until Windows NT comes closer to matching UNIX's performance. Given that a PC running Windows NT needs a high-end display, extra memory, and a high-speed network, the cost of a souped-up PC with Windows NT comes close to rivaling that of a UNIX workstation. Again, most mechanical CAD users would be reluctant to switch.

Table 2
Windows NT Offerings by Major Mechanical Vendors

Vendor	Product	Windows NT Plans
IBM	CATIA	No immediate plans
PTC	Pro/ENGINEER	Currently offered on Windows NT
Autodesk	AutoCAD	Currently offered on Windows NT
EDS Unigraphics	Unigraphics	Windows NT plans for 1996
Computervision	CADDS5	No plans
SDRC	I-DEAS/Master Series	No immediate plans
Hewlett-Packard	ME10	Currently offered on Windows NT
	ME30, SolidDesigner	No immediate plans
Intergraph	EMS	Will ship Windows NT version in 1995
Matra Datavision	Prelude, EUCLID	Currently offered on Windows NT
Adra	Cadra	Currently offered on Windows NT

Source: Dataquest (May 1995)

DOS, Windows, and Windows NT

At the other end of the spectrum we see those mechanical CAD vendors who play in the DOS and Windows world. DOS- and Windows-based sales made up approximately 17 percent of 1994 mechanical software sales. We see more of the DOS and Windows-based vendors porting their products to the Windows NT platform. This group includes Autodesk, Bentley Systems, and Applicon, as well as a number of smaller niche players (CAMAX, Surfware, and others). For the most part, these products are priced at the same price as their respective DOS/Windows-based software, or slightly higher.

It is still too early to tell how well Windows NT-based products will sell at the low end. Here again, Windows NT-based products are facing an uphill battle. Even with Windows NT software selling at the same price as DOS/Windows software, a current PC owner will suffer some "sticker shock" when shopping for a new Windows NT-compatible system. Furthermore, it is worth pointing out that the DOS/Windows-based mechanical software market is a slow-growing area – this market grew only 5 percent from 1993 to 1994. Much of the growth in the Windows market was at the expense of the DOS market. Windows NT has some opportunity here, but again, the DOS/Windows market for mechanical CAD software is not booming yet.

The Future for Windows NT in Mechanical CAD/CAM/CAE

It appears that Windows NT has barely started to scratch the surface of the mechanical CAD/CAM/CAE market. With the exception of PTC, the major UNIX players have yet to announce availability of their products on Windows NT. We are starting to see some of the traditional PC-based vendors (including some of the numerical control and analysis vendors) coming out with Windows NT-based products, but it is still too early to gauge how well these products will sell in the DOS/Windows world.

For the near future, Microsoft and Windows NT have an uphill battle. Thus far, signs point to the fact that UNIX users will not want to give up the familiarity and performance of their workstation environments. The DOS- and Windows-based mechanical users might move toward Windows NT faster, but we have yet to see this happen. In any case, Windows NT is facing a tough struggle in the mechanical CAD/CAM/CAE arena.

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Competitive Dynamics

Mechanical Applications Worldwide

Company Profile

Hewlett-Packard—Mechanical Design Division

Abstract: *This Company Profile on Hewlett-Packard Company's Mechanical Design Division identifies the organizational structure, product portfolio strengths and weaknesses, and strategic directions of this key software industry player. Analysis includes financial data, corporate strategy and direction, the company's products and technology, and a review of operations, sales, and marketing.*
By Petra Gartzen

Corporate Statistics

Corporate Headquarters	Hanover Street 3000 Palo Alto, CA 94304-1181, USA Telephone: (+1) 415-857-1501 Fax: (+1) 415-857-4586
MDD Headquarters	Herrenberger Straße 130 71034 Böblingen Germany Telephone: +49-7031-14-0 Fax: +40-7031-14-2999
General Manager MDD	Peter Bohn
Number of MDD Employees	135 (excluding sales, administration, and support)
Corporate Revenue	$20.3 billion in 1993, $25.0 billion in 1994
MDD Software Revenue 1993	$70.8 million
R&D Investment	15 percent of MDD turnover
Fiscal Year-End	October 31
Company Founded	1939
HP Entering MCAD Market	1985

Dataquest

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Hewlett-Packard Company's Mechanical Design Division (MDD) provides 2-D and 3-D design, drafting, and documentation systems plus product data management (PDM) solutions for the mechanical CAD/CAM market. Detailed 1994 data is not available at this time.

Corporate Overview

Hewlett-Packard's MDD was founded in Böblingen, Germany, in 1985. In 1986, the company introduced ME30, a 3-D modeling, design, and drafting CAD system. To manage the data generated by companies using ME10 and ME30, HP developed the engineering data management system HP-DMS.

In 1989, MDD was established as an independent division within HP, and that same year MDD started development of its next-generation product, PE/SolidDesigner, which was released in spring 1993.

In 1991, MDD acquired ABB Cade, the Swiss-German electrical engineering CAD company. The product DDS-C is now part of MDD's overall product offering.

In 1994, HP announced an OEM partnership with Cisigraph of France to develop PE/SurfaceStyler, a surface modeling application. In October, MDD announced version 3.0 of its PE/SolidDesigner product.

Organization

HP's MDD is a separate entity within the Software Business Unit (SBU), and like most HP divisions, it has its own profit and loss responsibility.

HP's SBU is headed by General Manager Tilman Schad, who previously held the position of General Manager, MDD. SBU consists of separate software development entities ranging from CASE and network and systems management to MCAD and PDM. See Figure 1 for SBU's organization chart.

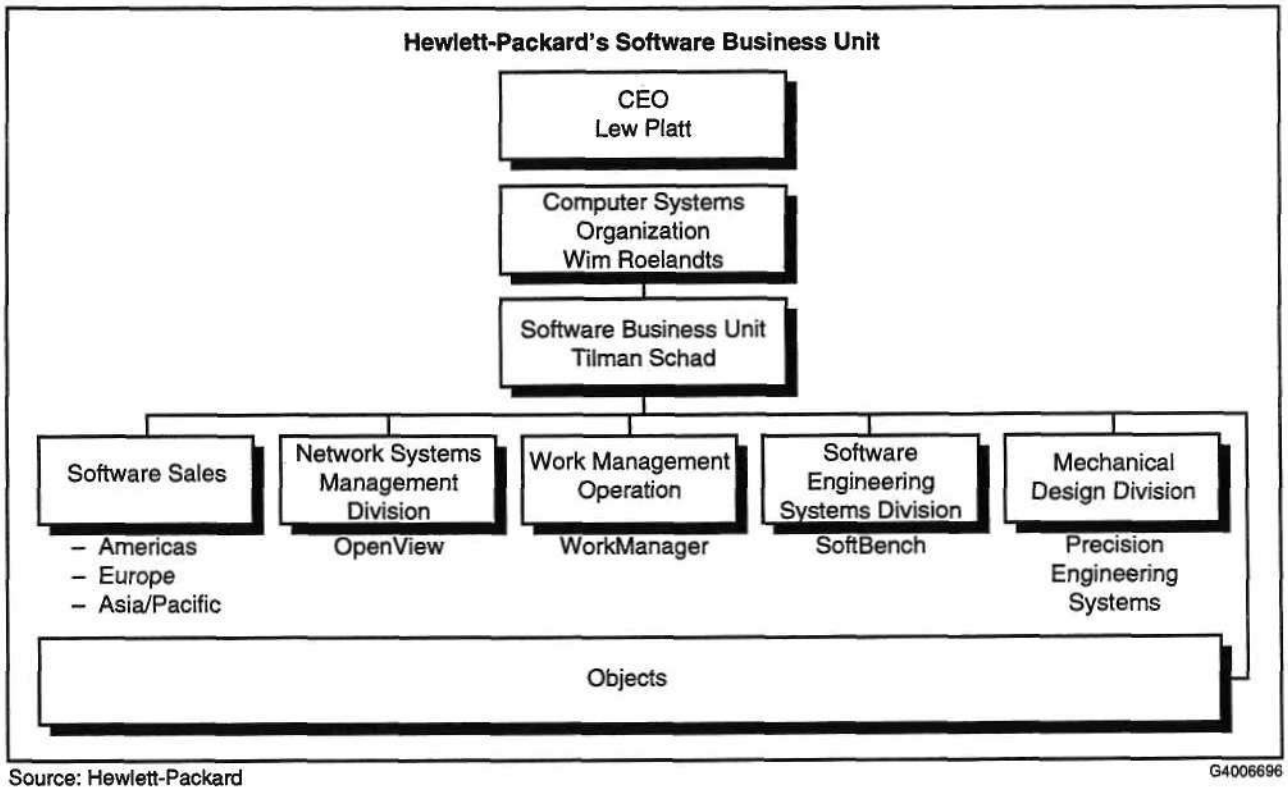
WorkManager, which was developed out of the need for CAD data and workflow management, led to the establishment of a new division called WorkManagement Operation (WMO) in November 1993. WMO also resides in the SBU. This means that MDD's solutions are closely linked to products offered by HP's WMO. Common charters for MDD and WMO support the development of software across multiple platforms.

All aspects of the SBU are also of strategic importance to HP as a whole, because the company uses the SBU's products for its internal product development in many divisions. See Figure 2 for the distribution of mechanical CAD software seats used internally at HP.

In December 1993, Peter Bohn was appointed general manager of MDD; Bohn had previously held several leading positions in software-related divisions within HP.

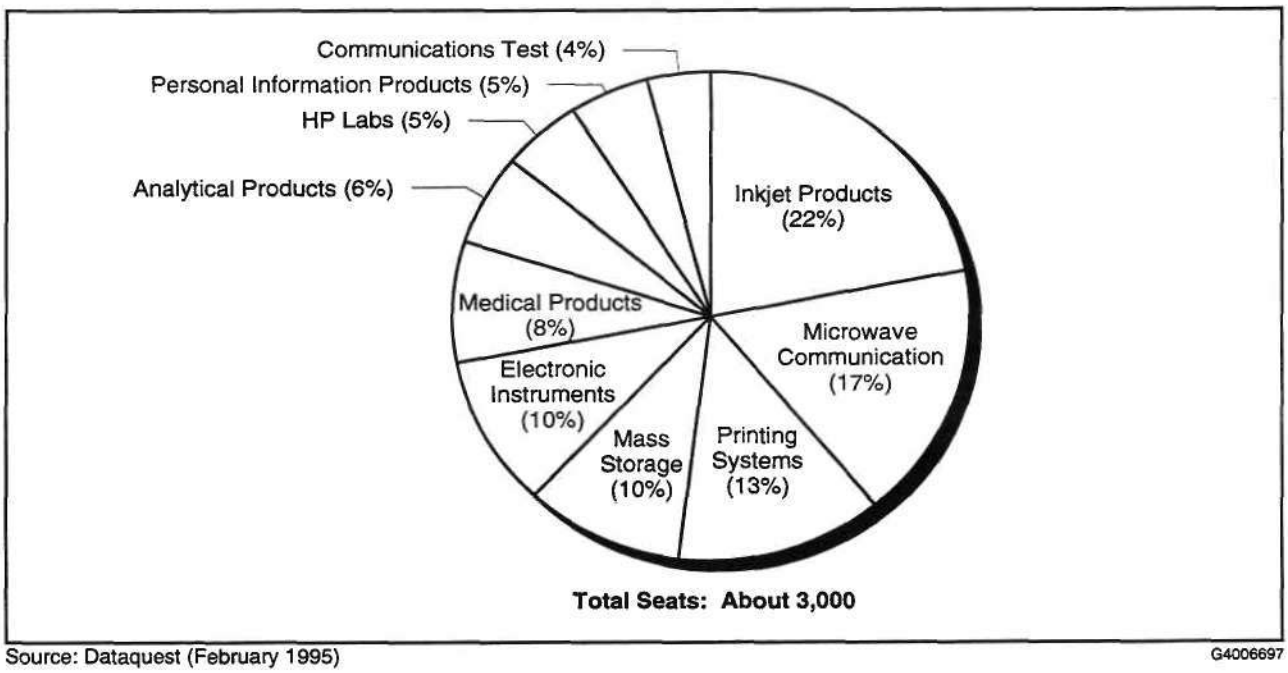
MDD's sales are divided into the three major world regions: Europe, United States, and Asia/Pacific. The product development and marketing areas are divided into two entities: one is in charge of the 2-D business, and the other focuses on the product modeling business.

Figure 1
Hewlett-Packard's Software Business Unit



Source: Hewlett-Packard G4006696

Figure 2
MDD Mechanical Software Seats Shipped into Hewlett-Packard Business Group in 1993



Source: Dataquest (February 1995) G4006697

Mission Statement

Because of the organizational structure, both the SBU's statement and MDD's individual statement apply.

The SBU's mission statement is as follows:

> Provide software foundations and solutions that our customers need to re-engineer their business processes for improved competitiveness.

Areas of Focus:

- Managing the new computing environment
- Workflow and information management
- Software application development environments
- Mechanical product design
- Object-oriented technologies

MDD's mission statement is as follows:

> Improve customer competitiveness by providing to them the highest quality and leading capability software products, services, and consulting in order to increase the effectiveness and efficiency of their product development process.

Market Position

Worldwide, mechanical CAD/CAM/CAE software revenue reached a total of $2.3 billion in 1993. MDD had a 3.1 percent share of that total, which placed the company in the No. 8 position among the top 10 MCAD software vendors (see Table 1). Market growth for mechanical CAD software slowed down in 1993, reaching a growth rate of just under 6 percent over 1992. In Germany, MDD's most important regional market, the market for MCAD applications actually declined by a huge 9.3 percent based on local currency.

MDD claims to have installed more than 50,000 mechanical CAD seats worldwide. Approximately 13 percent of these seats are 3-D products (mainly ME30, but a growing proportion of SolidDesigner), and the rest are ME10 seats (2-D). This is also reflected in the company's turnover in 1993, where the majority of the revenue came from PDM and ME10/ME30 sales. SolidDesigner started shipping in the spring of 1993.

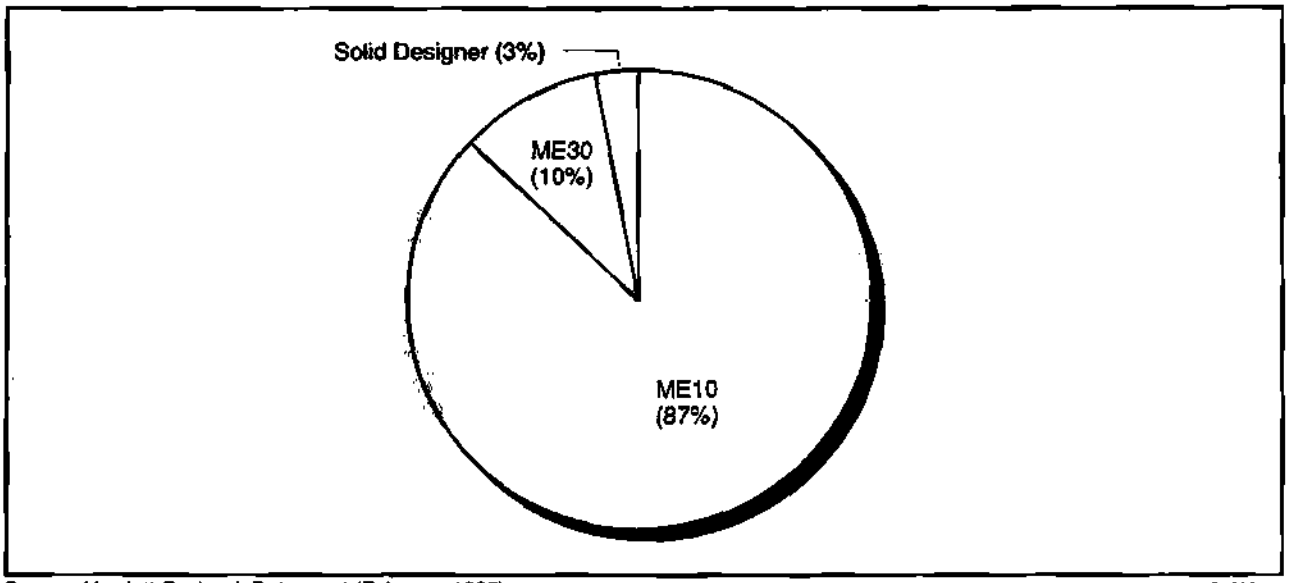
In terms of regional distribution of the aforementioned installed seats, 55 percent are in Europe, 30 percent in Japan, and 15 percent in the United States. The largest proportion, more than half of MDD's turnover and installations in Europe, is generated in Germany. The rest of the installed seats and turnover in Europe is divided among France, the United Kingdom, and Italy. (See Figures 3 and 4.)

Table 1
Top 10 MCAD Software Vendors

	1992 Software Revenue ($M)	1992 Share of Market (%)	1993 Software Revenue ($M)	1993 Share of Market (%)	Software Revenue (%)
IBM	308.7	14.2	325.5	14.2	5.4
Autodesk	136.5	6.3	160.2	7.0	17.4
Parametric Technology	81.2	3.7	151.0	6.6	85.9
Computervision	193.6	8.9	147.5	6.4	-23.8
EDS Unigraphics	106.9	4.9	129.2	5.6	20.9
SDRC	94.4	4.3	120.7	5.3	27.9
MacNeal-Schwendler	59.5	2.7	74.1	3.2	24.6
Hewlett-Packard	72.8	3.4	70.8	3.1	-2.8
Intergraph	72.6	3.3	70.5	3.1	-2.8
Fujitsu	46.9	2.2	67.4	2.9	43.8
Top 10 Companies	1,173.0	54.0	1,316.9	57.4	12.3
All Companies	2,170.4	100.0	2,294.7	100.0	5.7

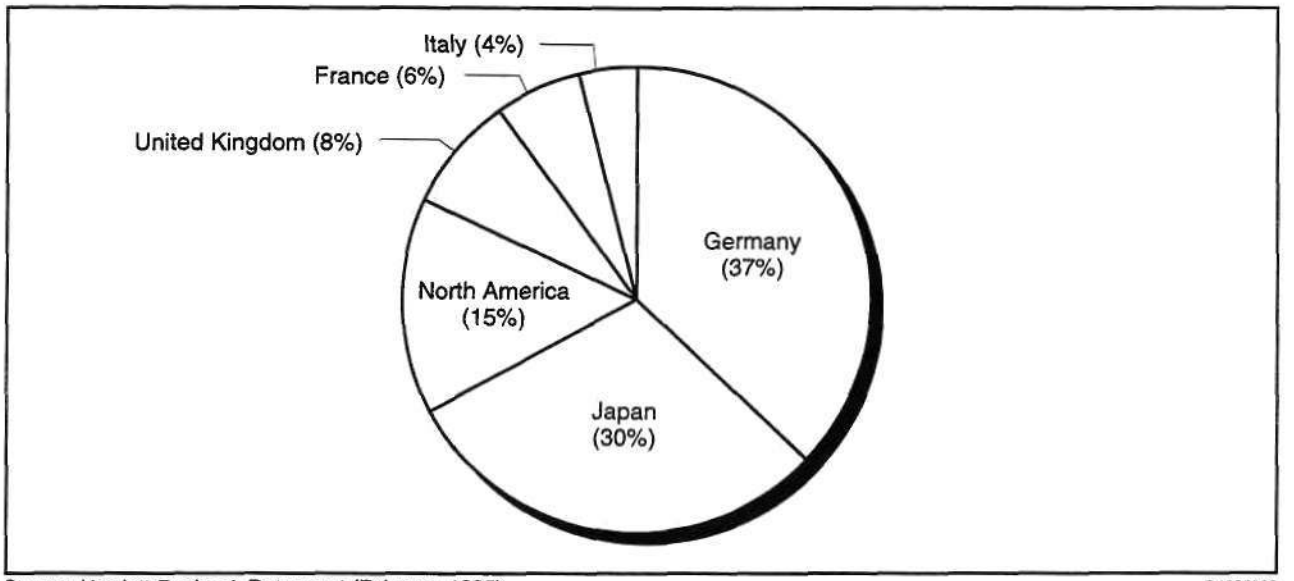
Source: Dataquest (February 1995)

Figure 3
Installed Seats by Product



Source: Hewlett-Packard, Dataquest (February 1995) G4006698

Figure 4
Installed Seats by Region



Source: Hewlett-Packard, Dataquest (February 1995) G4006699

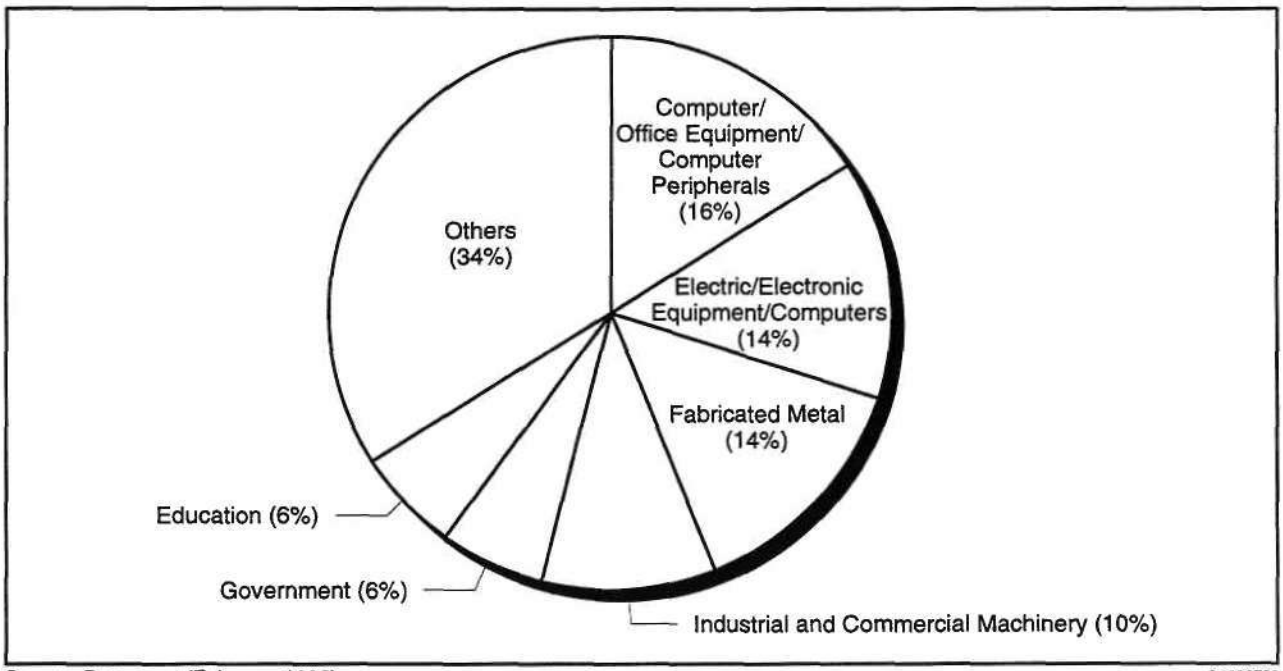
Looking at the company's position by industry sector, the company believes that it has a leading position in the machinery and fabricated metal industries in Germany. In Japan it also holds a leading position in those two industries and is also a major player in electronic packaging. Electronic packaging is a bigger industry in Japan than the machinery sector, whereas in Germany, the machinery sector is dominant. These sectors use ME10 to a large extent rather than solid modeling technology. Figure 5 shows MDD's 1993 worldwide software revenue distribution by industry sector. In each of the four major industry segments displayed in Figure 5, MDD is among the top 10 in software market share ranking (see Table 2).

In terms of mechanical subapplications, the largest portion of MDD's software revenue comes from documentation/drafting applications. This application is also the largest subapplication sector for mechanical software as a whole. MDD holds the number 5 position in this sector, which underlines the strength of its ME10 product. See Figure 6 for MDD's software revenue distribution by mechanical subapplication.

Product and Marketing Strategy

The family for all MDD's products is Precision Engineering Systems. MDD's product offering includes HP PE/SolidDesigner for product modeling design; HP PE/ME10 for 2-D design, drafting, and documentation; HP PE/ME30 for 3-D modeling, design, and drafting; HP PE/SheetAdvisor for sheet metal design; HP PE/DDS-C for electromechanical design; and HP/PE WorkManager for product data and workflow management. This product portfolio will increase soon with the introduction of PE/SurfaceStyler, the surface modeler based on Cisigraph's Strim 100 product. In addition to its own developments, MDD has also teamed up with a variety of software partners in areas such as CAM. See Figure 7 for MDD's product portfolio.

Figure 5
1993 Software Revenue by Industry



Source: Dataquest (February 1995) G4006700

Table 2
MDD's Market Ranking by Industry Sector, 1993

Industry Sector	Ranking
Computers/Office Equipment/Computer Peripherals	4
Electrical/Electronic Equipment/Semiconductors	5
Fabricated Metal Products (except Machinery and Transportation)	4
Industrial and Commercial Machinery	10

Source: Dataquest (February 1995)

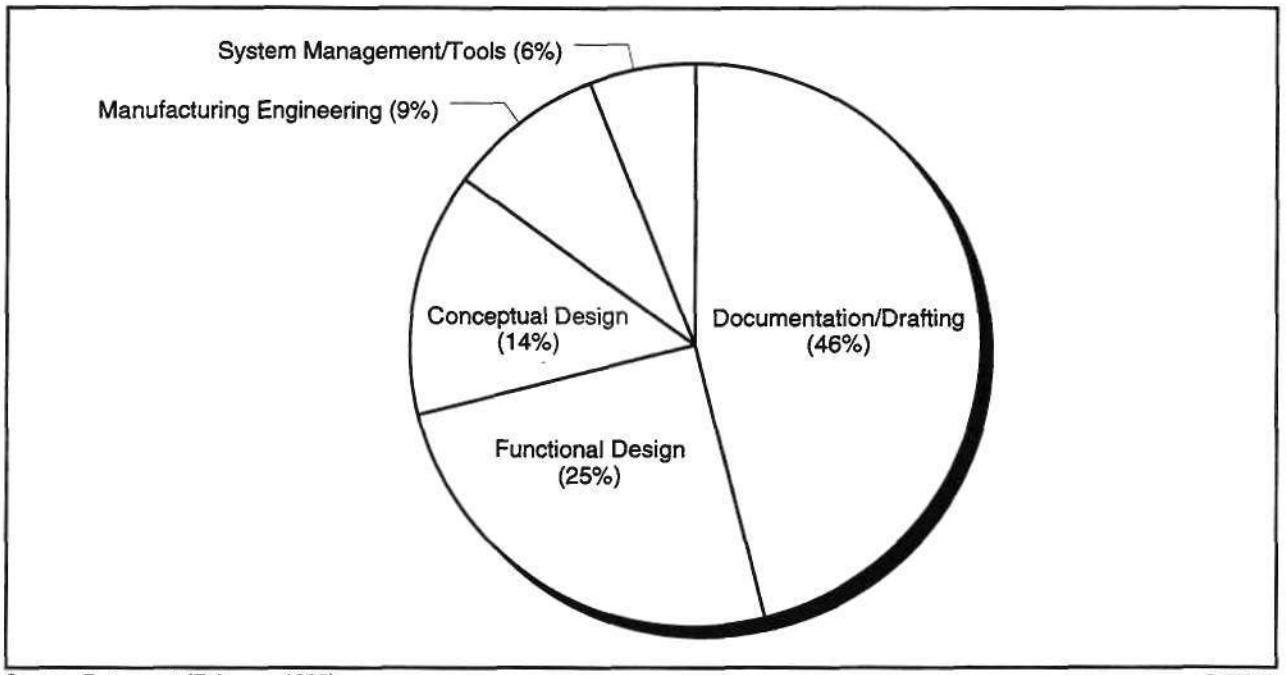
The strength of MDD's product line rests largely with ME10, because 2-D software is preferred in the industry sectors in which MDD operates in Germany and Japan.

In 1989, development of the next-generation product PE/SolidDesigner began. MDD still sells ME30, but PE/SolidDesigner is now the mainstream product.

PE/ME10

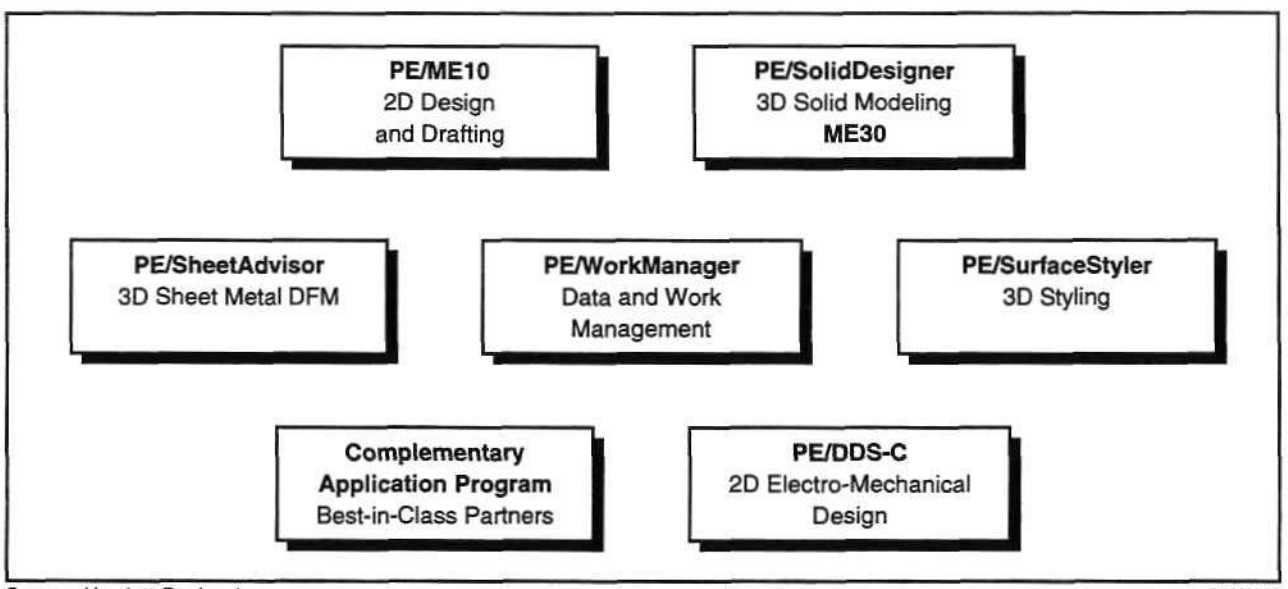
HP PE/ME10, a 2-D design, drafting, and documentation system targeted at mechanical and electromechanical design, is MDD's most successful product so far, with nearly 45,000 installations worldwide. The product is very popular with the user community, as a recent Dataquest Mechanical CAD/CAM/CAE systems user survey revealed. Users in Europe and the United States gave HP's Precision Engineering products the highest ratings in terms of ease of use and overall software quality. The user responses focused primarily on the 2-D ME10 package. HP tied with Matra Datavision for highest software quality and had the No. 1 rating for ease of use (see Table 3).

Figure 6
Software Revenue by Subapplication



Source: Dataquest (February 1995) G4006701

Figure 7
MDD Products



Source: Hewlett-Packard G4006702

Table 3
User Satisfaction Ratings for Mechanical CAD/CAM/CAE Software

Satisfaction with Ease of Use	Rating	Satisfaction with Software Quality	Rating
HP MDD (Mostly ME10)	4.33	HP MDD (Mostly ME10)	4.0
Adra Systems	3.82	Matra Datavision	4.0
CADAM	3.69	Autodesk	3.88
EDS UG	3.59	Adra Systems	3.82
PTC	3.55	Applicon, CADAM, PTC	3.5

Source: Dataquest (February 1995)

The PE/ME10 product is sold standalone, but is also integrated with PE/SolidDesigner to provide 3-D-to-2-D associativity to automatically update 3-D changes on related 2-D documentation.

In August, MDD announced HP PE/ME10 for MS Windows and Windows NT. The new software release supports Windows-specific data-exchange capabilities, such as cut and paste, and dynamic data exchange (DDE). The Windows-based product is competitively priced and is sold through the dealer channel.

PE/ME30

PE/ME30 is an integrated solid modeling, design, and drafting system. Its user interface is identically structured to PE/ME10 to enable a smooth migration from 2-D to 3-D. The product is targeted at users who want to migrate from ME10 to take the first step into solid modeling.

PE/SolidDesigner

SolidDesigner is an ACIS-based solid modeler and is the most interesting modeling technology to emerge to date. It has some very strong underlying concepts, such as dynamic labeling and modification without history trees or constraints, flexible workplane construction techniques, and dynamic feature recognition and manipulation.

Version 1.0 of SolidDesigner was announced in March 1992, but because of functionality and reliability problems, it was never aggressively marketed. PE/SolidDesigner Version 2.0, a much-improved and reliable system, was finally released at the end of 1993. However, as a competitive CAD product, even version 2.0 did not have the breadth of applications that some of the competition have, such as free-form surfacing and complex filleting and blending. The latest announcements are addressing exactly these issues.

Version 3.0 has improved IGES import capabilities that enable both surface and wire-frame data to be transferred into PE/SolidDesigner. Surface and solid data can also be imported via STEP. Once transferred, this data can coexist with PE/SolidDesigner data and can be manipulated accordingly. SolidDesigner also enables solid parts and assemblies to be exported to the object-oriented, geometric modeler ACIS-based systems using Version 1.5 of the ACIS SAT file format. This feature also provides a direct link to other ACIS-based systems. The other major enhancements in version 3.0 are variable radius blending and mass property capabilities. It also incorporates interference-checking capabilities, which allow the detection of interference, face touching, and noninterference of assemblies and part combinations.

MDD is now on schedule with its strategy of releasing two major releases of PE/SolidDesigner each year, which seems to indicate that the division is beginning to get the underlying technology under control. The next major release is planned for the second quarter of 1995.

With SolidDesigner, HP hopes to penetrate the market segments that are migrating from 2-D to solid modeling applications. The product has been criticized for being a single-platform modeler that is available only for the HP workstation. The latest announcement of porting the product to Sun and Silicon Graphics Inc. (SGI) workstations will address this criticism.

PE/SurfaceStyler

HP PE/SurfaceStyler is an engineering styling application based on the 3-D surface modeling software STRIM 100 from the French company Cisigraph.

A bidirectional data link to SolidDesigner allows the user to use the surfaces in SolidDesigner to create and modify solid models and to further detail and complete the mechanical design. However, the recent acquisition of Cisigraph by Matra Datavision puts a question mark on this OEM agreement with MDD. It remains to be seen how Matra will approach this issue.

PE/SheetAdvisor

HP PE/SheetAdvisor features design for manufacturability practices to aid engineers designing sheet metal parts and assemblies. By identifying possible manufacturing design flaws and providing cost and tooling information early in the design process, the product can help to reduce design iterations and to minimize human error. The product's main features are:

- Design for manufacturability
- Online cost estimation
- Predefined library of tools and online guidance to preferred materials
- 2-D flat generation for flats from the 3-D model

PE/DDS-C

In 1991, MDD acquired ABB CADE. ABB CADE was mainly active in the German-speaking markets with its products DDS-C, an electrical wiring system and a knowledge-based engineering shell. The electrical engineering product has since been integrated into the overall MDD product offering. The main users for this kind of technology are electrical engineering companies like ABB and Siemens, along with manufacturers of construction and machine tools, specialty machinery, electrical power utilities, mining, and automotive industries. These are also the industry sectors currently using the ME10/ME30 products.

PE/WorkManager

HP PE/WorkManager, which integrates with HP's CAD solutions, is an enterprisewide PDM solution with workflow capabilities. It is used as a framework for the product development process and to ensure the security, accuracy, and accessibility of the product development information.

Platform Strategy

For mission-critical applications in design and manufacturing, users expect to have the required software available on the optimal combination of hardware configurations. This forces the leading ISVs to be on all the leading hardware platforms. The PE/SolidDesigner product supports only HP's workstations, but the announcement that the software will be available on Sun and SGI next year will help overcome that weakness.

The porting activity for HP is even more important because of the mix of applications offered. The product modeling and documentation applications have been the focal point in the past. Now, the additional offering of an integrated product data and workflow management application increases the value of multiple platform porting. See Table 4 for the hardware platforms supported by the various MDD products.

Partnerships/Sales and Distribution

The final component of the HP PE/Systems solution is the PE/Complementary Application Program (CAP), a joint R&D and marketing program that enables HP to deliver additional functionality to its customers. HP continues to specialize in 2-D and 3-D mechanical design and workflow solutions, while partnering with other vendors to offer capabilities in applications such as numerical control (NC) machining, analysis (FEA), and electronic design automation (EDA). HP has relationships with about 70 companies worldwide, covering approximately 200 applications. Some of these are listed in Table 5.

A set of test suites is used to qualify products for joining the CAP. Integration of these products is based on standards such as ACIS, PDES/STEP, and IGES.

In addition to partnering with other vendors, HP MDD has a worldwide network of value-added resellers (VARs) and independent software vendors (ISVs) that, together with HP's own sales force, offer MDD's products to end users.

Table 4
Platform Strategy

Product	Computer Platforms Supported
PE/ME10	HP, Sun, MS Windows, NEC, Toshiba, SGI (Q1/95)
	MS Windows, MS Windows NT
PE/SolidDesigner	HP, Sun (Q1/95), SGI (Q1/95)
PE/SheetAdvisor	HP, Sun (Q2/95), SGI (Q2/95)
PE/DDS-C	HP, IBM, DEC, Sun (UNIX platforms)
	MS Windows
PE/SurfaceStyler	HP
PE/WorkManager	HP, Sun, MS Windows

Source: Dataquest (February 1995)

Table 5
MDD Complementary Application Partners (CAP)*

Application Area	Partner	Product
CAM	CAMAX Manufacturing Technologies	Camax, SmartCAM
	Cisigraph	NC Strimstation
	CADCentre	Solid Mill
	Cimalog	Cimalog
	Sapex	PAM-X
Analysis	Rasna	MECHANICA
	Framasoft+CSI	Mosaic
	Ansys Inc.	ANSYS
	Cisigraph	FE Strimstation
EDA	Mentor Graphics Corp.	Boardstation

*Selection only: There are approximately 200 applications available.
Source: Hewlett-Packard, Dataquest (February 1995)

Standards

MDD is committed to supporting international standards such as STEP and is implementing STEP-based data exchange. HP has also participated in ProSTEP for the automotive industry and in CAD Data Exchange (CADEX) and Product Data Exchange (PRODEX) established by the European Community's ESPRIT projects. HP PE/SolidDesigner supports the following standards-based technologies:

- OSF/Motif in the user interface
- Spatial Technology's ACIS Geometric Kernel as the open modeling kernel technology
- STEP protocol for 3-D solid data exchange
- Other open data exchange standards (IGES, ACIS SAT)

Major Customers

MDD has over 50,000 seats at customers in Europe, Japan, and North America. Customers include Panasonic, Duracell, Fujitsu, Motorola, and NEC (see Table 6 for profiles of some of MDD's customers). In addition, MDD's systems are installed at 56 internal HP divisions, totaling more than 3,000 users (see Figure 2).

Dataquest Perspective

Being part of HP is a strong advantage for MDD. It will be hard to find a competitor with such a broad spectrum of products, customer support centers, and training, among other offerings. However, it nonetheless seems that HP has been unable to establish worldwide awareness of its MCAD products.

One of the strong success stories of HP has been the ME10 product, which is one of the best 2-D mechanical CAD products around. Users confirmed this in a Dataquest survey of mechanical CAD/CAM/CAE end users.

Table 6
Major Customer Profiles

Company	Country	Industry Sector	Implementation
Jordan Grand-Prix	United Kingdom	Formula One racing cars	PE/SolidDesigner, PE/ME10
Toshiba	Japan	Power-plant turbines	PE/ME10
Leica	Germany	Optical instruments	PE/SolidDesigner, PE/ME10 HP DMS, Stereolithography
Hendry	United States	Sheet metal parts for telecommunications industry	PE/SheetAdvisor, PE/ME10 NC link
Leviton	United States	Electrical/electronic devices	PE/ME30, PE/SolidDesigner FEA, Stereolithography
Playmobil	Germany	Plastic toys	PE/SolidDesigner, PE/ME10 Stereolithography
RKS	United States	Industrial design for consumer electronics, computer equipment, medical/scientific equipment	PE/SolidDesigner, PE/ME30 PE/ME10, Rapid Prototyping
Sennheiser	Germany	Audio equipment	PE/SolidDesigner, PE/ME30 PE/ME10, Stereolithography
S.G. Hauser	United States	Industrial design for medical, consumer electronics, computer industry	PE/SolidDesigner, PE/ME10 CNC link, Rapid Prototyping
IDEO	United States	Industrial design, consumer design	PE/ME10, PE/ME30 PE/SolidDesigner
TRIM-C-O	United States	Sheet metal parts	PE/ME10, PE/ME30 PE/SolidDesigner PE/SheetAdvisor
Motorola	United States	Computers, components	PE/ME10, PE/ME30, PE/SheetAdvisor
Oki	Japan	Consumer electronics	PE/ME10
Panasonic	Japan	Consumer electronics	PE/ME10
Schindler	Germany	Elevator manufacturing	PE/ME10
Trumpf	Germany	Machine tools	PE/ME10, PE/ME30
Gildemeister	Germany	Machine tools	PE/ME10, PE/ME30
Festo	Germany	Machine tools, machinery	PE/ME10, PE/SolidDesigner

Source: Hewlett-Packard, Dataquest (February 1995)

ME10 had the No. 1 position in terms of software quality and ease of use. This product has never had the praise that it deserves.

We also believe that HP's lack of financial commitment to marketing is responsible for the lower penetration rates outside of Germany and Japan. The marketing behind the company's MCAD products is not sufficient in the face of products like AutoCAD and Parametric Technology.

SolidDesigner, MDD's flagship product, could be one of the best, if not the best, modelers available if the development group can maintain a rapid,

ongoing development of the code, offer a styling/surfacing solution soon, and maintain the functionality and modeling approach. It took a long time for SolidDesigner to become salable, and this certainly had a negative impact on the product's reputation. The latest release should help to overcome this and enable MDD to increase SolidDesigner's share of MDD's installed base in the coming year.

In summary, we believe that the company's major advantages are the ME10 product's high user rating, a large installed base of the ME10 product in Germany and Japan, and PE/SolidDesigner's unconstrained modeling approach and data exchange capabilities. However, MDD faces some major challenges: to grow the share of its business outside of Germany and Japan, to integrate surfacing technology, and to increase the user base of its PE/SolidDesigner product.

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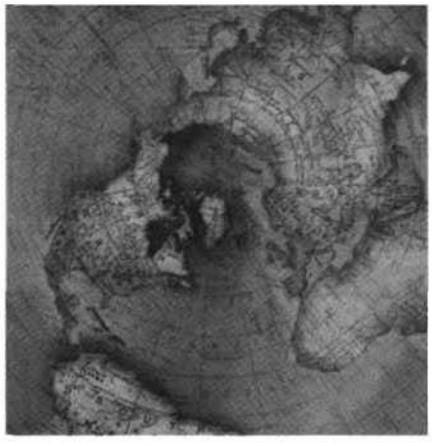

Dataquest

CAD/CAM/CAE and GIS Mechanical Forecast Update

Market Statistics

Program: Mechanical Applications Worldwide
Product Code: CMEC-WW-MS-9503
Publication Date: December 4, 1995
Filing: Market Analysis

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Note: All tables show estimated data.

CAD/CAM/CAE and GIS Mechanical Forecast Update

Fluctuating exchange rates once again masked the true market performance in the 1994 CAD/CAM/CAE and GIS market. Japanese CAD/CAM/CAE and GIS total factory revenue grew 4.8 percent from 1993 to 1994 when measured in U.S. dollars, contrary to what would be expected given the country's prolonged recession. However, the dollar depreciated against the yen at a rate of 8.2 percent so that when measured in yen, Japanese CAD/CAM/CAE and GIS total factory revenue declined 3.8 percent from 1993 to 1994.

Less dramatically, European CAD/CAM/CAE and GIS total factory revenue grew 9.9 percent from 1993 to 1994 when measured in U.S. dollars. With the dollar depreciating 1.5 percent, European CAD/CAM/CAE and GIS total factory revenue grew a lower 8.2 percent from 1993 to 1994 when measured in ECU. Table 1 shows the impact of currency fluctuation on the CAD/CAM/CAE and GIS software market.

Looking ahead, currency fluctuations will continue to be felt in all global markets. The dollar has continued to weaken during the early months of this year so that if we were to assume a stable currency for the remainder of the year, 1995 would end with the dollar depreciating 4.2 percent against the yen and 7.8 percent against the ECU (see Table 2). Although Dataquest does not forecast currency exchange rates, we do forecast with the best information available. The exchange rate is calculated as the simple arithmetic mean of the 12 average monthly rates for each country. For the purpose of this forecast, Dataquest assumes the September exchange rate will remain stable in the future.

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

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

More detailed data is available through Dataquest's Client Inquiry service, which can provide custom analysis of the multidimensional database.

Changes to Our Forecast Structure

Dataquest's CAD/CAM/CAE and GIS forecast is based upon the updated market share data gathered before the end of 1994 and updated throughout 1995. In order to better serve you, the new CAD/CAM/CAE and GIS database has been restructured as follows:

- Japan is now tracked as a region separate from Asia/Pacific.
- Asia/Pacific now includes China, Hong Kong, Korea, Singapore, Taiwan, and Rest of Asia (Australia, New Zealand, India, and Southeast Asia).

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

Revenue by Region	1993	1994	Forecast 1999	Growth (%) 1993-1994	CAGR (%) 1994-1999
Europe ($M)					
Software Revenue	1,628.29	1,824.12	3,276.03	12.0	12.4
Hardware Revenue	2,421.88	2,604.55	5,022.05	7.5	14.0
Service Revenue	996.57	1,115.23	1,976.19	11.9	12.1
Total Factory Revenue	5,046.74	5,543.91	10,274.27	9.9	13.1
ECU/U.S.$ Exchange Rate*	0.86	0.84	0.77	-1.5	-1.8
Europe (ECU Millions)					
Software Revenue	1,394.80	1,538.83	2,522.54	10.3	10.4
Hardware Revenue	2,074.58	2,197.20	3,866.98	5.9	12.0
Service Revenue	853.67	940.81	1,521.67	10.2	10.1
Total Factory Revenue	4,323.04	4,676.84	7,911.19	8.2	11.1
Japan ($M)					
Software Revenue	1,203.33	1,315.70	2,013.89	9.3	8.9
Hardware Revenue	2,148.02	2,174.59	2,893.95	1.2	5.9
Service Revenue	756.90	813.74	1,074.17	7.5	5.7
Total Factory Revenue	4,108.24	4,304.03	5,982.01	4.8	6.8
Japan/U.S.$ Exchange Rate*	110.85	101.81	99.73	-8.2	-0.4
Japan (Yen Millions)					
Software Revenue	133,388.69	133,951.14	200,845.20	0.4	8.4
Hardware Revenue	238,107.55	221,394.71	288,613.32	-7.0	5.4
Service Revenue	83,902.25	82,847.36	107,126.86	-1.3	5.3
Total Factory Revenue	455,398.49	438,193.21	596,585.38	-3.8	6.4
North America ($M)					
Software Revenue	1,758.41	1,929.06	3,711.42	9.7	14.0
Hardware Revenue	2,345.76	2,512.99	4,526.12	7.1	12.5
Service Revenue	1,036.93	1,176.56	1,916.85	13.5	10.3
Total Factory Revenue	5,141.36	5,618.72	10,154.40	9.3	12.6
Worldwide ($M)					
Software Revenue	4,890.91	5,418.96	9,776.21	10.8	12.5
Hardware Revenue	7,351.48	7,798.97	13,510.08	6.1	11.6
Service Revenue	2,968.24	3,313.93	5,319.26	11.6	9.9
Total Factory Revenue	15,210.89	16,531.96	28,605.55	8.7	11.6

*Assuming a stable currency, the 1999 exchange rate is the September 1995 exchange rate.
Source: Dataquest (October 1995)

Table 2
Foreign Currency versus the U.S. Dollar

		Actual				Current			Year-to-Year Change (%)					
Country	Currency	1990	1991	1992	1993	1994	1995	1996	1990-1991	1991-1992	1992-1993	1993-1994	1994-1995	1995-1996
Austria	Schilling	11.36	11.67	10.95	11.65	11.40	10.32	10.05	2.73	-6.2	6.4	-2.1	-9.5	-2.6
Belgium	Franc	33.41	34.13	32.02	34.67	33.66	30.16	29.38	2.16	-6.2	8.3	-2.9	-10.4	-2.6
Denmark	Krone	6.18	6.39	6.02	6.49	6.35	5.70	5.54	3.40	-5.8	7.8	-2.2	-10.2	-2.8
Finland	Markka	3.82	4.04	4.45	5.73	5.21	4.39	4.27	5.76	10.1	28.8	-9.1	-15.7	-2.7
France	Franc	5.44	5.64	5.27	5.67	5.54	5.04	4.92	3.68	-6.6	7.6	-2.3	-9.0	-2.4
Germany	D-Mark	1.62	1.66	1.56	1.66	1.62	1.45	1.43	2.47	-6.0	6.4	-2.4	-10.8	-1.0
Italy	Lira	1,197.22	1,238.93	1,227.75	1,577.85	1,609.34	1,625.01	1,616.00	3.48	-0.9	28.5	2.0	1.0	-0.6
Netherlands	Guilder	1.82	1.87	1.75	1.86	1.82	1.64	1.64	2.75	-6.4	6.3	-2.2	-9.9	0.2
Norway	Krone	6.25	6.49	6.18	7.11	7.04	6.42	6.25	3.84	-4.8	15.0	-1.0	-8.8	-2.6
Spain	Peseta	102.03	103.81	101.90	127.87	133.48	125.35	123.48	1.74	-1.8	25.5	4.4	-6.1	-1.5
Sweden	Krona	5.92	6.04	5.81	7.82	7.70	7.30	6.95	2.03	-3.8	34.6	-1.5	-5.2	-4.8
Switzerland	Franc	1.39	1.43	1.40	1.48	1.37	1.20	1.16	2.88	-2.1	5.7	-7.4	-12.7	-3.0
United Kingdom	Pound	0.56	0.57	0.57	0.67	0.65	0.64	0.63	1.79	0	17.5	-3.0	-1.5	-1.6
Europe Average	ECU	0.79	0.81	0.77	0.86	0.84	0.78	0.77	2.27	-4.9	11.4	-1.5	-7.8	-1.0
China	Renminbi	4.79	5.33	5.51	5.76	8.54	8.32	8.32	11.27	3.4	4.5	48.3	-2.6	0
Hong Kong	Dollar	7.79	7.77	7.74	7.74	7.73	7.74	7.73	-0.26	-0.4	0	-0.1	0.1	-0.1
Japan	Yen	144.05	134.59	126.34	110.85	101.56	97.34	99.73	-6.57	-6.1	-12.3	-8.4	-4.2	2.5
Korea	Won	242.70	730.67	782.41	799.42	805.80	773.20	768.20	201.06	7.1	2.2	0.8	-4.0	-0.6
Singapore	Dollar	1.81	1.73	1.63	1.62	1.53	1.42	1.42	-4.42	-5.8	-0.9	-5.3	-7.2	0
Taiwan	Dollar	26.64	26.49	24.93	26.15	26.45	27.50	27.06	-0.56	-5.9	4.9	1.1	4.0	-1.6

Source: Dataquest (October 1995)

- Service is divided into hardware service and software service.
- Platforms have been replaced by operating systems, to include UNIX, host, Windows NT and PC.

This restructuring is reflected in the forecast. The net result is a better history from which to forecast. Unfortunately, because of this restructuring, the data will not match the data in Dataquest's previously published market share documents. In addition to some shifting of revenue to allow for the restructuring, several company changes were made as follows:

- Work in the new database resulted in the loss of some companies' European and Asian revenue, most notably Altera. The revenue for these companies has been corrected and is available through your inquiry privilege.
- UniCAD had inadvertently been excluded from our market share database and was therefore not included in previously published market share documents. It has been added.
- Mentor Graphics restated its revenue for 1992 and 1993, correcting an error in its reporting by shifting revenue from the year of order to the year of sale and realigning its sales to our changed subapplication definitions.

Worldwide Forecast Assumptions

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

Mechanical Forecast Assumptions

The mechanical CAD/CAM/CAE market, which grew 9.7 percent in 1994, is expected to reach a market size of $3.9 million in five years. The market will be fueled by a complex and rich blend of emerging technologies, regional growth, and new applications for CAD technology.

Emerging Technologies

Topping the list of emerging technologies is product data management. This market has clearly begun to take off, not only in Europe and the United States but in Japan and Korea as well. Within the past year, we have seen pilot programs begin to move to full-scale production, support for new client platforms (Windows NT, Windows), integration with materials resource planning (MRP) systems, and an emergence of a "lite" product data management (PDM) category. PDM will be one of the significant drivers of the mechanical CAD market through 1999. Farther down the road, we expect growth in the industry to come from other emerging technologies, including generative numerical control (NC) software, analysis, conceptual design, and simulation/optimization software.

Regional Growth

The outlook for the European markets is brighter than it has been for the last few years. The European economy as a whole continues to emerge slowly from its recession, and many of the European industries have begun a major restructuring of their information technology (IT) investment. Tool purchases by automotive companies and their supplier bases will lead to higher growth for both software and hardware revenue in the mechanical CAD/CAM/CAE sector in Europe.

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

New Applications for CAD Technology

In 1994, we saw the beginning of new applications for mechanical CAD technology. Growth is picking up in nontraditional industries (those industries outside of aerospace and automotive). We expect this trend to continue as mechanical modeling, analysis, design, and simulation software become more user-friendly. Closely linked to the use of mechanical CAD in new arenas is the availability of such software on lower-cost platforms like Windows NT and the use of object technology to create customized industry- or application-specific solutions.

AEC Forecast Assumptions

The Impact of Windows NT

Intergraph dominates the UNIX market in North America, and the company's shift to Windows NT will cause both the collapse of UNIX sales in North America and the gradual erosion of UNIX in Europe. Windows NT will get a boost in 1995, driven by frustrated PC users who demand high performance and who cannot wait for Windows 95 to solve their requirements.

Factors that should contribute to the long-term expansion of the AEC CAD market are as follows:

CAD Is Becoming a Business Requirement

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

CAD purchases are increasingly justified as a competitive advantage in both sales and design reviews. Electronic design data is also required

downstream by the designer's client, from the federal government down to the small commercial developer. Also, a significant pool of untapped users still exists. The current relatively low market penetration of AEC CAD systems should allow steady worldwide growth during the next five years, despite constant volatility in demand for the buildings and infrastructure to be designed.

New Features in AEC CAD Products Are Achievable

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

The following trends will inhibit growth in the AEC CAD industry:

Design Is Only Part of the Problem

AEC's one-design-one-build structure means CAD provides fewer economic benefits to these users than does the one-design-build-many structure of manufacturing. Construction, which is essentially a prototype build, is fraught with uncertainties and delays that are not well addressed by existing AEC systems. Design tools can only thrive in the AEC structure when they support more of the entire business problem.

Poor Cooperation among Users

Users are poorly organized to take advantage of improved products, partly because of competition between engineering constructors and partly because designs are often split among several different companies representing different and competing aspects of the design process. New approaches to the design and construction process are needed to allow users to take full advantage of CAD tools.

GIS/Mapping Forecast Assumptions

The Impact of Windows NT

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

Factors that should contribute to the long-term expansion of the GIS market are as follows:

There Exists an Abundant Supply of Prospective Buyers

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

New Technologies Will Drive Growth

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

Data Will Drive Growth

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

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

Several factors seriously constrain the long-term expansion of the GIS market, as follows:

High Cost of Entry Remains a Barrier

There will remain an uncertain, but certainly high, cost of creating a working GIS system in traditional environments. No magic will emerge to create a low-cost, meaningful data set for mainstream customers in government and utilities. Data conversion will remain costly because the significant cost of correcting prior errors and omissions on paper maps is inevitably bundled into the cost of "conversion."

Price Pressures Inhibit Growth

Price pressure will hold down total revenue. Innovation is the only way to maintain prices in any software industry, and GIS vendors will struggle in their attempt to create compelling new applications and improved investment payoff for customers.

Electronic Design Automation

The EDA software market grew 16.8 percent in 1994. Over the next five years, growth will continue to be fueled by continually increasing design complexity and ever-higher speeds.

Electronic CAE

The demands today's tools place on CPU processing speed and memory size are reversing the process of equalization and driving the sales of UNIX-class tools. Equalization (PC-based tools becoming more expensive as UNIX-based tools fall in price) was either caused by the stagnation of the design challenge or, more likely, the stagnation in tool development. Design complexity is forcing a large-scale swap: gate-level users are swapping up to registered transfer (RT)-level while RT-level users are swapping up to electronic system (ES)-level tools. RT-level tools will begin to appear on Windows NT, competing with the UNIX-based tools while the ES-level tools will remain UNIX-based. Meanwhile, low-end design—still manageable by PC-based tools—is shifting to Asia/Pacific and driving PC growth in that region. The main inhibitor to growth in CAE tools is the engineering learning curve.

IC Layout

The IC-layout market grew as expected, 20 percent from 1993 to 1994, after several very sleepy years. Design complexity and high speed is forcing replacement of obsolete tools, driving this high growth. This is primarily a replacement market of very high-cost tools and very few players. The ensuing frenzy for market share is the result. The few PC-based tools in this market are being replaced by UNIX-class tools in North America and Japan. Growth in the very few PC-based tools is in Europe (including eastern Europe) and Asia/Pacific. It is yet unclear whether Windows NT will be able to penetrate the IC Layout market.

PCB/MCM/Hybrid

The 3.3 percent growth in the printed circuit board (PCB) market comes as a surprise, given the forecast negative 2 percent growth from 1993 to 1994. The strong yen masked a decline in PCB growth (in yen) in Japan, where half of PCB sales are.

Organizational manufacturing models are driving changes in the PCB market. As manufacturing organizations are moving to Asia/Pacific (from both North America and Japan), the low-speed designing is following, driving PC sales in that region. In North America, Europe, and Japan, high-speed board design is moving from manufacturing into engineering departments that are traditionally UNIX-based. Where new engineering environments are being created for RT-level designs, the opportunity for Windows NT to take over both the CAE environment and the PCB environment exists.

Forecast Methodology

Fundamental to the way Dataquest conducts its research is the underlying philosophy that the best data and analyses come from a well-balanced program. This program includes the following: balance between primary and secondary collection techniques; balance between supply-side and demand-side analysis; balance between focused, industry-specific research and coordinated, "big-picture" analysis aided by integration of data from the more than 25 separate high-technology industries Dataquest covers; and balance between the perspectives of

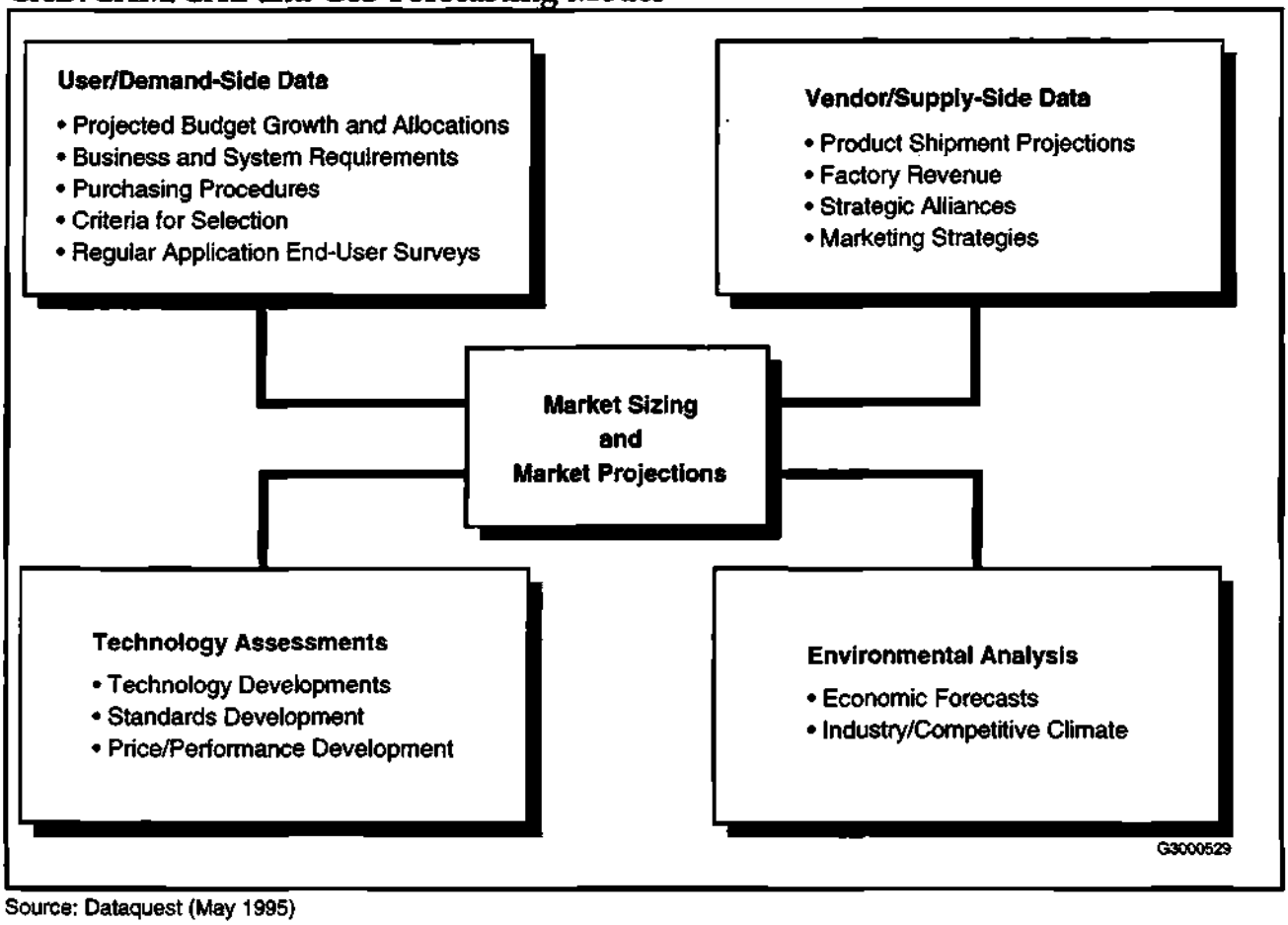
experienced industry professionals and rigorous, disciplined techniques of seasoned market researchers.

Dataquest also analyzes trends in the macro environment, which can have major influences on both supply-side and demand-side forecasting. In addition to demographics, analysts look at gross national product (GNP) growth, interest rate fluctuation, business expectations, and capital spending plans. In the geopolitical arena, the group looks at trade issues, political stability or lack thereof, tariffs, nontariff barriers, and such factors as the effect on Europe of the events of 1994.

Figure 1 shows the CAD/CAM/CAE and GIS forecasting model. The overall forecasting process uses a combination of techniques such as time series and technological modeling. Market estimates and forecasts are derived using the following research techniques:

- Segment forecasting—Individual forecasts are derived for each application segment tracked by the CAD/CAM/CAE and GIS group. Specifically, each application, segmented by region and platform, is forecast and rolled up. In this way, each application segment incorporates its own set of unique assumptions.

Figure 1
CAD/CAM/CAE and GIS Forecasting Model



Source: Dataquest (May 1995)

- Demand-based analysis—Market growth is tracked and forecast in terms of the present and anticipated demand of current and future users. This requires the development of a total available market model and a satisfied available market figure to assess the levels of penetration accurately. Dataquest analysts also factor in the acceptance or ability for users to consume new technology.
- Capacity-based analysis—This method involves identifying future shipment volume constraints. These constraints, or "ceilings," can be the result of component availability, manufacturing capacity, or distribution capacity. In any case, capacity limitations are capable of keeping shipments below the demand level.

Segmentation Definitions

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

Applications

- Mechanical—The mechanical segment refers to computer-aided tools used by engineers, designers, analysts, technicians, and draftspeople working predominantly in the discrete manufacturing industries, but includes government and education. Users of mechanical CAD/CAM/CAE tools work in all departments across the typical organization, with a majority found in product design, advanced engineering, and manufacturing engineering. Common design applications include conceptual design, industrial design, structural or thermal analysis, detail design, and electromechanical design (the mechanical part of design with electrical or electronic components and mechanisms). Common manufacturing applications include tool and fixture design, numerical control part programming, offline robotics programming, and interface to quality-control systems. Management tools for database control and distribution are included in this segment, as well as user-defined application programming.
- Architecture, Engineering, and Construction (AEC)—The AEC segment covers the use of computer-aided tools by architects, contractors, plant engineers, civil engineers, and other people associated with these disciplines to aid in designing and managing buildings, industrial plants, ships, and other types of nondiscrete entities.
- Geographic Information Systems (GIS)/Mapping—GIS is computer-based technology, and the segment is composed of hardware, software, and data used to capture, edit, display, and analyze spatial (tagged by location) information.
- Electronic Design Automation (EDA)—The EDA segment covers computer-based tools used to automate the process of designing an electronic product, including printed circuit boards, ICs, and systems. EDA includes ECAE, IC layout, and PCB/hybrid/MCM, as follows:
  - Electronic computer-aided engineering (ECAE)—These are computer-aided tools used in the engineering or design phase of electronic products (as opposed to the physical layout phase of the

product). Examples of ECAE applications are schematic capture and simulation.

- IC layout—This is a software application tool used to create and validate the physical implementation of an IC. The IC layout category comprises polygon editors, symbolic editors, placement and routing (gate array, cell, and block), design verification tools (DRC/ERC/logic-to-layout), compilers, and module development tools.
- PCB/hybrid/MCM—This segment covers products used to create the placement and routing of the traces and components laid out on a printed circuit board. Also included in this category are thermal analysis tools.

Regions

The following bullets define the regions.

- North America—North America includes United States, Mexico, and Canada.
- Europe—Europe includes the United Kingdom, Scandinavia, Benelux, France, Germany, Italy, Spain, Austria/Switzerland, Russia, central Europe, and the rest of Europe.
- Japan
- Asia—Asia includes Singapore, Taiwan, Korea, China, Hong Kong, and the rest of Asia (Australia, India, and Southeast Asia).
- Rest of World—Rest of World includes all other countries and regions, including Africa, the Middle East, Central America, and South America.

Operating Systems

The following paragraphs define the operating systems.

UNIX. UNIX includes all UNIX variants and older workstation operating systems.

Host. Host includes minicomputer and mainframe operating systems in which external workstations' functions are dependent on a host computer.

Windows NT. Windows NT is the Microsoft operating system.

PC. PC includes DOS, Windows, Windows 95, OS/2, and Apple operating systems.

Line Items

Line item definitions are as follows:

- Average selling price (ASP) is defined as the average price of a product, inclusive of any discounts.
- CPU revenue is the portion of revenue derived from a system sale that is related to the value of the CPU.

- CPU shipment is defined as the number of CPUs delivered.
- CPU installed base is defined as the total number of CPUs in active, day-to-day use.
- Unit shipment is defined as the number of products delivered (that is, seats).
- Seats are defined as the number of possible simultaneous users.
- Installed seats are defined as the total number of seats in active, day-to-day use.
- Hardware revenue is defined as the sum of the revenue from the hardware system components: CPU revenue, terminal revenue, and peripherals revenue.
- Peripherals revenue is defined as the value of all the peripherals from turnkey sale. (Peripherals in this category typically are input and output devices.)
- Terminal revenue is defined as revenue derived from the sale of terminals used to graphically create, analyze, or manipulate designs. The term is applicable only to the host systems.
- Software revenue is revenue derived from the sale of application software.
- Service revenue is defined as revenue derived from the service and support of CAD/CAM/CAE or GIS systems. Service is followed as software service and hardware service.
- Total factory revenue is defined as the amount of money received for goods measured in U.S. dollars and is the sum of hardware, software, and service revenue.

Table A-1
CAD/CAM/CAE/GIS Software History and Forecast
Top Level Mechanical Forecast, Worldwide, All Operating Systems

	1992	1993	1994	1995	1996	1997	1998	1999	CAGR (%) 1994-1999
Software Revenue ($M)									
Worldwide, All Operating Systems	2,125	2,249	2,455	2,757	3,020	3,305	3,585	3,892	9.7
Worldwide									
UNIX	1,431	1,597	1,819	2,078	2,242	2,376	2,517	2,661	7.9
Windows NT	-	1	37	74	170	315	432	572	73.0
Personal Computer	441	438	467	505	538	572	606	637	6.4
Host/Proprietary	254	213	133	101	68	43	30	21	-30.5
All Operating Systems									
North America	602	705	783	862	978	1,109	1,227	1,354	11.6
Europe	844	793	884	1,059	1,152	1,244	1,335	1,435	10.2
Japan	604	652	676	713	754	801	854	917	6.3
Asia/Pacific	49	72	81	90	101	113	126	139	11.5
Rest of World	25	28	31	33	35	38	42	47	8.3
Year-to-Year Software Revenue Growth Rate (%)									
Worldwide, All Operating Systems		5.9	9.2	12.3	9.5	9.5	8.5	8.6	
Worldwide									
UNIX		11.6	13.9	14.2	7.9	6.0	6.0	5.7	
Windows NT		NA	2,383.8	101.3	129.4	84.6	37.2	32.6	
Personal Computer		-0.7	6.8	8.1	6.6	6.2	5.9	5.2	
Host/Proprietary		-15.9	-37.8	-24.2	-32.1	-37.5	-30.3	-27.8	
All Operating Systems									
North America		17.0	11.1	10.1	13.4	13.4	10.7	10.3	
Europe		-6.1	11.5	19.8	8.8	8.0	7.3	7.5	
Japan		8.0	3.7	5.4	5.8	6.3	6.5	7.4	
Asia/Pacific		44.8	13.0	11.4	11.5	11.8	11.8	10.8	
Rest of World		11.3	13.0	5.2	7.1	9.0	10.6	10.0	

NA = Not applicable

Source: Dataquest (October 1995)

Table B-1
CAD/CAM/CAE/GIS Software History and Forecast
Detail Mechanical Forecast, Worldwide, All Operating Systems

	1992	1993	1994	1995	1996	1997	1998	1999	CAGR (%) 1994-1999
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	233,986	270,252	296,516	325,000	357,300	390,600	424,400	459,400	9
Seats	253,580	285,723	309,001	335,200	364,800	395,500	427,900	462,100	8
Year-to-Year Increase (%)	13	13	8	8	9	8	8	8	
Installed Base									
CPUs	855,361	1,006,494	1,173,350	1,331,200	1,475,500	1,610,700	1,716,800	1,786,600	9
Seats	955,905	1,100,936	1,259,168	1,406,700	1,542,100	1,671,600	1,775,100	1,843,100	8
Year-to-Year Increase (%)	18	15	14	12	10	8	6	4	
REVENUE DATA ($M)									
CPU Revenue	3,057	3,066	3,259	3,504	3,787	4,083	4,358	4,694	8
Terminal Revenue	292	224	201	145	105	71	53	42	-27
Peripheral Revenue	437	284	277	263	253	244	232	224	-4
Hardware Revenue	3,785	3,575	3,737	3,912	4,145	4,398	4,644	4,960	6
Year-to-Year Increase (%)	0	-6	5	5	6	6	6	7	
Software Revenue	2,125	2,249	2,455	2,757	3,020	3,305	3,585	3,892	10
Year-to-Year Increase (%)	15	6	9	12	10	9	8	9	
Software Service	540	642	838	921	995	1,051	1,105	1,155	7
Hardware Service	741	728	691	726	747	770	795	828	4
Service Revenue	1,281	1,369	1,529	1,647	1,742	1,822	1,900	1,983	5
Year-to-Year Increase (%)	7	7	12	8	6	5	4	4	
Total Factory Revenue	7,191	7,193	7,722	8,316	8,907	9,525	10,128	10,836	7
Year-to-Year Increase (%)	5	0	7	8	7	7	6	7	

NA = Not applicable
Source: Dataquest (October 1995)

Table B-2
CAD/CAM/CAE/GIS Software History and Forecast
Detail Mechanical Forecast, Worldwide, UNIX

	1992	1993	1994	1995	1996	1997	1998	1999	CAGR (%) 1994-1999
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	76,577	92,419	108,799	119,300	130,100	139,400	149,400	159,900	8
Seats	76,577	92,419	108,799	119,300	130,100	139,400	149,400	159,900	8
Year-to-Year Increase (%)	10	21	18	10	9	7	7	7	
Installed Base									
CPUs	268,647	341,603	425,770	506,700	584,600	659,800	726,300	772,400	13
Seats	268,647	341,603	425,770	506,700	584,600	659,800	726,300	772,400	13
Year-to-Year Increase (%)	31	27	25	19	15	13	10	6	
REVENUE DATA ($M)									
CPU Revenue	1,793	2,070	2,304	2,568	2,767	2,923	3,089	3,256	7
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	337	215	214	201	182	160	142	125	-10
Hardware Revenue	2,130	2,286	2,519	2,769	2,949	3,084	3,231	3,381	6
Year-to-Year Increase (%)	16	7	10	10	6	5	5	5	
Software Revenue	1,431	1,597	1,819	2,078	2,242	2,376	2,517	2,661	8
Year-to-Year Increase (%)	23	12	14	14	8	6	6	6	
Software Service	453	540	704	799	847	857	866	858	4
Hardware Service	449	559	542	610	637	650	664	675	4
Service Revenue	901	1,100	1,246	1,410	1,483	1,507	1,529	1,533	4
Year-to-Year Increase (%)	27	22	13	13	5	2	1	0	
Total Factory Revenue	4,462	4,983	5,583	6,257	6,675	6,967	7,277	7,574	6
Year-to-Year Increase (%)	20	12	12	12	7	4	4	4	

NA = Not applicable
Source: Dataquest (October 1995)

Table B-3
CAD/CAM/CAE/GIS Software History and Forecast
Detail Mechanical Forecast, Worldwide, NT/Hybrid

	1992	1993	1994	1995	1996	1997	1998	1999	CAGR (%) 1994-1999
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	-	72	2,005	3,700	8,300	15,000	20,300	26,500	68
Seats	-	72	2,005	3,700	8,300	15,000	20,300	26,500	68
Year-to-Year Increase (%)	NA	NA	2,667	86	124	79	35	31	
Installed Base									
CPUs	-	72	2,055	5,800	14,100	26,900	39,800	55,300	93
Seats	-	72	2,055	5,800	14,100	26,900	39,800	55,300	93
Year-to-Year Increase (%)	NA	NA	2,737	181	144	91	48	39	
REVENUE DATA ($M)									
CPU Revenue	-	1	24	54	118	238	342	498	83
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	-	-	3	5	9	16	19	23	56
Hardware Revenue	-	1	27	59	127	254	361	522	81
Year-to-Year Increase (%)	NA	NA	3,120	122	116	100	42	45	
Software Revenue	-	1	37	74	170	315	432	572	73
Year-to-Year Increase (%)	NA	NA	2,384	101	129	85	37	33	
Software Service	-	0	12	24	58	111	157	215	77
Hardware Service	-	-	11	11	22	43	59	83	51
Service Revenue	-	0	23	35	81	154	217	299	67
Year-to-Year Increase (%)	NA	NA	15,436	52	132	91	41	38	
Total Factory Revenue	-	2	86	168	378	723	1,009	1,393	74
Year-to-Year Increase (%)	NA	NA	3,411	95	125	91	40	38	

NA = Not applicable
Source: Dataquest (October 1995)

Table B-4
CAD/CAM/CAE/GIS Software History and Forecast
Detail Mechanical Forecast, Worldwide, Personal Computer

	1992	1993	1994	1995	1996	1997	1998	1999	CAGR (%) 1994-1999
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	152,248	173,461	182,068	199,100	216,700	234,800	253,600	272,100	8
Seats	152,248	173,461	182,070	199,100	216,700	234,800	253,600	272,100	8
Year-to-Year Increase (%)	20	14	5	9	9	8	8	7	
Installed Base									
CPUs	559,027	638,488	721,434	797,600	858,300	906,900	934,200	942,900	5
Seats	559,027	638,488	721,434	797,600	858,300	906,900	934,200	942,900	5
Year-to-Year Increase (%)	17	14	13	11	8	6	3	1	
REVENUE DATA ($M)									
CPU Revenue	478	528	557	609	711	797	836	871	9
Terminal Revenue	-	-	-	-	-	-	-	-	NA
Peripheral Revenue	40	35	43	48	58	66	71	75	12
Hardware Revenue	519	563	600	657	769	863	907	946	10
Year-to-Year Increase (%)	7	9	6	10	17	12	5	4	
Software Revenue	441	438	467	505	538	572	606	637	6
Year-to-Year Increase (%)	21	-1	7	8	7	6	6	5	
Software Service	31	44	46	48	53	57	62	67	8
Hardware Service	22	29	36	33	40	46	51	54	9
Service Revenue	53	73	82	81	93	104	113	121	8
Year-to-Year Increase (%)	14	38	12	-1	15	12	9	8	
Total Factory Revenue	1,013	1,074	1,149	1,243	1,400	1,538	1,625	1,705	8
Year-to-Year Increase (%)	13	6	7	8	13	10	6	5	

NA = Not applicable
Source: Dataquest (October 1995)

Table B-5
CAD/CAM/CAE/GIS Software History and Forecast
Detail Mechanical Forecast, Worldwide, Host/Proprietary

	1992	1993	1994	1995	1996	1997	1998	1999	CAGR (%) 1994-1999
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	5,162	4,299	3,645	2,900	2,100	1,400	1,000	800	-26
Seats	24,756	19,770	16,128	13,100	9,600	6,300	4,600	3,600	-26
Year-to-Year Increase (%)	-14	-20	-18	-19	-26	-35	-26	-22	
Installed Base									
CPUs	27,687	26,330	24,091	21,100	18,600	17,000	16,500	16,000	-8
Seats	128,231	120,773	109,908	96,600	85,100	78,000	74,800	72,600	-8
Year-to-Year Increase (%)	-2	-6	-9	-12	-12	-8	-4	-3	
REVENUE DATA ($M)									
CPU Revenue	786	467	374	273	191	125	91	69	-29
Terminal Revenue	292	224	201	145	105	71	53	42	-27
Peripheral Revenue	59	34	17	8	4	2	1	0	-53
Hardware Revenue	1,136	725	592	427	300	198	145	112	-28
Year-to-Year Increase (%)	-22	-36	-18	-28	-30	-34	-27	-23	
Software Revenue	254	213	133	101	68	43	30	21	-31
Year-to-Year Increase (%)	-19	-16	-38	-24	-32	-37	-30	-28	
Software Service	56	57	76	50	37	26	19	15	-28
Hardware Service	271	139	103	72	48	31	22	16	-31
Service Revenue	327	196	179	122	86	56	41	31	-30
Year-to-Year Increase (%)	-26	-40	-9	-32	-30	-34	-27	-25	
Total Factory Revenue	1,716	1,134	904	649	454	297	216	164	-29
Year-to-Year Increase (%)	-22	-34	-20	-28	-30	-35	-27	-24	

NA = Not applicable
Source: Dataquest (October 1995)

Table B-6
CAD/CAM/CAE/GIS Software History and Forecast
Detail Mechanical Forecast, North America, All Operating Systems

	1992	1993	1994	1995	1996	1997	1998	1999	CAGR (%) 1994-1999
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	92,515	105,486	114,645	125,700	137,300	149,700	161,800	174,500	9
Seats	98,981	109,101	117,794	127,800	138,700	150,700	162,500	175,200	8
Year-to-Year Increase (%)	17	10	8	9	8	9	8	8	
Installed Base									
CPUs	345,266	397,144	455,718	511,100	561,600	609,000	646,000	668,000	8
Seats	381,995	429,064	482,500	532,200	578,100	622,700	658,500	680,100	7
Year-to-Year Increase (%)	15	12	12	10	9	8	6	3	
REVENUE DATA ($M)									
CPU Revenue	812	861	959	1,036	1,147	1,289	1,415	1,568	10
Terminal Revenue	93	56	50	30	18	13	11	9	-28
Peripheral Revenue	76	33	32	30	31	33	33	34	1
Hardware Revenue	982	951	1,041	1,096	1,196	1,335	1,459	1,611	9
Year-to-Year Increase (%)	-3	-3	9	5	9	12	9	10	
Software Revenue	602	705	783	862	978	1,109	1,227	1,354	12
Year-to-Year Increase (%)	19	17	11	10	13	13	11	10	
Software Service	151	197	268	296	332	368	399	427	10
Hardware Service	192	201	200	209	221	239	256	276	7
Service Revenue	344	398	468	506	553	607	655	703	8
Year-to-Year Increase (%)	9	16	18	8	9	10	8	7	
Total Factory Revenue	1,928	2,054	2,292	2,464	2,727	3,051	3,341	3,668	10
Year-to-Year Increase (%)	5	7	12	7	11	12	10	10	

NA = Not applicable
Source: Dataquest (October 1995)

Table B-7
CAD/CAM/CAE/GIS Software History and Forecast
Detail Mechanical Forecast, Europe, All Operating Systems

	1992	1993	1994	1995	1996	1997	1998	1999	CAGR (%) 1994-1999
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	92,200	91,091	99,479	106,900	116,900	126,300	135,000	144,400	8
Seats	99,777	95,480	103,808	110,600	119,800	128,200	136,400	145,400	7
Year-to-Year Increase (%)	7	-4	9	7	8	7	6	7	
Installed Base									
CPUs	343,281	390,942	440,954	483,700	521,100	557,800	586,400	600,400	6
Seats	382,505	426,802	473,658	512,600	546,600	581,000	608,300	621,300	6
Year-to-Year Increase (%)	19	12	11	8	7	6	5	2	
REVENUE DATA ($M)									
CPU Revenue	1,230	1,068	1,170	1,276	1,379	1,472	1,558	1,662	7
Terminal Revenue	118	88	86	63	48	34	25	18	-27
Peripheral Revenue	159	85	74	72	69	66	63	60	-4
Hardware Revenue	1,507	1,241	1,330	1,411	1,496	1,572	1,645	1,740	6
Year-to-Year Increase (%)	-6	-18	7	6	6	5	5	6	
Software Revenue	844	793	884	1,059	1,152	1,244	1,335	1,435	10
Year-to-Year Increase (%)	4	-6	12	20	9	8	7	7	
Software Service	256	259	346	389	417	430	442	449	5
Hardware Service	307	259	251	269	277	283	290	299	4
Service Revenue	563	518	596	658	695	713	732	748	5
Year-to-Year Increase (%)	-2	-8	15	10	6	3	3	2	
Total Factory Revenue	2,914	2,552	2,811	3,128	3,343	3,529	3,712	3,923	7
Year-to-Year Increase (%)	-3	-12	10	11	7	6	5	6	

NA = Not applicable
Source: Dataquest (October 1995)

Table B-8
CAD/CAM/CAE/GIS Software History and Forecast
Detail Mechanical Forecast, Japan, All Operating Systems

	1992	1993	1994	1995	1996	1997	1998	1999	CAGR (%) 1994-1999
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	38,125	53,811	57,488	62,200	67,100	72,300	78,500	84,900	8
Seats	42,779	59,994	61,803	65,800	69,800	73,800	79,400	85,600	7
Year-to-Year Increase (%)	14	40	3	6	6	6	8	8	
Installed Base									
CPUs	137,162	171,863	209,100	245,100	276,300	303,300	323,800	337,800	10
Seats	156,161	192,855	230,380	266,000	296,800	323,100	343,300	356,800	9
Year-to-Year Increase (%)	18	23	19	15	12	9	6	4	
REVENUE DATA ($M)									
CPU Revenue	901	1,006	980	1,028	1,077	1,113	1,152	1,205	4
Terminal Revenue	69	71	53	39	29	16	10	8	-32
Peripheral Revenue	186	155	158	147	137	126	117	108	-7
Hardware Revenue	1,156	1,232	1,192	1,214	1,242	1,255	1,279	1,321	2
Year-to-Year Increase (%)	12	7	-3	2	2	1	2	3	
Software Revenue	604	652	676	713	754	801	854	917	6
Year-to-Year Increase (%)	25	8	4	5	6	6	7	7	
Software Service	109	156	189	199	207	212	221	233	4
Hardware Service	215	239	210	217	217	214	212	212	0
Service Revenue	324	394	400	416	424	426	433	446	2
Year-to-Year Increase (%)	16	22	1	4	2	1	2	3	
Total Factory Revenue	2,083	2,278	2,267	2,343	2,420	2,482	2,565	2,684	3
Year-to-Year Increase (%)	17	9	0	3	3	3	3	5	

NA = Not applicable
Source: Dataquest (October 1995)

Table B-9
CAD/CAM/CAE/GIS Software History and Forecast
Detail Mechanical Forecast, Asia/Pacific, All Operating Systems

	1992	1993	1994	1995	1996	1997	1998	1999	CAGR (%) 1994-1999
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	7,621	14,025	18,634	23,300	28,300	33,700	39,300	44,800	19
Seats	8,031	15,095	19,117	23,900	28,800	34,100	39,700	45,100	19
Year-to-Year Increase (%)	40	88	27	25	20	18	16	14	
Installed Base									
CPUs	18,345	30,837	47,213	66,400	87,400	108,200	125,500	142,600	25
Seats	21,562	34,362	50,423	69,500	90,400	111,300	128,800	146,100	24
Year-to-Year Increase (%)	43	59	47	38	30	23	16	13	
REVENUE DATA ($M)									
CPU Revenue	75	95	108	121	138	157	175	195	12
Terminal Revenue	7	6	10	11	8	8	7	6	-9
Peripheral Revenue	11	9	9	11	13	15	17	18	16
Hardware Revenue	93	110	128	143	159	180	199	219	11
Year-to-Year Increase (%)	3	18	16	12	11	13	11	11	
Software Revenue	49	72	81	90	101	113	126	139	11
Year-to-Year Increase (%)	65	45	13	11	12	12	12	11	
Software Service	15	22	24	26	27	28	30	33	6
Hardware Service	18	21	22	22	24	25	28	30	7
Service Revenue	33	43	46	48	51	54	58	63	7
Year-to-Year Increase (%)	38	32	5	5	5	6	8	8	
Total Factory Revenue	175	225	254	281	310	346	382	422	11
Year-to-Year Increase (%)	22	28	13	11	10	12	11	10	

NA = Not applicable
Source: Dataquest (October 1995)

Table B-10
CAD/CAM/CAE/GIS Software History and Forecast
Detail Mechanical Forecast, Rest of World, All Operating Systems

	1992	1993	1994	1995	1996	1997	1998	1999	CAGR (%) 1994-1999
HARDWARE SHIPMENT DATA									
Shipments									
CPUs	3,525	5,839	6,269	6,900	7,600	8,600	9,800	10,800	11
Seats	4,012	6,053	6,480	7,000	7,800	8,700	9,900	10,900	11
Year-to-Year Increase (%)	13	51	7	9	10	12	13	10	
Installed Base									
CPUs	11,306	15,709	20,365	25,000	29,000	32,400	35,200	37,700	13
Seats	13,682	17,853	22,207	26,400	30,200	33,500	36,200	38,800	12
Year-to-Year Increase (%)	23	30	24	19	14	11	8	7	
REVENUE DATA ($M)									
CPU Revenue	38	35	41	43	47	52	58	64	9
Terminal Revenue	5	2	2	2	1	1	1	1	-16
Peripheral Revenue	4	3	4	3	3	3	4	4	0
Hardware Revenue	47	40	47	48	52	57	62	68	8
Year-to-Year Increase (%)	34	-15	16	3	8	10	9	10	
Software Revenue	25	28	31	33	35	38	42	47	8
Year-to-Year Increase (%)	61	11	13	5	7	9	11	10	
Software Service	7	8	11	11	12	12	13	14	5
Hardware Service	10	8	8	8	8	9	9	10	5
Service Revenue	18	16	19	19	20	21	23	24	5
Year-to-Year Increase (%)	79	-10	20	2	4	5	6	7	
Total Factory Revenue	90	84	97	101	108	117	127	139	7
Year-to-Year Increase (%)	48	-7	16	4	7	9	9	9	

NA = Not applicable
Source: Dataquest (October 1995)

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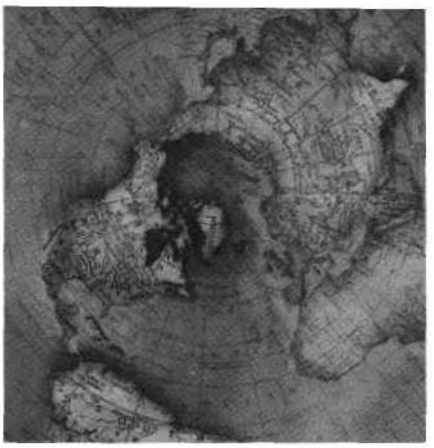

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Mechanical CAD/CAM/CAE Applications

Market Trends

Program: Mechanical Applications Worldwide
Product Code: CMEC-WW-MT-9501
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Mechanical CAD/CAM/CAE Applications

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Chapter 1
Executive Summary

Introduction

After a year of sluggish growth, the mechanical CAD/CAM/CAE market is picking up steam. After a sluggish 1993, the market grew 9 percent during 1994, and it is poised for even higher growth in the near future. Mechanical CAD tools and technologies are being introduced that will allow the engineer to tackle even more complex design problems. In this report, we define, quantify, and examine the technologies, tools, vendors, and trends that will impact the mechanical CAD market in the years to come.

Major Trends and Issues

Major trends and issues are as follows:

- The mechanical CAD/CAM/CAE software market grew 9.2 percent, to $2,455 million, in 1994. Leading the way in software revenue growth were Parametric Technology, SDRC, Matra Datavision, EDS Unigraphics, NEC, and Autodesk.
- The big comeback story occurred in Europe in 1994, with this region posting double-digit, positive growth after a few years of downturn.
- The high growth areas for 1994 included product data management (PDM) systems, functional design, manufacturing engineering, and manufacturing process simulation. Sluggish performance was seen in the drafting and documentation market.
- UNIX-based software still dominates the market, accounting for 74 percent of the mechanical CAD software sales in 1994.
- The low end of the market, traditionally dominated by Autodesk, is beginning to see more intense competition. We will begin to see these competitive changes in 1996.
- Mechanical CAD tools are beginning to infiltrate new territory. Tools are finding their way into "nontraditional" industries—namely, telecommunications/data communications, consumer electronics, and computers/peripherals.
- The coveted aerospace and automotive accounts continue to change hands at the expense of established players.
- The proportion of software service revenue to software revenue continues to increase, partly as a result of mechanical CAD/CAM/CAE software's increasing ability to take on more complex design problems.
- Object-oriented programming technologies are beginning to infiltrate the CAD world, with a handful of vendors announcing new product architectures based on object technology.
- The elements of a PDM are now into place, and PDM deployment is taking off. User interest and acceptance have yet to hit a high point.
- Manufacturing engineering is showing renewed interest as many of the design tools filter over into the manufacturing side.

- With the exception of a few vendors, performance in the analysis market was outstanding. We are seeing the beginning of a wave of analysis usage by the mainstream, as these tools are being picked up more and more by designers and engineers rather than by analysts.
- Continued improvements in graphics and hardware performance are paving the way for more advanced visualization tools. Simulation, visualization, and rendering applications constitute a small market with good growth potential.

Chapter 2
Report Overview, Definitions, and Methodology

Report Organization

This Mechanical CAD/CAM/CAE Market Trends report presents the results of our investigation into the current and future conditions of the mechanical CAD/CAM/CAE marketplace. It is intended to provide insight and analysis into the intricacies of this technically demanding and complex market.

Dataquest has made numerous changes to its CAD/CAM/CAE database in the past six months. Our switch to new database software has allowed us to track the market at a greater level of detail. In previous years, we concentrated on publishing market share information at various levels of breakdown, including regional, country-level, computing platform, and operating system statistics. This year, we have decided to concentrate more closely on detailed information at the subapplication level.

The results of this subapplication effort appear in this report. We have spent the last few months compiling and analyzing both market share and size information for our mechanical subapplications. We believe that this information will enable us to more accurately gauge the size of key markets and their growth potentials.

We have divided this report into four major sections. The remainder of Chapter 2 includes an explanation of the market research methodology used in this report. Our mechanical subapplications are defined, and our survey methodology and data collection methods are outlined. Chapter 3 provides a snapshot of the mechanical CAD industry as it stands today, and Chapter 4 identifies the trends having the greatest impact on the mechanical CAD/CAM/CAE industry for the future. Chapter 5 looks at each of the subapplications in greater detail. Market share information, industry trends, and driving forces for each subapplication are identified and discussed. Appendix A contains final 1994 market share information for the mechanical CAD/CAM/CAE market.

Data Collection Process

Fundamental to the way Dataquest conducts its research is an underlying philosophy that the best data and analysis come from a well-balanced program. This program includes the following: balance between primary and secondary collection techniques; balance between supply-side and demand-side analysis; balance between focused industry-specific research and coordinated "big picture" analysis aided by integration of data from more than 25 separate high-technology industries that Dataquest covers; and balance between the perspectives of experienced industry professionals and rigorous, disciplined techniques of seasoned market researchers.

Supply-Side Data

In the fourth quarter of each year, Dataquest surveys all major participants in the mechanical CAD/CAM/CAE industry to obtain preliminary market share data. Each vendor is offered the opportunity to self-report the information required. Although there is a primary contact for each

company, large companies are surveyed across product lines and geographic regions. Thus, there is a corresponding increase in the number of contacts at large companies. Examples of job titles of people contacted for information include:

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

We resurvey companies during the second quarter of the following year to verify final annual results and determine the mechanical subapplication information. The information in this document is based upon the final market share data for 1994.

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

- Revenue published by major industry participants
- Estimates made by knowledgeable and reliable industry spokespersons
- Government or trade association data
- Published product literature and price lists
- Annual reports, Securities and Exchange Commission documents, and credit reports
- Company publications and press releases
- Reports from financial analysts
- Reseller and supplier reports and reports from a vendor's competitors

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

We believe that the estimates presented here are the most accurate and meaningful estimates generally available today. Dataquest's mechanical CAD/CAM/CAE market numbers are often higher than those reported by other sources. We survey worldwide, which involves more vendors, higher total market revenue, lower market share per vendor, and a more accurate market picture, which is particularly useful when comparing regions or applications.

Demand-Side Data

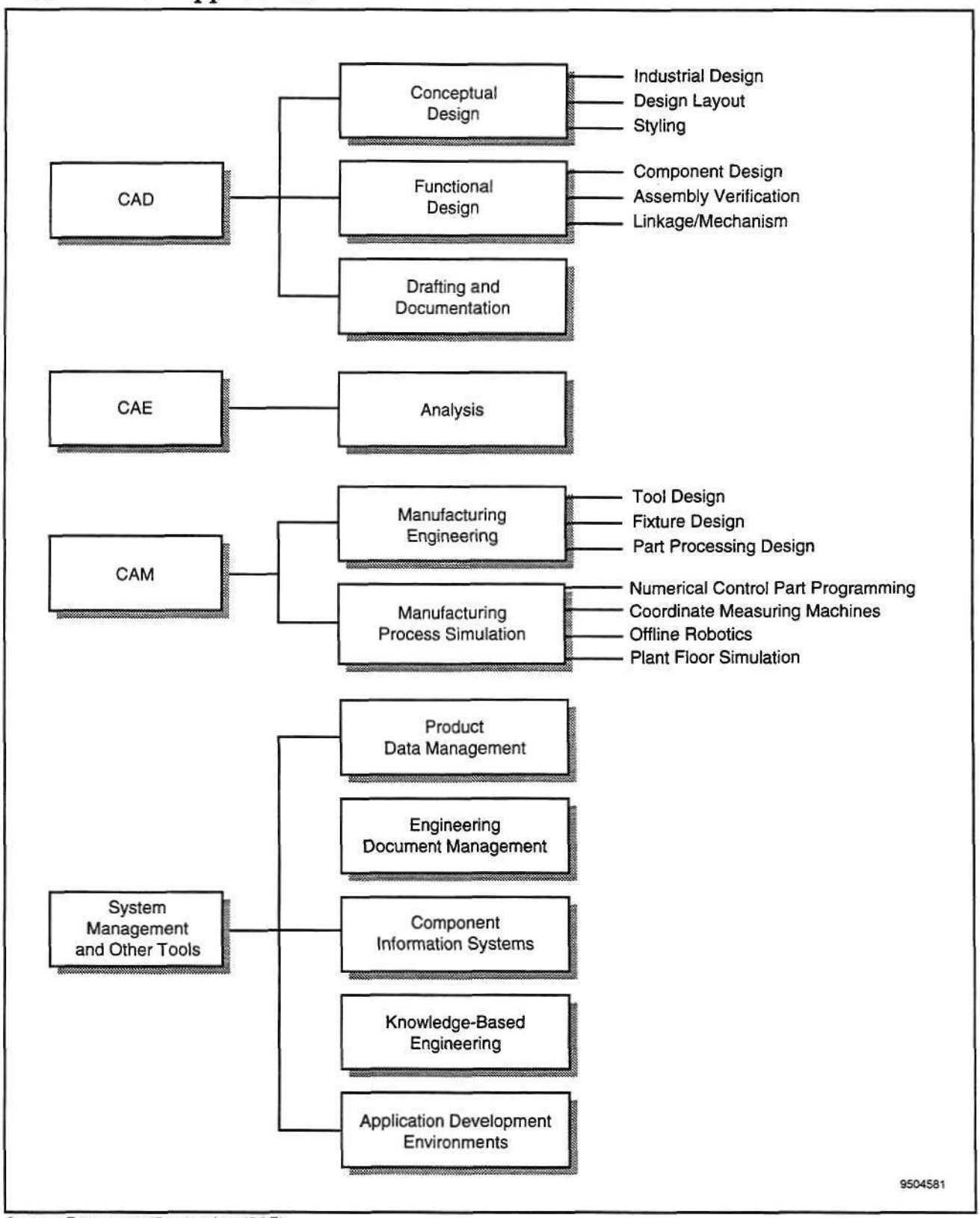
Dataquest also relies heavily on demand-side, or end-user, data for validating vendor market share and identifying mechanical CAD/CAM/CAE trends. Demand-side data is gathered using extensive survey techniques. End users are identified using a variety of means, including databases of past survey respondents, corporate intelligence databases, mechanical software vendors' registered users lists, and magazine subscriber lists. End-user surveys are often conducted by telephone to allow for better screening of prospective respondents. At least one major end-user survey is conducted each calendar year, and a number of informal surveys are conducted throughout the year. The results of these surveys are entered into a statistical analysis package for cleansing and analysis of the data. This statistical database allows Dataquest to cross-tabulate the data for improved analysis.

Mechanical CAD/CAM/CAE Subapplications—Segmentation and Definitions

Figure 2-1 depicts the mechanical subapplications that Dataquest tracks. We have adopted the following definitions for the mechanical CAD/CAM/CAE subapplications:

- Conceptual design
  - Industrial design—A process that provides a common environment for the entire conceptual design process, including painting, modeling, rendering, and visualization
  - Design layout—An initial design process in which the major components and part interfaces are defined
  - Styling—A detailed design process in which aesthetic considerations are foremost in importance
- Functional design
  - Component design—Design of the individual components in an assembly
  - Assembly verification—Integration of component designs into an assembly to test size/shape and functional characteristics
  - Linkage/mechanism—An assembly of components with two or more movable parts, usually providing some means of power, control, or fastening application
- Analysis—The analysis of a physical system, part, or assembly; includes structural, thermal, vibrational, composite, fatigue, stack-up, mass property, and quality control analysis
- Drafting and documentation
  - Detail drafting—Representation of a part in standard geometric drafting format, including all part geometry dimensions and notations describing mechanical/structural, functional, and material characteristics
  - Schematics/detailed diagrams—Schematics used to describe hydraulic and pneumatic systems
  - Technical illustration—Drawing of a component or assembly that is generally intended for publication

Figure 2-1
Mechanical Subapplications



Source: Dataquest (September 1995)

- Manufacturing engineering
  - Tool design—The design of custom-made tooling to facilitate a manufacturing process
  - Fixture design—The design of structural aids that hold the component or assembly during the manufacturing process
  - Part processing design—The design of a series of manufacturing processes
- Manufacturing process simulation
  - Numerical control (NC) part programming—The programming of a numerical control machine tool or automated processing system
  - Coordinate measuring machines—Programming of machines used to measure the physical dimensions of a part
  - Offline robotics—A process simulation that graphically represents the sequence of steps to program a robot for a particular operation and downloads data to a robot to update its control program
- System management and other tools
  - PDM—Software typically used in an engineering or manufacturing environment to manage product data. Characteristics of PDM systems include product structure management, workflow, and vault/document management capabilities.
  - Engineering data management—Software with traditional document or vault management capabilities and limited workflow capabilities designed for use within an engineering environment
  - Component information systems—Software used to navigate within and manage a repository of engineering parts and associated data
  - Knowledge-based engineering tools—Tools used to capture design intent and build standard practices for controlling, modifying, and automating design and manufacturing activities. Also known as rule-based engineering.
  - Application development environments—Programming tools to aid in the generation of user-defined programs that drive or interface with CAD/CAM/CAE applications

Chapter 3
1994 Market Snapshot

The mechanical CAD/CAM/CAE market reached $2,455 billion in software revenue in 1994, up 9.2 percent from 1993. The five leading players commanded about 43 percent of the market (see Table 3-1). Similar to 1993, the No. 1 and No. 2 spots were held by IBM and Parametric Technology Corporation (PTC). Above-average growth was seen by many of the leading companies, including Parametric Technology, SDRC, Matra Datavision, EDS Unigraphics, and Autodesk. In the remaining sections of this chapter, we delve further into the market statistics for 1994, looking at the mechanical CAD/CAM/CAE market from a variety of perspectives.

Still a UNIX Market

The mechanical CAD/CAM/CAE market remains predominantly UNIX based. In 1994, UNIX software sales made up 74.0 percent of the market, while DOS/Windows software made up 19.4 percent of the market. Host-based systems declined to 5.4 percent of the market, and Windows NT-based sales accounted for the remaining 1.2 percent.

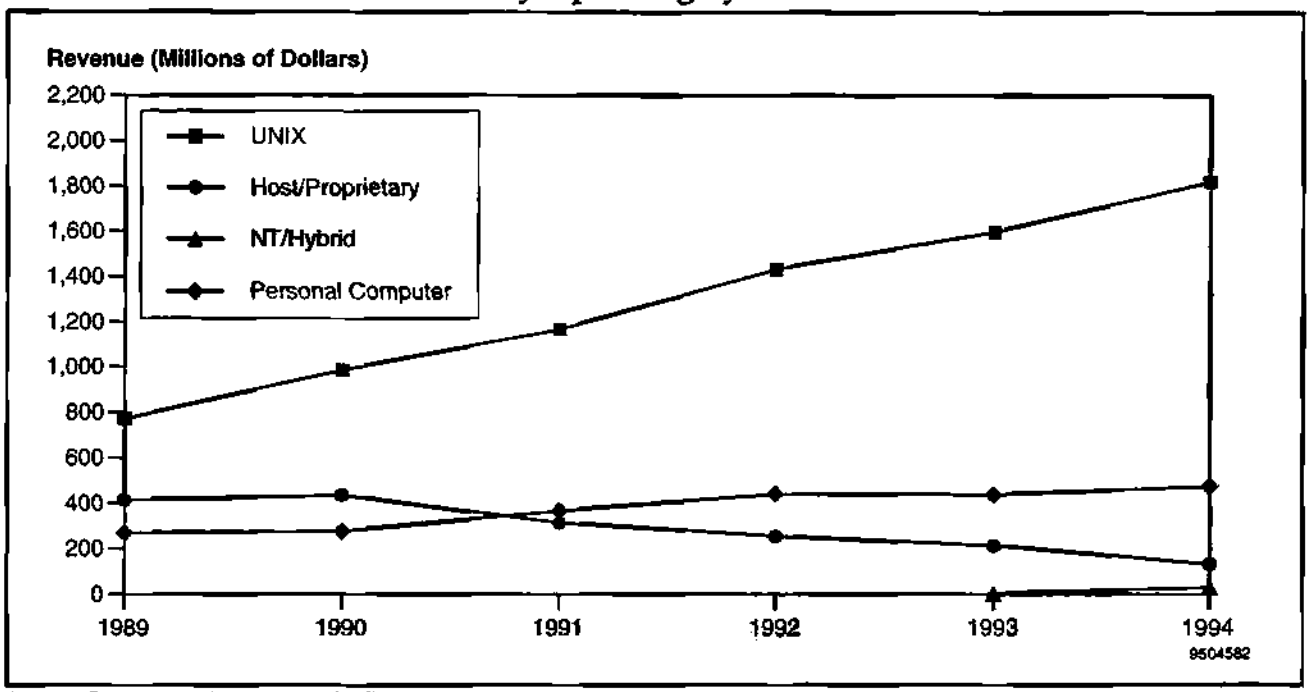
Sales of UNIX-based software have outpaced growth of both DOS- and Windows-based software for the last three years (see Figure 3-1). Despite the abundance of low-end, DOS/Windows players, this market remains overwhelmingly dominated by Autodesk, and to a lesser degree by IBM, with its sales of CADAM and MICROCADAM. To date, the major mechanical vendors sell their flagship CAD/CAM programs primarily on the UNIX platform and, in a few cases, on the NT platform. We will further discuss the impact of the Windows NT operating system on the mechanical CAD industry in Chapter 4.

Table 3-1
1994 Mechanical Market Share

Rank	Vendor	1994 Software Revenue ($M)	Growth (%) 1993-1994	1994 Market Share (%)
1	IBM	363.7	9.3	14.8
2	Parametric Technology	205.0	36.4	8.3
3	Autodesk	176.8	10.9	7.2
4	EDS Unigraphics	169.8	14.0	6.9
5	Computervision	148.9	0.2	6.1
6	SDRC	111.4	30.1	4.5
7	MacNeal-Schwendler	95.0	-18.1	3.9
8	Matra Datavision	75.5	19.8	3.1
9	Hewlett-Packard	71.6	2.3	2.9
10	Hitachi	66.4	7.5	2.7

Source: Dataquest (September 1995)

Figure 3-1
Mechanical Market Performance by Operating System



Source: Dataquest (September 1995)

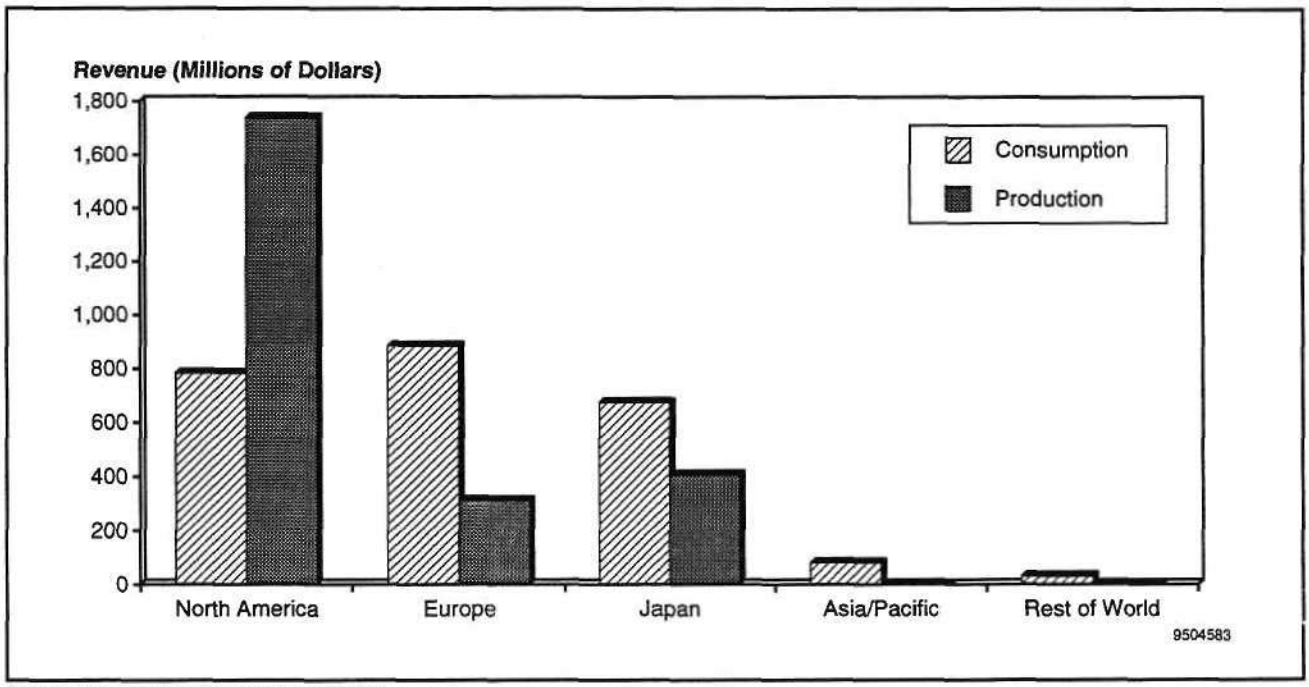
Regional Differences

Each region of the world (Japan and Asia/Pacific, Europe, and North America) has historically spent nearly equal amounts of money on mechanical CAD/CAM/CAE software. Figure 3-2 shows regional consumption of mechanical CAD software over time. The Asian countries, led by Japan, now account for 31 percent of the software consumed. Europe continues to consume slightly more in software revenue than North America.

Fluctuating exchange rates once again masked true market performance in Japan. The Japanese mechanical market grew a surprising 3.7 percent in 1994 when measured in U.S. dollars, contrary to what would be expected in light of Japan's prolonged recession. However, because the dollar depreciated against the yen at a rate of 8.2 percent, the Japanese mechanical software market actually declined from 1993 to 1994 when measured in yen. PTC made significant headway into Japan during 1994, nearly doubling its 1993 Japanese revenue.

The big comeback in 1994, however, occurred in Europe. After several years of gloom in the European CAD/CAM/CAE market, we are finally beginning to see light at the end of the tunnel. The broadening and strengthening of recovery in the European economies marked the end of the long and unusually severe downturn of recent years. All major European economies began a return to positive gross domestic product (GDP) growth in 1994, and GDP is expected to remain stable for the foreseeable future. This growth, in turn, will lead to increased industrial production. Such improved economic indicators are instilling more confidence in industry, and businesses are expected to substantially increase their investment in manufacturing for the remainder of 1995 and throughout

Figure 3-2
Regional Differences in Mechanical CAD/CAM/CAE Software Consumption and Production



Source: Dataquest (September 1995)

1996. In particular, car production and sales figures in Europe are on the rise, and the outlook for the European industrial machinery sector has improved sharply.

Industrial Outlook

The aerospace and automotive industries continue to dominate the mechanical CAD market; the two industries combined accounted for nearly 30 percent of 1994 software sales. However, these two industries, along with industrial machinery, actually lost ground in 1994 (see Table 3-2). The big gains, in terms of gaining percentage share of the market, occurred in some of the "nontraditional" mechanical CAD industries—telecommunications/data communications, consumer electronics, and computers/peripherals. We fully expect the automotive and industrial machinery markets to post healthier gains over the next few years, and we expect the gains in some of the smaller mechanical CAD industries, such as medical manufacturing, computers/peripherals, telecommunications, and consumer electronics, to continue over the next five years as 3-D CAD/CAM/CAE tools find their place in these fast-growing industries.

Modeling Technologies

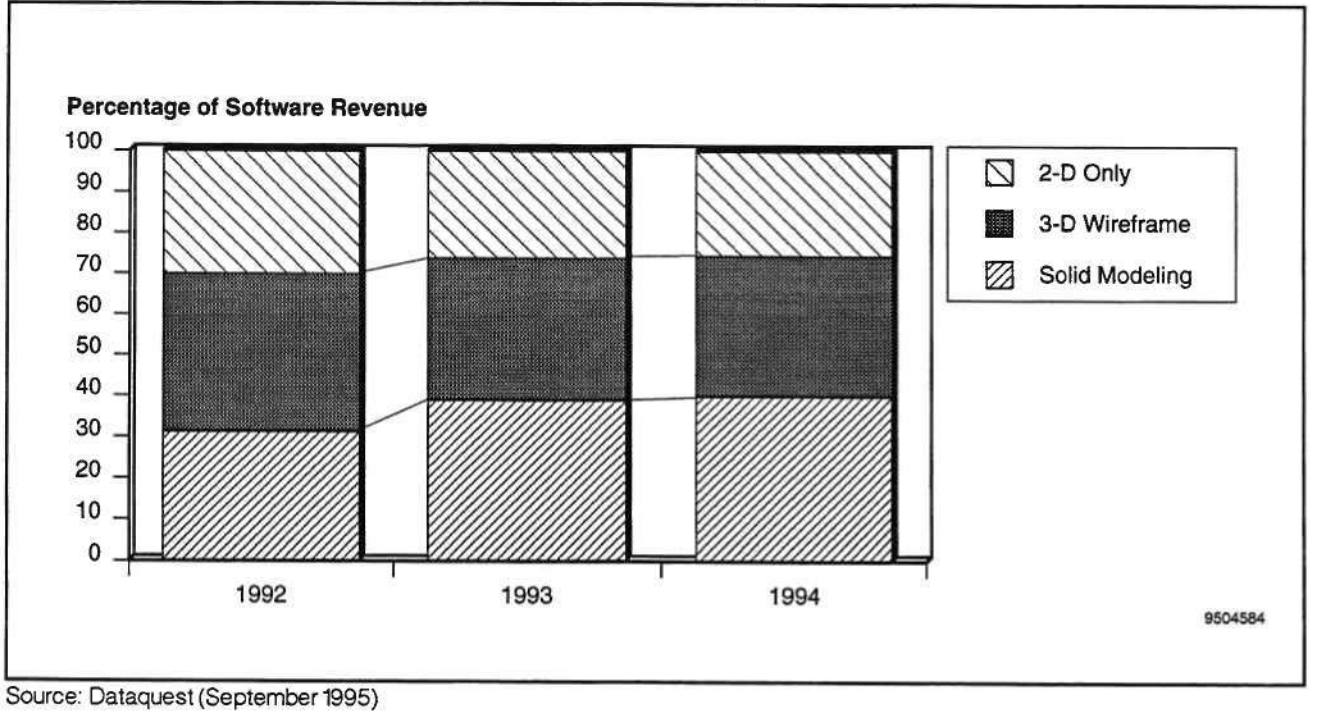
Growth in solid-modeling-based systems has been on a steady upward climb for the last three years. This growth in solid modeling is based on the value of a more complete data structure and is coming largely at the expense of 3-D wireframe systems. However, there is still a relatively high interest in 2-D solutions, which serves as a strong reminder that many drawings are still made in this environment. Dataquest estimates that about 40 percent of the software sold in 1994 was based on solid-modeling technology (see Figure 3-3).

Table 3-2
1994 Mechanical Revenue by Industry

Industry	1994 Software Revenue ($M)	Distribution (%)	Growth (%) 1993-1994
Automotive/Motorcycles/Bikes	425.1	17.3	8.1
Aerospace	292.8	11.9	6.8
Industrial and Commercial Machinery	269.9	11.0	8.6
Electrical and Electronic Equipment	208.4	8.5	10.3
Computers/Office Equipment/Peripherals	191.3	7.8	16.2
Fabricated Metal	167.0	6.8	10.6
Consumer Electronics	112.9	4.6	25.9
Service/Design/Consulting	102.7	4.2	8.5
Telecommunications/Data Communications	95.8	3.9	29.3
Manufacturing, Others	86.0	3.5	5.2

Source: Dataquest (September 1995)

Figure 3-3
1994 Mechanical Revenue by Modeling Technology



Source: Dataquest (September 1995)

There still exists a relatively untapped market for 3-D application usage in Japan. Japanese companies have traditionally had a heavy reliance on drafting-oriented tasks. An end-user survey conducted in Japan in 1994 showed that the top three reasons cited for not using 3-D CAD systems were that 2-D CAD is enough (29 percent of respondents), 3-D systems are very expensive (21 percent), and 3-D systems are difficult to use (21 percent).

Hardware Vendors

In mechanical CAD applications, Sun Microsystems continues to lead the pack in terms of both unit shipments of workstations and CPU revenue. However, this does not mean that the other hardware vendors are sitting idle. Hewlett-Packard, with $580 million in CPU revenue in 1994, has been right behind Sun for the past three years. Further, both IBM and Silicon Graphics Inc. (SGI) have continued to make market share gains in unit shipments and CPU revenue at the expense of Sun (and, to a lesser extent, Digital Equipment Corporation). Table 3-3 shows the historical performance of the major mechanical workstation vendors.

Table 3-3
Mechanical Workstation Vendor Market Share

	1994 Share of Market		1993 Share of Market	
	Unit Shipments (%)	CPU Revenue (%)	Unit Shipments (%)	CPU Revenue (%)
Sun Microsystems	35	24	37	25
Hewlett-Packard	22	24	23	24
IBM	17	21	14	18
Silicon Graphics	11	14	11	14
Digital Equipment	13	11	13	11
Intergraph	1	1	2	2
Rest of Market	1	5	1	6

Note: Columns may not add to 100 percent because of rounding.
Source: Dataquest (September 1995)

Chapter 4
Major Trends

Dataquest has identified the following trends that will influence the mechanical CAD/CAM/CAE market over the next five years. While some of these trends are technology driven—based on technologies that are being developed and adopted by designers and engineers—others are industry driven and vendor driven.

Intense Competition at the High End; Renewed Interest in the Low End

The mechanical CAD/CAM/CAE industry can be envisioned as having a high end, dominated by workstation-based systems that are often sold direct, and a low end, dominated by mostly PC-based systems often sold through a dealer network.

The high end is characterized by products that are often UNIX based, offer a full range of functionality from CAD to CAM to CAE, are solid-modeling based, and command higher price points. The high end is filled with the large competitors—IBM, PTC, EDS Unigraphics, Computervision, and SDRC—and a smaller group of players that include Matra Datavision, HP, and Intergraph. There are also many Japanese vendors offering art-to-part systems, specialty niche analysis vendors, numerical control vendors, and PDM vendors that compete at the high end.

Within the high end, there is clearly a market that is emerging unto itself; namely, the "top-tier," much coveted aerospace and automotive accounts. The year 1994 saw the beginning of a change of hands in these accounts, with some of the top accounts falling to new vendors, and we have yet to reach the end of the tunnel, particularly as the European automotive accounts change hands. The use of proprietary CAD systems in Japan is still pervasive; however, the major Japanese auto manufacturers either have some commercial CAD seats already or are looking to move in that direction.

The low-end market is characterized by lower price points, extensive use of the dealer channel, typically less software functionality, and PC-based operating systems. Some low-end vendors see this market as an opportunity to migrate primarily 2-D users to basic, 3-D solid-modeling systems.

Until this year, the low end has been dominated by Autodesk and, to a lesser extent, IBM. The year 1995 has marked the beginning of turmoil at the low end, with Computervision and Bentley making aggressive moves on this market. Computervision is moving rapidly ahead with its object-oriented Pelorus architecture, announcing its first product, Design Post Drafting, earlier this year. Bentley, now responsible for its own marketing separate from Intergraph, is making moves on the mechanical market with Microstation and its upcoming object-oriented architecture, Objective Microstation. We expect new sales at the low end to occur in the future, with some coming at the expense of the existing installed base.

More Complex Design Problems Leading to Higher Service Revenue

There is no question that CAD/CAM software is being used to tackle increasingly difficult problems. As CAD software becomes more entrenched within a company and its design/manufacturing processes, and as the problems solved with CAD software become more abstract and conceptual in nature, service plays a growing role, both in the design and manufacturing side as well as in the business process side. This trend toward higher software service dollars began a few years ago, and we expect service revenue to continue to take a bigger piece of the pie. In 1992, the ratio of service revenue to software revenue for all mechanical CAD companies was 1:4. In 1994, this ratio was 1:3.

In Table 4-1, we show the revenue and market share for mechanical vendors based on a combination of software and software service revenue for 1994. While IBM and PTC still claim the top two spots, the rest of the rankings change. Computervision jumps up to the No. 3 spot, close behind PTC, and Intergraph moves up into the top 10.

Computing and Graphics Performance Expectations

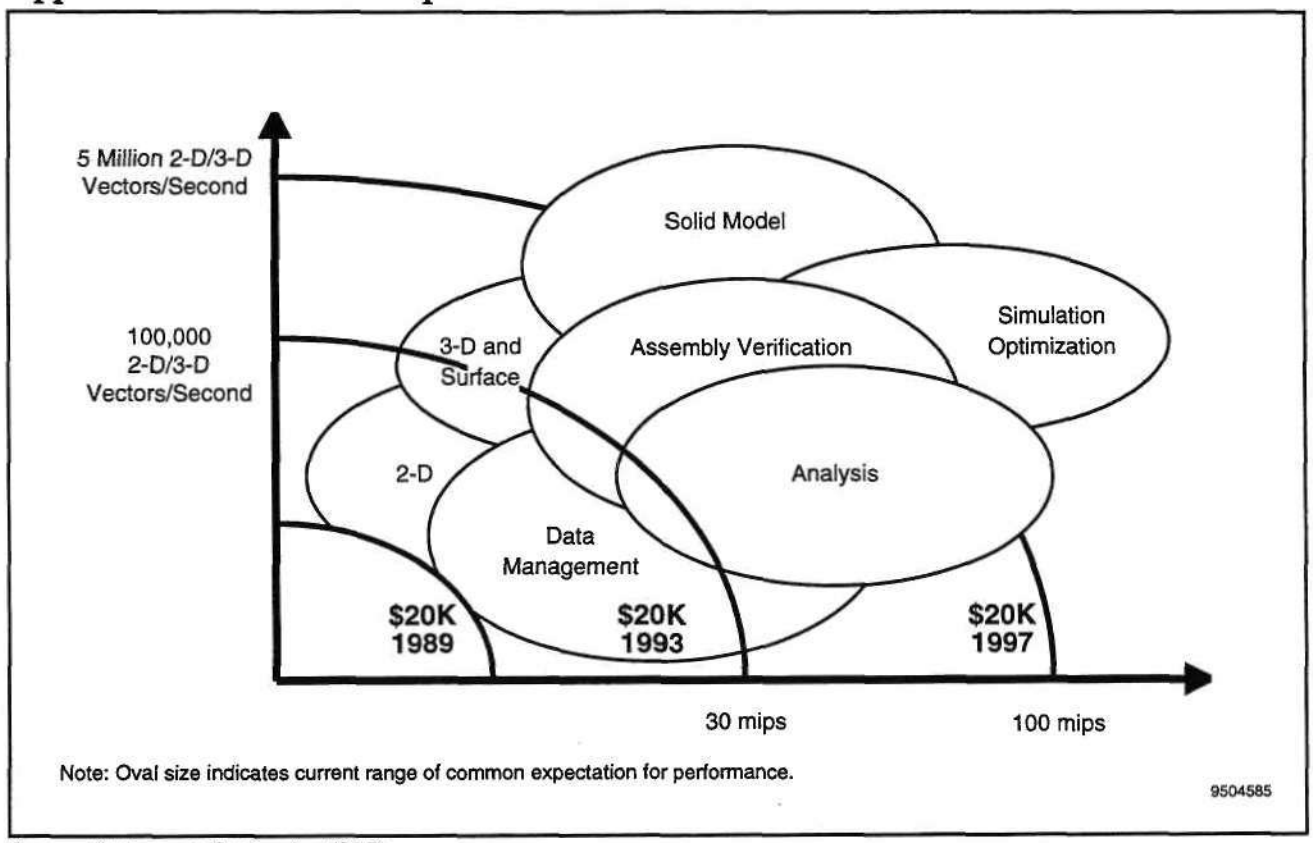
As the complexity of mechanical CAD applications has increased, so too has the performance of the computing platforms. What can be accomplished with reasonable interactive performance on a $20,000 workstation is evolving (see Figure 4-1). In 1989, a $20,000 workstation could support only the basic applications of 2-D drafting and assembly design. In 1994, all of the basic and many of the advanced mechanical CAD/CAM/CAE applications could be effectively handled on such a workstation.

Table 4-1
1994 Vendor Rankings Based on Software and Software Service

Rank	Vendor	Software/Software Service Revenue ($M)	Market Share (%)
1	IBM	550.5	16.7
2	Parametric Technology	262.8	8.0
3	Computervision	255.8	7.8
4	EDS Unigraphics	221.3	6.7
5	Autodesk	176.7	5.4
6	SDRC	167.5	5.1
7	MacNeal-Schwendler	116.7	3.5
8	Hewlett-Packard	93.1	2.8
9	Matra Datavision	86.4	2.6
10	Intergraph	83.1	2.5
	All Companies	3,293.7	100

Source: Dataquest (September 1995)

Figure 4-1
Applications Performance Spectrum



Source: Dataquest (September 1995)

What we see is growth in the user expectations for baseline computing and graphics functionality. As computing and graphics performance improve, user expectations and user-perceived acceptable hardware performance are driven even higher. New applications that require more computing and graphics performance will continue to evolve. Digital mock-ups, electronic or virtual product definitions, design optimization, and styling are just a few examples. An almost insatiable need exists to continue to design more complex products in a more realistic, simulated environment. Making this full-simulation capability a reality at an affordable price will keep hardware developers busy for many years to come.

Data Sharing, Interoperability, and the New Standards

The year 1994 marked the beginning of a renewed interest in standards, and we see this continuing in 1995 and beyond. In early 1994, STEP became an international standard, and in early 1995, the major mechanical CAD vendors began announcing STEP capabilities. In 1995 we also began to see an interest in object-oriented technologies and the vendor-driven CAD extensions to object linking and embedding (OLE). We are not saying that the two standards are competing with one another; however, we foresee both standards influencing the mechanical CAD industry in the future. While it is too early to assess the impact of the CAD OLE initiative, we believe that, although the STEP standard is progressing slowly, there is enough interest in it on a worldwide basis for it to influence the CAD industry for some time.

The STEP Standard

In North America, STEP is no longer in the limelight, having taken a backseat to the interest being generated by such things as object-oriented software and CAD and OLE. Nevertheless, the standard is still progressing. In 1995, all of the major CAD vendors announced some sort of STEP capability, mostly at the translation level (see Table 4-2). STEP is still very active in Europe, largely driven by the fact that standards are often incorporated into local laws. ProSTEP GmbH is the more commercial arm of the STEP effort in Europe, concentrating on providing products and services for compatible applications focused on the auto industry. ProSTEP is even venturing into developing solutions aimed for engineering data management (EDM), with the first results targeted for early 1996. EDM has been around in Germany for a number of years, so it is not surprising that this initiative to develop a data exchange standard for EDM is happening in Germany through ProSTEP. Clearly, to make EDM truly useful, a data exchange standard is absolutely necessary.

While the Japanese companies have traditionally relied on internally developed software CAD packages, they are investigating the idea of STEP translators. The Japanese Automobile Manufacturers Association has been working to develop a set of STEP translators that will work with four proprietary CAD/CAM systems.

CAD and OLE

Meanwhile, Intergraph is taking a slightly different approach to the data translation/legacy data problem. Intergraph, in conjunction with other vendors and end users in the industry, is developing CAD extensions to Microsoft's OLE technology. Work is now under way for adding OLE extensions for specific mechanical technologies like analysis and numerical control. Intergraph's Mechanical Division envisions using this CAD OLE technology in a situation in which an engineer builds an assembly whose individual components are designed using software from different CAD programs. No data translations are required; instead, the components are treated as OLE objects, thus circumventing the problem of inaccurate or incomplete data transfers.

Table 4-2
STEP Offerings from Major CAD Vendors

Vendor	Product	AP203	AP214
Computervision	CADDS5, Pelorus	X	X
Dassault Systemes	CATIA Rev 4.1	X	
EDS Unigraphics	UG V10.4	X	X
Hewlett-Packard	SolidDesigner 3.0	X	X
Intergraph	EMS	X	
Matra Datavision	Euclid Designer	X	X
Parametric Technology	Pro/ENGINEER 14.0	X	X
SDRC	IDEAS Master Series 2	X	X

Source: Dataquest (September 1995)

Breaking the Engineering Walls—PDM

The number of companies in the PDM arena is staggering. At last count, there were over 30 companies vying for a position in this highly fragmented but rapidly growing market. These vendors are attacking the market from three primary areas of expertise—mechanical CAD/CAM vendors who have a strong history in mechanical CAD software and understand PDM needs from an engineering or manufacturing perspective; document management vendors with vault management or workflow strengths; and specialty, PDM-only vendors (many of whom have a strong understanding of engineering design or manufacturing).

All of the elements for PDM systems have finally fallen into place. Broadly speaking, these elements include vault management, workflow capabilities, and product structure management. Beyond these basic elements, companies continue to tout advantages over their competitors in PDM graphical user interfaces, database technology used (relational or object oriented), availability of PCs as clients, and system scalability to the enterprise level.

To the CAD world, PDM systems open up a host of new possibilities. Dataquest believes that one of the biggest benefits of the PDM trend is that it will help bring CAD—or more specifically, design engineering activities—into the mainstream of a company. Consider a fully functional, enterprisewide PDM system. Designers are not the only ones who need to access information that resides in the PDM system; purchasing departments, manufacturing, accounting, logistics, and other engineering design departments need access as well. Opportunities open up for software vendors to create tight links between CAD/CAM software, MRP (manufacturing resource planning) systems, component information systems (CIS), and purchase order software.

There is now a critical mass of users in need of some sort of data management system to reduce costs and gain control of the work environment. A Dataquest end-user survey indicated that, on average, there are 19,000 active CAD files per engineering site. Despite the mountains of data that companies as a whole are facing, the use of PDM systems at the enterprise level is still small. PDM deployment is not cheap, and it is difficult for companies to rationalize such purchases when PDM deployment typically takes many months, often encompasses some degree of business process examination and/or re-engineering, takes buy-in from disparate groups within a company, and may not show immediate benefits.

As a result, the PDM vendors have responded to these gaps by putting together solutions at the $50,000 price point (for perhaps 10 seats) with limited PDM functionality. Most of the projects being adopted now are pilot projects focusing on smaller workgroups. We expect this trend to continue, with price points for PDM systems dropping to a more palatable level in the very near future. We will further discuss PDM systems in Chapter 5.

Object Technology Concepts Are Taking Off

While object-oriented programming has been around for many years, it had not filtered into the world of CAD/CAM until now. Object-oriented programming techniques are being used not only in mechanical CAD but also in CAD markets such as architecture/engineering/construction. The use of object technology by the mechanical CAD vendors started with Matra Datavision's CAS.CADE/SF and Euclid Designer in 1994. Following in 1995 were Computervision's Pelorus, Bentley Systems' Objective Microstation, Intergraph's Jupiter, and, most recently, Autodesk's AutoCAD Runtime Extension (ARX) developer kits.

In its truest form, object-oriented programming can benefit the developers of CAD/CAM software in the following ways:

- Because these new object-oriented architectures are in essence providing a "design environment" for CAD software developers, these developers can focus on application development rather than on other software programming tasks, like database structure, platform/operating system interfaces, or software housekeeping tasks.
- Because of the use of reusable code, modules, and objects, software development times, in theory, should be shorter.
- Software developers can build vertical applications suited to specific tasks, industries, or customers.

Benefits to the designers and engineers include:

- Timely software releases and upgrades that support multiple platforms
- Potential to have software be compliant to a given standard, such as STEP (both Computervision and Matra Datavision are using STEP-compliant databases in their new architectures)
- Customization of CAD programs to suit specific needs

It is still too early to tell what the full impact of object-oriented programming will be on the CAD world, but engineers are already embracing these new architectures. For instance, Computervision has won at least two major contracts based on a software architecture (Pelorus) that holds a lot of potential but few applications to date. We fully expect the use of object technology to attract the attention of many developers in the CAD/CAM industry.

An Uphill Battle for Windows NT

The world of mechanical CAD/CAM/CAE is still highly entrenched in UNIX. Microsoft's foray into the CAD world with the NT operating system began as far back as 1992. NT-based products began hitting the market in 1994, with some products aimed at the DOS/Windows mechanical CAD designers and others at UNIX-based CAD users. Table 4-3 indicates which of the major mechanical vendors have NT offerings.

To date, any Windows NT-based application software that has been brought to the market has also been available on UNIX or DOS/Windows platform for the same price. The result is little or no cost savings at the application level. The CAD/CAM/CAE industry has been around long

Table 4-3
Windows NT Offerings by Major Mechanical Vendors

Vendor	Product	NT Platform Available	Have Announced Future NT Availability	Have Not Made NT Plans Public
IBM	CATIA			X
Parametric Technology	Pro/ENGINEER	X		
Autodesk	AutoCAD	X		
EDS Unigraphics	Unigraphics		X	
Computervision	CADDS5			X
SDRC	I-DEAS/Master Series		X	
Matra Datavision	Prelude, EUCLID	X		
Hewlett-Packard	SolidDesigner			X
Intergraph	EMS		X	

Source: Dataquest (September 1995)

enough for several operating systems to have emerged, been implemented, and been absorbed into the framework of the end-user environment. Each one along the way has offered some benefit in improved middleware support, performance, or graphics. The market has been eager to embrace anything that provides a relative performance improvement, significant price benefit, or ease-of-use enhancement. Furthermore, as we stated earlier, the baseline user expectation for hardware performance continues to rise, and CAD applications continue to evolve in complexity. The bottom line opportunity for Windows NT is to address all of these issues.

The Merging of Mechanical Design and Electronic Design

System design automation (SDA) is a logical extension of the current trends in mechanical design automation and EDA. As design problems become more complex and simulation tools become more capable, users will need to combine these activities into an integrated environment. This is where SDA has significant potential value. The logic of a system can be verified in terms of electrical and mechanical engineering. Automotive, aerospace, and consumer electronic industries are full of examples of this kind of integrated design: adaptive suspension systems, antilock brakes, and film and video cameras.

The SDA market is not expected to take off for another four or five years. Vendors who are well positioned for this market will need to have a good understanding of both electronic design and mechanical design in order to merge the two disciplines for a system-level offering.

Chapter 5
The Mechanical Market by Subapplication

In Chapter 2, we outlined and defined the subapplications that Dataquest tracks. In this chapter, we provide a detailed look at the major subapplications highlighted in Figure 5-1. A summary table of 1994 performance by major subapplication is shown in Table 5-1.

Conceptual Design

The conceptual design market grew 8.3 percent over 1993. Market share of the leading vendors is shown in Figure 5-2. While IBM led the market, Alias Research (now owned by SGI) grew over 20 percent to take second place in 1994.

While this market was lackluster in 1994, we fully expect it to blossom in the next five years. PTC's purchase of the Evans & Sutherland industrial design software (along with PTC's purchase of analysis vendor Rasna) sent a wake-up call to the market. It is hard to discount the actions of one of the fastest-growing CAD companies as trivial, especially when there lies the prospect of bringing the analysis and conceptual design processes much closer together. With this thought in mind, we believe that the analysis market will help fuel the conceptual design market, and vice versa.

Functional Design

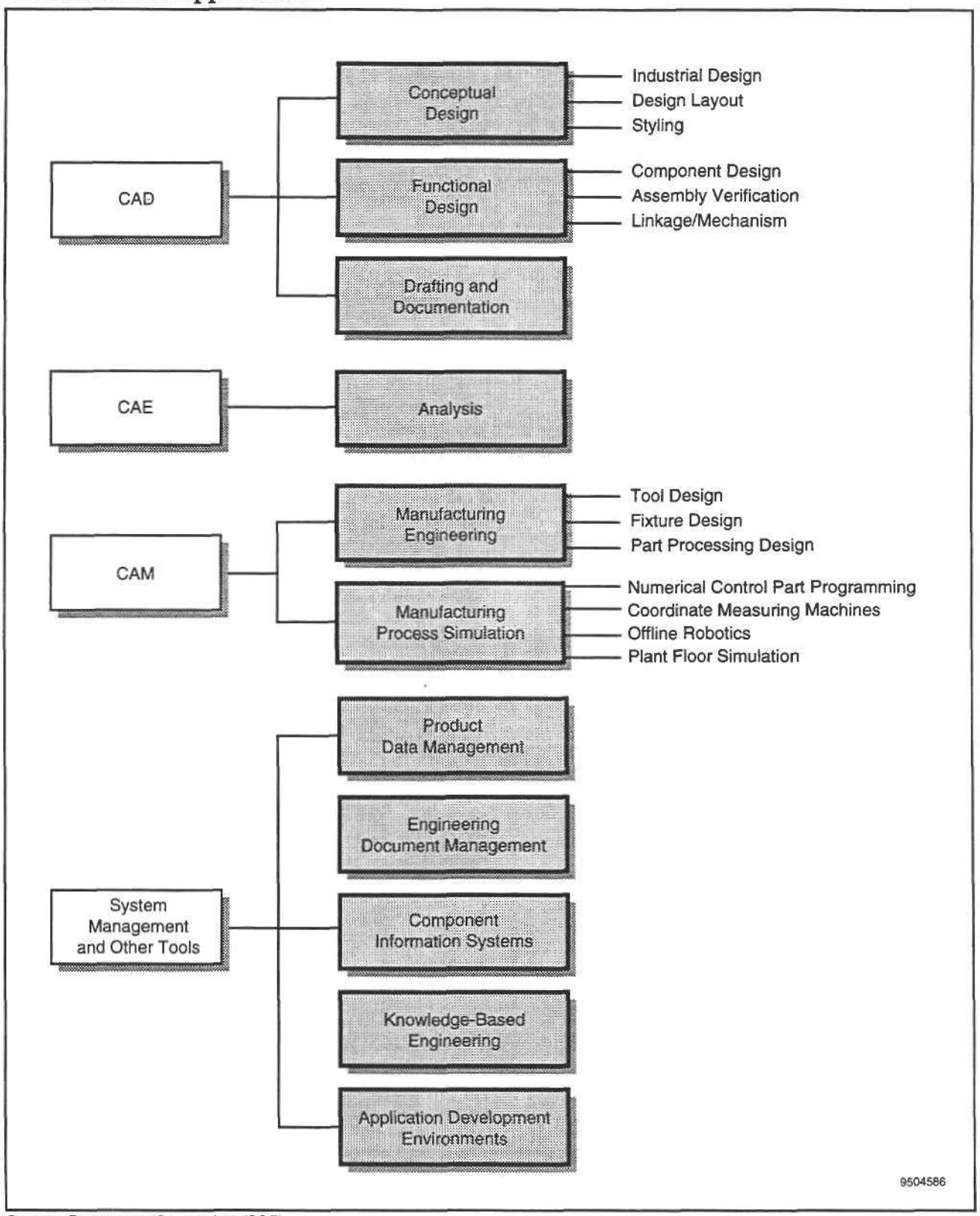
The functional design market is one of the larger subapplications in the mechanical CAD industry. In 1994, IBM edged out PTC for first place in this market, with each company generating about $110 million in functional design sales. The usual competitors round out the top five (see Figure 5-3).

Table 5-1
1994 Performance of Mechanical Subapplications

Application	Subapplication	1994 Software Revenue ($M)	Growth (%) 1993 to 1994
CAD	Conceptual Design	254	8.3
	Functional Design	558	11.4
	Drafting and Documentation	589	4.2
CAE	Analysis	372	7.7
CAM	Manufacturing Engineering	160	10.0
	Manufacturing Process Simulation	277	13.4
System Management and Other Tools	Knowledge-Based Engineering	12	26.6
	Product Data Management/Engineering Data Management	190	21.7
	Application Development Environments	33	7.5

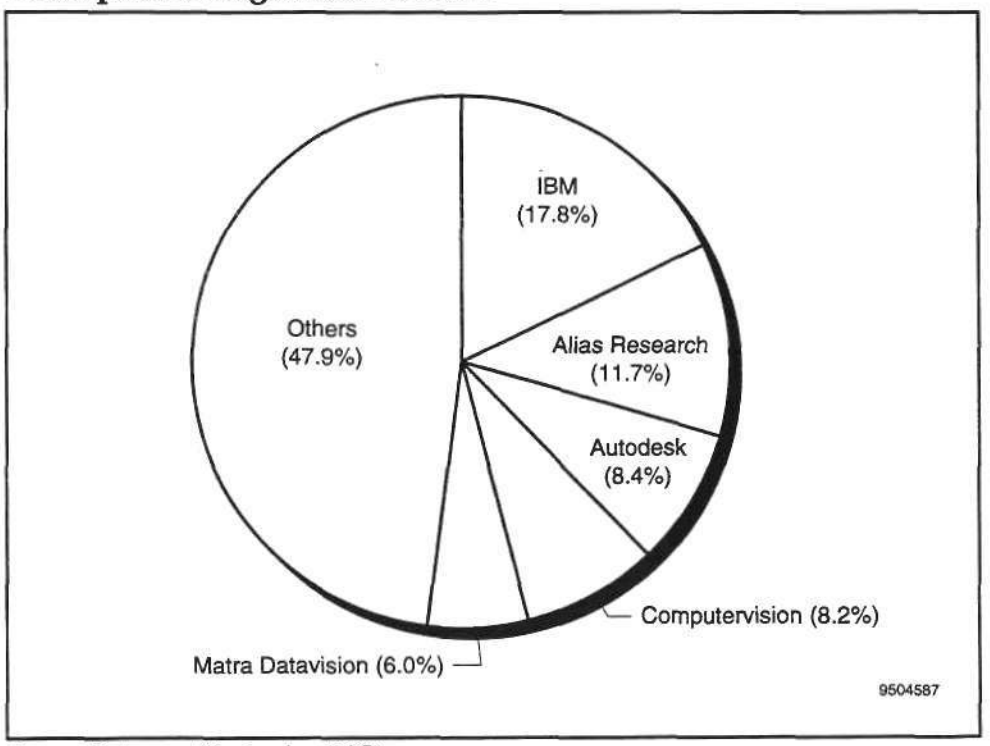
Source: Dataquest (September 1995)

Figure 5-1
Mechanical Subapplications



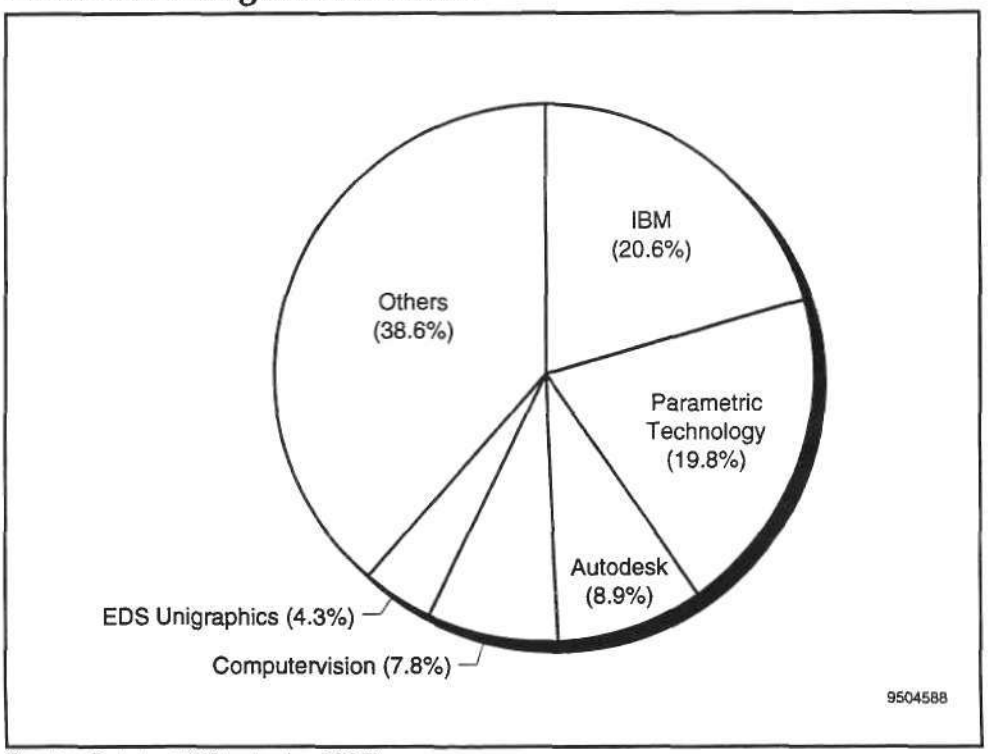
Source: Dataquest (September 1995)

Figure 5-2
Conceptual Design Market Share



Source: Dataquest (September 1995)

Figure 5-3
Functional Design Market Share



Source: Dataquest (September 1995)

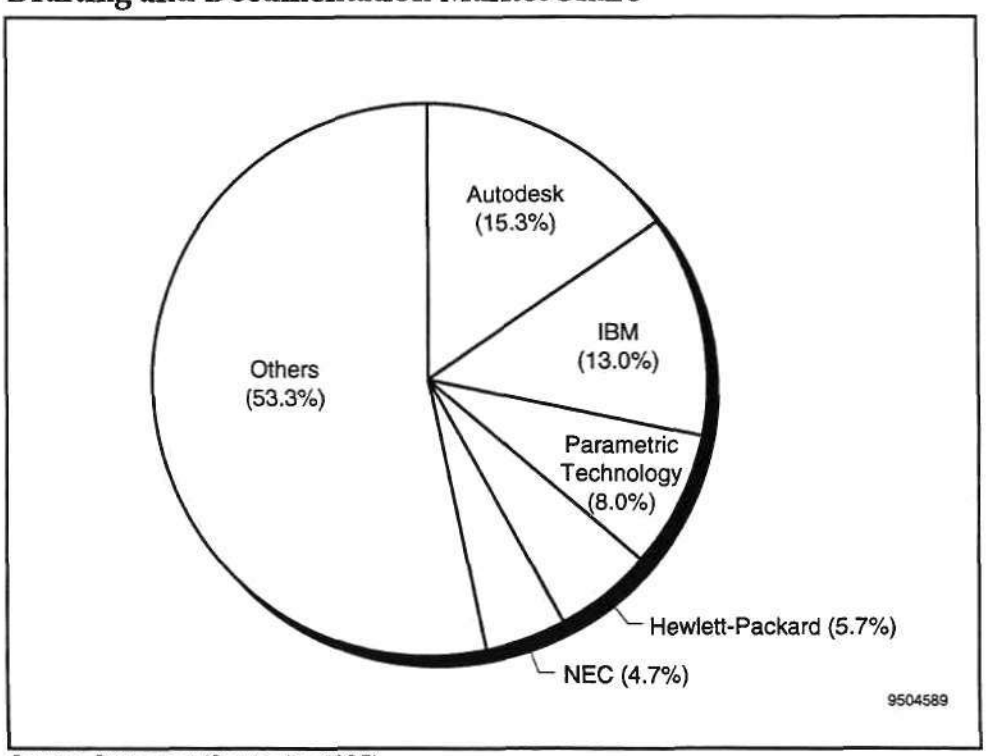
We previously believed that the functional design market was headed for a slowdown as a result of being squeezed by the conceptual design and analysis markets. However, 1994 was a year of good growth. Much of this growth was driven by strong performances from PTC in component design. We still believe that functional design is one of the more mature subapplications and that any growth in this segment will come not from component design but from virtual prototyping tools like assembly verification and linkage/mechanism software.

Assembly verification permits the engineer or designer to test component designs for size, shape, and functional characteristics. Assembly verification software, coupled with good graphics and visualization tools, can give an engineer good insight into potential design problems before the design moves further downstream. Similarly, linkage/mechanism tools can provide quick simulations and analysis of designs. Here we see players outside of the normal top vendors, players such as Mechanical Dynamics and CADSI. Again, we expect these tools to drive growth in functional design because they allow the designer to iteratively test and refine design assumptions while facing time-to-market pressures.

Drafting and Documentation

Drafting and documentation has traditionally been the largest mechanical subapplication, and 1994 was no exception. This subapplication reached $590 million in 1994, with Autodesk leading the way for yet another year (see Figure 5-4). While this is not an area of rapid change, drafting's large market share confirms that, even after 25 years of mechanical CAD development, this application is still a fundamental requirement.

Figure 5-4
Drafting and Documentation Market Share



Source: Dataquest (September 1995)

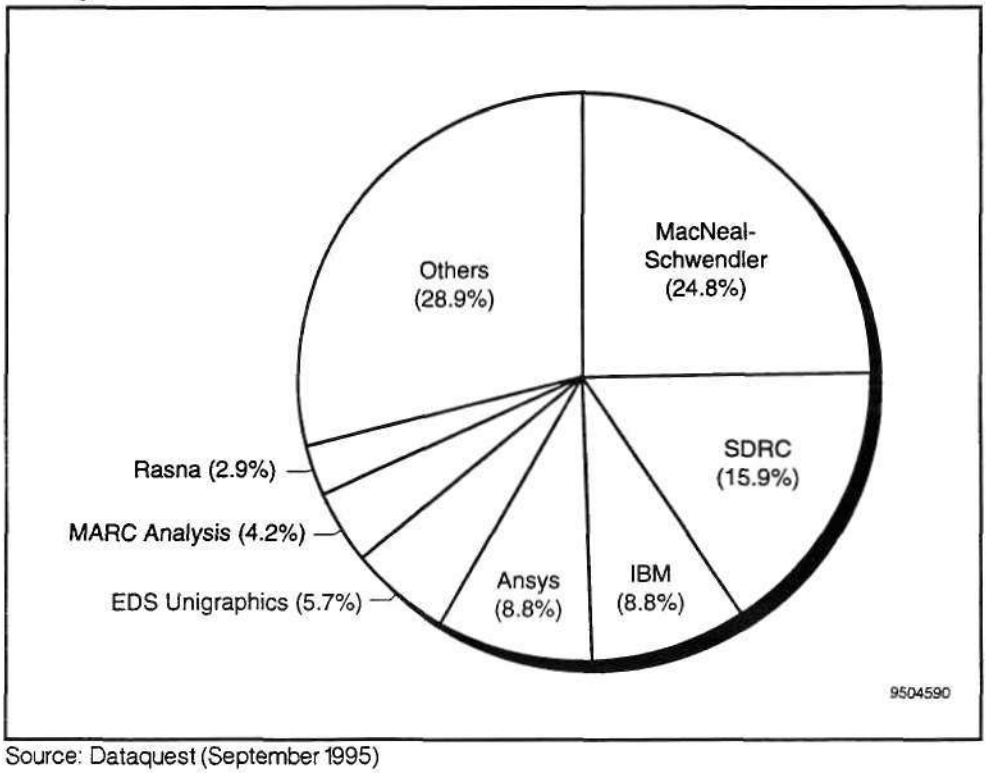
Prior to 1995, we had thought that this subapplication had nearly reached its peak. However, because of the renewed interest in the low end and aggressive marketing by some of the smaller players, we believe that drafting applications may pick up slightly in 1995 or 1996. We have passed a transition point where the mechanical CAD/CAM/CAE market is evolving toward a replacement market worldwide; we fully expect new sales to replace older software in drafting applications.

Analysis

We had predicted that the analysis market would reach $400 million in 1994; however, the market only grew 7.7 percent to $372 million. Nevertheless, this small growth masks the outstanding performance seen by many of the vendors in the analysis market. Lackluster performance by a few vendors dragged this market down into single-digit growth.

Once again, MacNeal-Schwendler dominated the market, making up nearly 25 percent of the 1994 analysis sales. While all but one of the major CAD vendors offer analysis modules (Autodesk is the exception), it is in this subapplication that we see strong market share by "analysis-only" vendors like Ansys, MARC Analysis, and Rasna (see Figure 5-5).

Figure 5-5
Analysis Market Share



Source: Dataquest (September 1995)

As discussed earlier, PTC's purchase of Rasna will only help to propel the analysis market forward by ensuring that these problem are important to the mainstream designer. Even if PTC's purchase of Rasna jeopardizes the relationships that other analysis vendors have with PTC, there are still opportunities to pursue within this market. Resellers will be looking to sell analysis products other than Rasna software, and opportunities will open up for analysis vendors to build interfaces to other major CAD packages. Additionally, there are niches within the analysis market to pursue, such as nonlinear analysis, and nontraditional industries to pursue, such as electronic packaging.

We believe that the analysis market has been poised for growth for a few years and that its growth—albeit sluggish and single digit in nature—actually began in 1994. Analysis vendors have responded to designers' needs in the last two years by developing better user interfaces, error-checking code, and automatic mesh-generation features. While seasoned analysts will always be needed in complex jobs, more designers are now able to use the technology. We anticipate that analysis will be used in a number of different scenarios and at different points in the product development cycle, from quick, what-if evaluations of an initial conceptual design to more rigorous, detailed analysis and design optimization.

Manufacturing Engineering

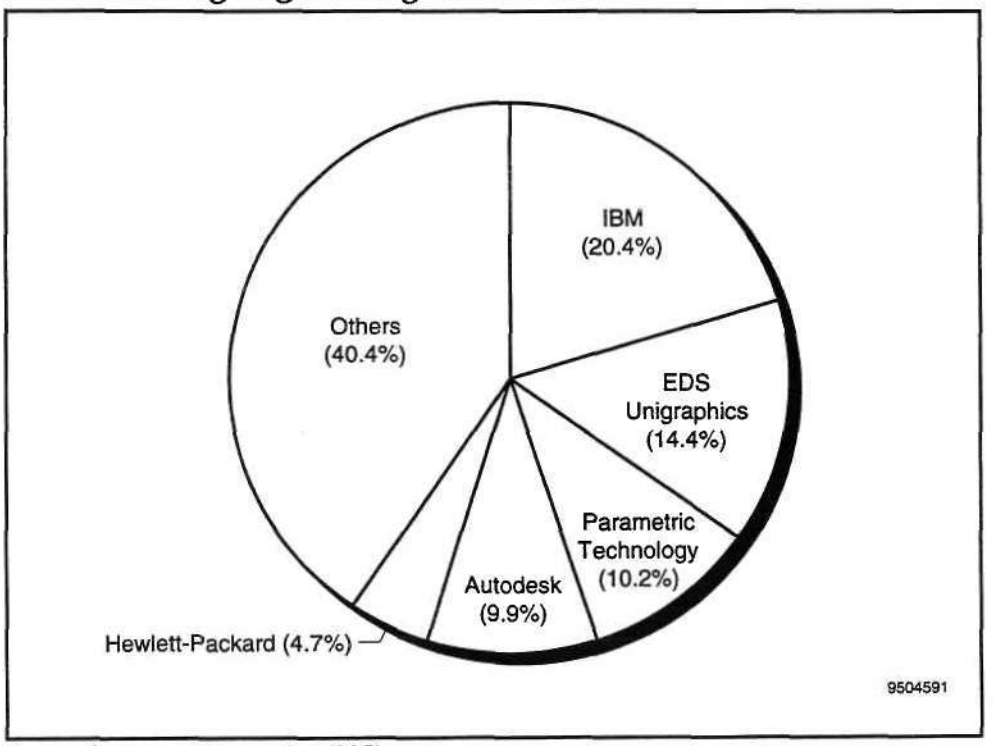
Manufacturing engineering consists of those software tools used in fixture design, tool design, and part processing design. This subapplication grew faster than we had anticipated, turning in 10 percent growth in 1994. Figure 5-6 shows the market leaders in this subapplication. Two factors will drive growth in this market. First, as better design and analysis tools become available to the design side, we expect that some of these tools will filter over to the manufacturing side. Second, there is typically a mix of different systems and computers within the design and manufacturing environments. As applications are developed that can work with disparate systems, either through data translations, a unified database, or standards, we will see growth in manufacturing engineering.

Manufacturing Process Simulation

The manufacturing process simulation market consists predominantly of numerical control (NC) software, which makes up 93 percent of that market. The balance of manufacturing process simulation consists of coordinate measuring machines, off-line robotics, and plant floor simulation. Similar to the analysis market, the manufacturing process simulation market contains a number of "NC-only" or "primarily NC" vendors like CNC Software, Gerber Systems, and Straessle Informationssysteme, as well as the traditional CAD vendors with art-to-part solutions.

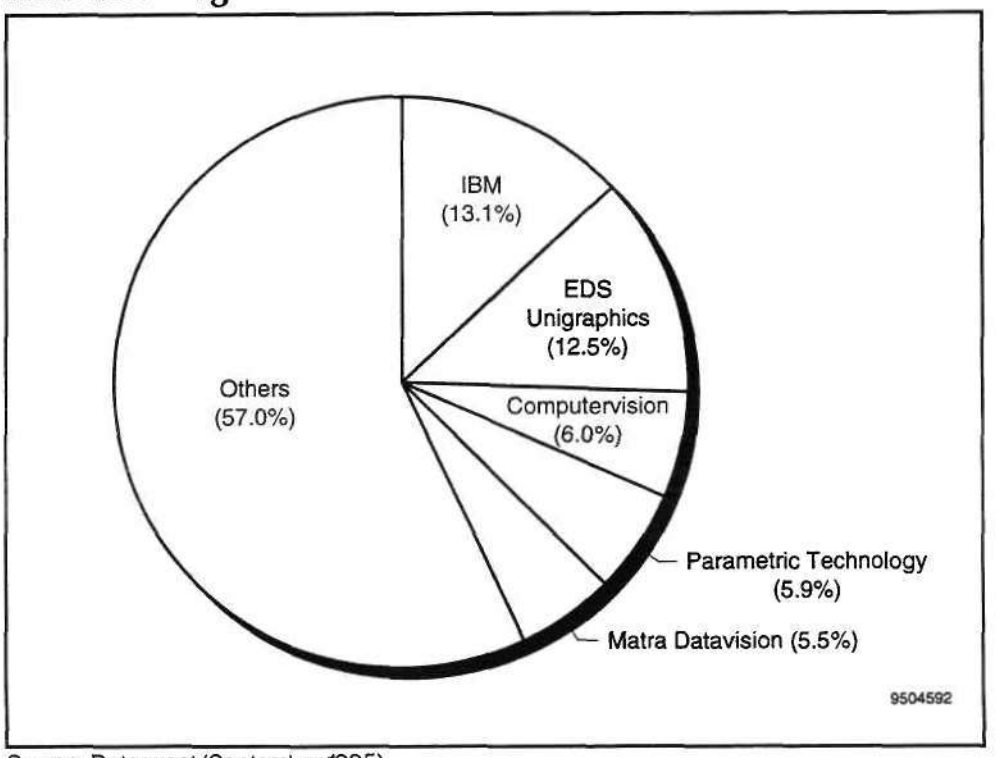
Overall, the manufacturing process simulation market took off in 1994, growing 13.4 percent. The major CAD vendors dominate the market, as seen in Figure 5-7, with some of the Japanese-based CAD vendors also turning in strong performances. Matra Datavision's purchase of Cisigraph in 1994 helped catapult the combined company into the No. 5 spot.

Figure 5-6
Manufacturing Engineering Market Share



Source: Dataquest (September 1995)

Figure 5-7
Manufacturing Process Simulation Market Share



Source: Dataquest (September 1995)

The key factor for growth in this market will come from the ability of these tools to close the gap between design and manufacturing. Like the manufacturing engineering market, we expect the tighter integration between engineering and manufacturing activities to pave the way for more widespread use of generative NC programs and offline robotics over the next three years. Plant floor simulation tools are a small but growing market that have not yet drawn strong attention from manufacturing companies or many software vendors. We expect this subapplication to expand, but not for another three years.

PDM and EDM

No technology in the CAD/CAM/CAE world has drawn quite as much attention in the past year as PDM. It is easy to understand why, given the promise of PDM systems to decrease manufacturing costs, reduce time to market, and increase product quality—all hot buttons within any company.

While we had originally intended to track the PDM and EDM markets separately, we found that these two areas are melding together such that clear-cut distinctions cannot be made for some vendors. Thus, we will combine the two entities in this report. In any case, we will still be focusing on PDM or EDM systems that interface or have the ability to interface reasonably with CAD/CAM/CAE systems.

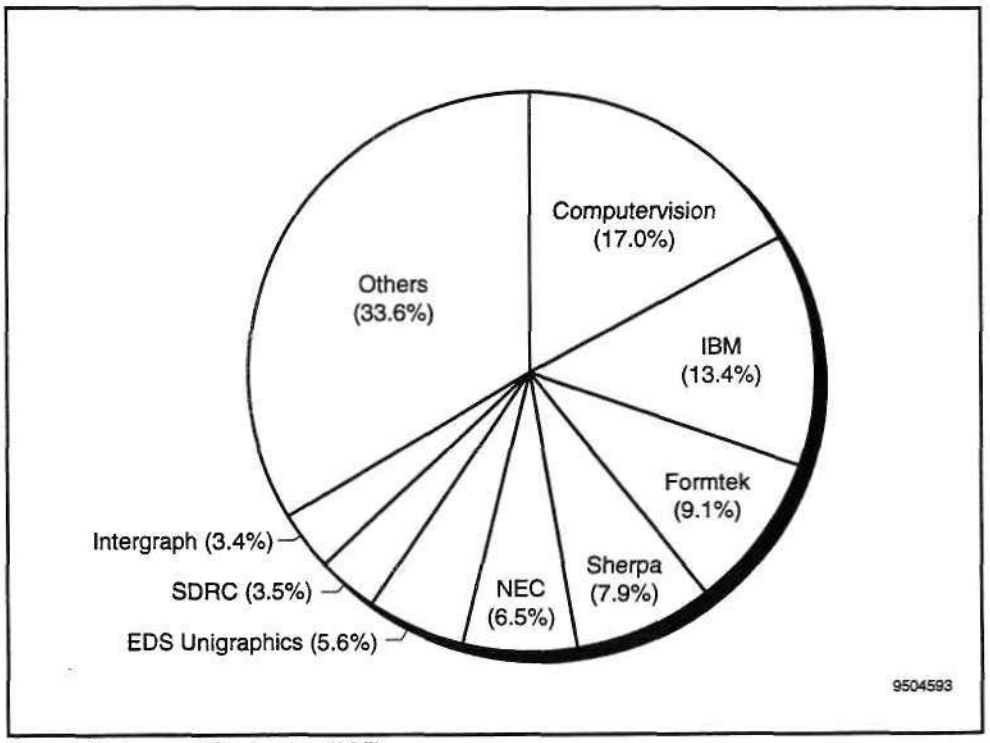
The combined PDM/EDM market grew about 22 percent in 1994 to reach $190 million in software revenue. Market share of the leading vendors is shown in Figure 5-8. In the case of Hewlett-Packard, we believe we have understated its PDM revenue for 1994, and HP is one of the leading PDM vendors today. Service revenue associated with PDM/EDM is higher than the typical 25 percent we see for the mechanical CAD industry overall. For 1994, PDM/EDM revenue contributed $80 million, or about $1 in service spent for every $2.40 in software. Again, because Dataquest focuses on mechanical CAD and PDM, our service revenue does not include revenue generated from PDM-specific integrators, consultants, and the like. While most of the sales to date have been in North America and Europe, interest is growing in Asia, particularly in Japan and Korea.

Trends affecting the PDM/EDM market are as follows:

- Average selling prices (ASPs) are beginning to drop as vendors announce new packaging and pricing structures aimed at workgroups instead of enterprise-level implementations.
- The sales cycle for PDM systems remains high, indicating that there is still a significant amount of end-user education and business process reengineering taking place before implementation.
- The PDM products are becoming modularized, with specific modules aimed at vault management, product structure management, and workflow capabilities.
- Most PDM systems are robust enough to work with CAD data from different vendors.
- GUIs and PCs as clients are now standard on most PDM systems.

As discussed earlier, the PDM/EDM market will be the highest-growing mechanical subapplication over the next five years; this market has only begun to take off. As pilot projects become full-blown implementations,

Figure 5-8
PDM and EDM Market Share



Source: Dataquest (September 1995)

this market will grow, with others adopting the technology as the benefits become more clear-cut and evident. PDM technology will continue to find its way into more companies at a higher level (that is, at an enterprise level) and into more industries (such as pharmaceuticals, process industries, and utilities). There exist opportunities for software vendors, systems integrators, consultants, and hardware suppliers.

Component Information Systems

Today, the component information systems (CIS) subapplication is small, with only three players – Aspect Development, Autodesk, and CADIS and Information Handling Systems (IHS) – in a market that straddles both mechanical design and electronic design. Because of the limited number of players in this market, we will not provide subapplication information. Nevertheless, we feel that this subapplication is of growing importance and warrants a discussion.

CIS is a market that has seen a number of players come and go, but only recently has it emerged as a more sophisticated, technologically savvy market. The traditional CIS players have been companies like IHS and Viewpoint. The new players in the market are Aspect and CADIS.

CIS systems typically consist of a database or repository of parts or components, associated part information (like tolerance information, specifications, part numbers), and a search engine. In an ideal working scenario, different functions in an organization (engineering, manufacturing, purchasing) have access to a CIS database, which can be used to choose both customized and noncustomized parts based on various criteria (such as

preferred supplier, part cost, previously used parts). Implementation of a CIS can involve transferring a company's legacy data to the system as well as putting in place new component information and suppliers.

The players in the CIS market today, which include Autodesk, Aspect Development, CADIS, and IHS, differentiate themselves from one another based on a number of factors, including:

- Electrical or mechanical component emphasis
- Legacy data conversion or commercial vendor part information emphasis
- Search capabilities
- Interfaces to PDM or CAD systems

While Aspect, CADIS, and IHS compete almost head-to-head at the high end of this market, Autodesk is occupying a comfortable niche at the low end with an inexpensive CD-ROM-based product that includes both parts and materials specifications.

We envision high growth for this small market over the next five years, provided that CIS systems are tightly linked to PDM systems or the CAD environment. Again, the factor that will drive growth is that designers need to be able to both access and manage the information around them. CIS systems provide a tool for accomplishing these tasks.

Knowledge-Based Engineering

Like component information systems, knowledge-based engineering (KBE) tools constitute a small market with essentially two players, Concentra and Stone & Webster. While generative technologies and knowledge-based engineering have existed for quite some time, and while companies have come and gone in this market, KBE has yet to take off. This subapplication grew 26.6 percent from 1993 to 1994. In covering this market, we do not include those tools that are not well integrated with CAD/CAM systems.

"Knowledge-based engineering," "rule-based engineering," "expert systems," and "generative technology" are terms used to describe processes technologies that can automate repetitive portions of the engineering design process. For instance, a company could use a KBE system to develop a model that captures the full spectrum of engineering rules, industry standards, manufacturing constraints, cost, and scheduling constraints. As a result of capturing these processes, new designs can be generated directly from functional specifications. Some of the major CAD/CAM programs are beginning to introduce design rule checkers and design advisors that have elements of knowledge engineering in them. KBE tools typically interface to CAD packages.

The major benefit for the end user is a significant reduction in product development time and therefore cost. KBE today requires a significant amount of programming to develop the interfaces between CAD systems and knowledge-based engineering systems and to have usable, working applications available for the end user. We expect expansion in the KBE market to come when more robust applications are developed based on

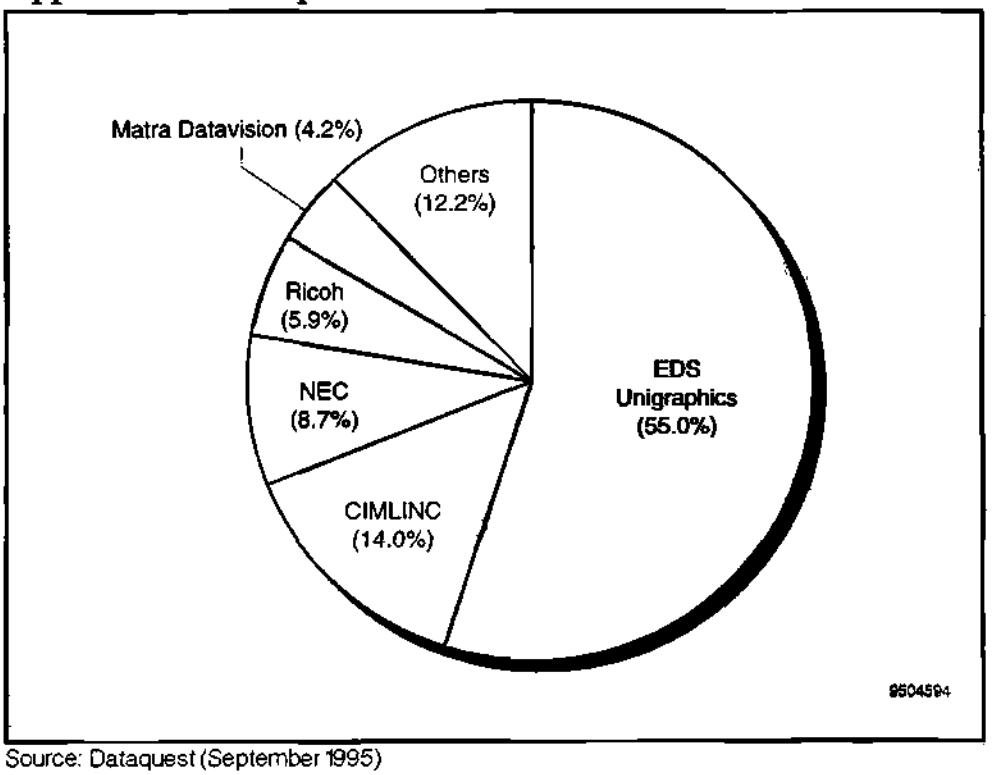
the technology or when the task of building (programming) applications becomes easier. Concentra Corporation is already targeting the application-specific market by delivering a salesforce automation tool.

Application Development Environments

Application development environments are the programming tools used to aid in the generation of user-defined programs. These tools include the customization tools that CAD vendors offer (such as EDS Unigraphics' UG/GRIP) as well as Matra Datavision's new CAS.CADE software development environment. Market share information for 1994 is shown in Figure 5-9.

The application development environment is one that should see new entrants in 1996. These new entrants will primarily be the new object-oriented software development environments that vendors are now announcing.

Figure 5-9
Application Development Environments Market Share



Source: Dataquest (September 1995)

Appendix A
Market Share

Final 1994 market share information for the mechanical CAD/CAM/CAE market is in Tables A-1 to A-7.

Table A-1
1994 CAD/CAM/CAE/GIS Software Market Share Update (Revenue in Millions of Dollars), Top 30 Mechanical Software Companies, Worldwide, All Operating Systems

Rank	Company Name	1992	1993	1994	1993-1994 Growth (%)	1994 Share of Market (%)
1	IBM	296.7	332.7	363.7	9.3	14.8
2	Parametric Technology	81.2	150.2	205.0	36.4	8.3
3	Autodesk	142.3	159.4	176.8	10.9	7.2
4	EDS Unigraphics	114.6	148.9	169.8	14.0	6.9
5	Computervision	193.5	148.6	148.9	0.2	6.1
6	SDRC	83.7	85.6	111.4	30.1	4.5
7	MacNeal-Schwendler	105.5	115.9	95.0	-18.1	3.9
8	Matra Datavision	63.4	63.0	75.5	19.8	3.1
9	Hewlett-Packard	72.8	70.0	71.6	2.3	2.9
10	Hitachi	54.8	61.8	66.4	7.5	2.7
11	NEC	50.4	54.3	61.7	13.7	2.5
12	Intergraph	71.9	71.0	61.1	-14.0	2.5
13	Toshiba – No Dist.	41.9	45.3	49.0	8.2	2.0
14	Nihon Unisys	38.0	51.5	48.1	-6.5	2.0
15	Hitachi Zosen Info Systems	34.0	38.7	34.5	-10.7	1.4
16	Ansys	24.1	28.7	32.5	13.3	1.3
17	Alias Research	23.5	24.4	29.6	21.3	1.2
18	Applicon	40.2	29.4	29.6	0.6	1.2
19	Sharp System Products – No Dist.	14.3	22.3	26.3	17.7	1.1
20	Fujitsu	14.1	20.6	24.9	20.9	1.0
21	Siemens Nixdorf Info systeme	30.9	26.2	24.7	-5.8	1.0
22	Straessle Informationssysteme	24.8	15.7	18.6	18.7	0.8
23	ADRA Systems	13.4	16.1	18.0	11.5	0.7
24	Formtek	6.2	9.6	17.3	80.3	0.7
25	Rasna Corporation	8.8	13.6	15.8	16.1	0.6
26	MARC	11.8	13.1	15.5	18.2	0.6
27	Sherpa Corp.	9.0	12.0	15.0	25.0	0.6
28	Tokyo Electron – No Dist.	16.0	12.6	14.3	13.5	0.6
29	PROCAD GmbH	4.6	4.7	14.3	204.3	0.6
30	Cimatron	8.0	9.7	13.5	39.9	0.6
	All North American Companies	1,443.8	1,584.1	1,737.9	9.7	70.8
	All European Companies	328.3	282.6	311.5	10.2	12.7
	All Asian Companies	353.0	382.3	406.1	6.2	16.5
	All Companies	2,125.1	2,248.9	2,455.5	9.2	100.0

Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-2
1994 CAD/CAM/CAE/GIS Software Market Share Update (Revenue in Millions of Dollars), Top 30 Mechanical Software Companies, North America, All Operating Systems

Rank	Company Name	1992	1993	1994	1993-1994 Growth (%)	1994 Share of Market (%)
1	EDS Unigraphics	70.5	97.3	110.4	13.5	14.1
2	Parametric Technology	52.5	95.9	108.6	13.3	13.9
3	IBM	65.8	73.6	84.1	14.3	10.7
4	Autodesk	65.2	76.5	84.0	9.8	10.7
5	MacNeal-Schwendler	55.6	59.5	53.1	-10.8	6.8
6	SDRC	27.6	26.5	45.7	72.1	5.8
7	Intergraph	39.1	41.3	33.1	-19.7	4.2
8	Computervision	27.8	23.2	30.9	33.1	4.0
9	Alias Research	15.3	15.9	19.5	23.0	2.5
10	Ansys	9.8	14.7	17.2	17.7	2.2
11	Applicon	14.4	12.1	14.2	17.7	1.8
12	Rasna Corporation	7.3	10.2	11.4	11.4	1.5
13	Hewlett-Packard	14.6	11.3	11.2	-1.4	1.4
14	ADRA Systems	8.1	8.5	9.4	11.5	1.2
15	Formtek	3.3	5.1	9.2	80.3	1.2
16	MCS	6.6	7.9	8.3	5.0	1.1
17	Sherpa Corp.	5.9	7.2	8.3	14.6	1.1
18	CAMAX Manufacturing	8.9	8.1	7.4	-9.0	0.9
19	Concentra	6.7	5.4	6.7	24.0	0.9
20	Gerber Systems	4.7	6.8	6.4	-5.9	0.8
21	Engineering Mechanics	4.7	5.3	6.1	15.0	0.8
22	Deneb Robotics	4.0	5.0	5.6	12.5	0.7
23	CIMLINC	4.5	4.7	5.5	16.2	0.7
24	Algor Interactive Systems	3.6	4.8	5.4	12.6	0.7
25	Matra Datavision	4.7	4.8	5.3	9.3	0.7
26	CADKEY	6.8	6.0	5.2	-11.9	0.7
27	SRAC	3.5	4.0	4.6	14.3	0.6
28	American Small Business Comp.	2.8	4.1	4.6	10.9	0.6
29	CNC Software	4.0	4.1	4.5	10.1	0.6
30	ICEM Technologies	9.6	3.6	3.8	5.8	0.5
	All North American Companies	583.3	689.5	764.9	10.9	97.7
	All European Companies	19.2	14.3	16.6	16.1	2.1
	All Asian Companies	-	1.2	1.5	17.7	0.2
	All Companies	602.5	705.0	783.0	11.1	100.0

Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-3
1994 CAD/CAM/CAE/GIS Software Market Share Update (Revenue in Millions of Dollars), Top 30 Mechanical Software Companies, Europe, All Operating Systems

Rank	Company Name	1992	1993	1994	1993-1994 Growth (%)	1994 Share of Market (%)
1	IBM	118.4	132.8	163.3	23.0	18.5
2	Computervision	126.8	92.3	91.4	-1.0	10.3
3	Parametric Technology	18.1	40.4	69.7	72.4	7.9
4	Matra Datavision	54.3	52.5	63.4	20.7	7.2
5	Autodesk	53.1	52.6	60.1	14.3	6.8
6	EDS Unigraphics	33.6	37.7	44.1	17.2	5.0
7	Hewlett-Packard	42.2	38.3	37.3	-2.7	4.2
8	SDRC	26.0	24.8	27.8	12.2	3.1
9	MacNeal-Schwendler	28.9	34.2	27.7	-19.1	3.1
10	Siemens Nixdorf Info systeme	30.3	25.7	24.2	-5.8	2.7
11	Intergraph	27.1	21.4	21.2	-0.9	2.4
12	Straessle Informationssysteme	22.7	14.3	15.8	10.8	1.8
13	PROCAD GmbH	4.6	4.6	14.3	211.6	1.6
14	Applicon	24.6	16.2	14.2	-12.2	1.6
15	ISD Software	13.4	12.2	13.2	8.2	1.5
16	CAD Lab	15.2	11.4	12.9	13.3	1.5
17	ASCAD	8.4	8.7	11.4	30.7	1.3
18	Wiechers Datentechnik	8.1	8.5	8.9	4.6	1.0
19	Ansys	9.1	7.8	8.5	9.1	1.0
20	Radan Computational	7.9	8.1	8.1	-0.2	0.9
21	Sherpa Corp.	3.2	4.8	6.8	40.6	0.8
22	Tebis	10.1	6.3	6.4	1.6	0.7
23	ICEM Technologies	10.7	5.7	6.2	9.2	0.7
24	Investronica SA	6.2	6.2	6.2	-1.0	0.7
25	Han Dataport	5.4	4.4	5.5	26.3	0.6
26	Delcam International	9.5	4.8	5.5	13.0	0.6
27	Serbi	4.3	4.5	5.0	12.0	0.6
28	Cimatron	6.0	5.6	5.0	-10.1	0.6
29	Ziegler Informatics	5.7	6.0	4.9	-18.1	0.6
30	PAFEC	6.0	4.9	4.9	-0.6	0.5
	All North American Companies	554.6	546.4	619.4	13.4	70.0
	All European Companies	289.7	246.2	265.0	7.7	30.0
	All Asian Companies	-	-	-	NA	-
	All Companies	844.3	792.5	884.4	11.6	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-4
1994 CAD/CAM/CAE/GIS Software Market Share Update (Revenue in Millions of Dollars), Top 30 Mechanical Software Companies, Japan, All Operating Systems

Rank	Company Name	1992	1993	1994	1993-1994 Growth (%)	1994 Share of Market (%)
1	IBM	97.9	108.7	92.3	-15.0	13.7
2	Hitachi	54.8	61.8	66.4	7.5	9.8
3	NEC	50.4	54.3	61.7	13.7	9.1
4	Toshiba—No Dist.	41.9	45.3	49.0	8.2	7.3
5	Nihon Unisys	38.0	51.5	48.1	-6.5	7.1
6	Hitachi Zosen Info Systems	33.7	38.3	34.2	-10.7	5.1
7	SDRC	28.3	26.7	29.5	10.5	4.4
8	Parametric Technology	10.6	14.0	26.6	90.7	3.9
9	Sharp System Products—No Dist.	14.3	22.3	26.3	17.7	3.9
10	Fujitsu	14.1	20.6	24.9	20.9	3.7
11	Computervision	21.7	23.5	22.4	-4.6	3.3
12	Hewlett-Packard	14.6	19.8	22.4	12.6	3.3
13	Tokyo Electron—No Dist.	16.0	12.6	14.3	13.5	2.1
14	Mitsui Engineering	5.3	16.7	12.9	-22.9	1.9
15	MacNeal-Schwendler	14.6	17.2	11.0	-35.9	1.6
16	Autodesk	20.9	12.4	10.8	-13.3	1.6
17	Toshiba Engineering—No Dist.	8.8	8.9	9.8	10.8	1.5
18	MARC	6.4	8.2	9.6	18.0	1.4
19	Graphtec Engineering	6.9	7.0	7.9	12.4	1.2
20	Toyo Information Systems—No Dist.	6.0	6.9	7.6	10.0	1.1
21	Kubota Computer	7.3	6.1	7.1	15.3	1.0
22	Adam Net	1.6	3.6	6.9	90.6	1.0
23	Design Automation	7.5	5.8	5.9	2.2	0.9
24	Wacom	6.2	5.7	5.9	3.7	0.9
25	Alias Research	4.0	4.3	5.2	22.2	0.8
26	Omron	5.8	4.6	5.2	12.4	0.8
27	CADIX	3.5	4.1	4.6	12.3	0.7
28	Ansys	4.1	4.3	4.6	5.7	0.7
29	Matra Datavision	3.8	3.6	4.2	16.0	0.6
30	EDS Unigraphics	2.8	3.7	3.6	-4.2	0.5
	All North American Companies	242.2	263.2	261.4	-0.7	38.7
	All European Companies	9.1	8.9	11.0	23.6	1.6
	All Asian Companies	352.4	379.8	403.4	6.2	59.7
	All Companies	603.7	652.0	675.8	3.7	100.0

Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-5
1994 CAD/CAM/CAE/GIS Software Market Share Update (Revenue in Millions of Dollars), Top Five Mechanical Software Companies, Worldwide, NT/Hybrid

Rank	Company Name	1992	1993	1994	1993-1994 Growth (%)	1994 Share of Market (%)
1	Parametric Technology	-	-	20.5	NA	55.5
2	Intergraph	-	-	13.6	NA	36.8
3	PROCAD GmbH	-	-	1.5	NA	4.0
4	Rasna Corporation	-	1.8	1.3	-28.6	3.4
5	CAD Distribution	-	-	0.1	NA	0.2
	All North American Companies	-	1.8	35.4	1897.8	95.8
	All European Companies	-	-	1.6	NA	4.2
	All Asian Companies	-	-	-	NA	-
	All Companies	-	1.8	36.9	1986.4	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-6
1994 CAD/CAM/CAE/GIS Software Market Share Update (Revenue in Millions of Dollars), Top 30 Mechanical Software Companies, Worldwide, Personal Computer

Rank	Company Name	1992	1993	1994	1993-1994 Growth (%)	1994 Share of Market (%)
1	Autodesk	133.7	149.9	166.3	11.0	35.6
2	IBM	78.2	49.8	48.6	-2.2	10.4
3	NEC	10.6	11.8	19.7	67.2	4.2
4	Toshiba – No Dist.	13.8	13.6	13.4	-1.5	2.9
5	Investronica SA	10.1	10.4	10.5	1.2	2.3
6	Intergraph	7.6	9.4	9.7	2.9	2.1
7	Hitachi	9.9	9.8	9.7	-1.5	2.1
8	MCS	4.0	6.1	9.0	48.6	1.9
9	Cimatron	3.3	5.0	8.2	64.0	1.8
10	Wiechers Datentechnik	6.5	7.7	8.1	5.6	1.7
11	Ansys	4.7	6.3	7.2	13.3	1.5
12	Computervision	11.9	8.9	6.9	-22.0	1.5
13	CNC Software	6.0	6.1	6.7	10.1	1.4
14	Design Automation	7.6	6.5	6.7	3.1	1.4
15	CADKEY	7.6	7.2	6.6	-7.3	1.4
16	Fujitsu	2.1	9.3	6.2	-32.8	1.3
17	Tebis	10.1	6.5	6.2	-3.9	1.3
18	ASHLAR	3.4	4.0	5.2	30.7	1.1
19	Formtek	1.9	2.9	5.2	80.3	1.1
20	American Small Business Comp.	3.1	4.6	5.1	10.9	1.1
21	ADRA Systems	2.3	4.5	5.1	11.5	1.1
22	Serbi	4.3	4.5	5.0	12.0	1.1
23	Ziegler Informatics	5.8	6.1	5.0	-17.5	1.1
24	CAMAX Manufacturing	5.0	5.6	5.0	-10.6	1.1
25	Hewlett-Packard	-	-	4.9	NA	1.0
26	Wacom	5.3	4.7	4.7	0.6	1.0
27	Algor Interactive Systems	3.5	4.1	4.6	12.6	1.0
28	SRAC	1.0	0.6	4.4	642.9	0.9
29	CAD Lab	2.5	2.5	4.2	64.7	0.9
30	Micrografx	3.1	3.6	3.9	7.5	0.8
	All North America Companies	299.1	303.7	323.8	6.6	69.3
	All European Companies	76.3	77.4	81.8	5.6	17.5
	All Asian Companies	65.3	56.4	61.6	9.2	13.2
	All Companies	440.7	437.5	467.2	6.8	100.0

NA = Not applicable
Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

Table A-7
1994 CAD/CAM/CAE/GIS Software Market Share Update (Revenue in Millions of Dollars), Top 30 Mechanical Software Companies, North America, UNIX

Rank	Company Name	1992	1993	1994	1993-1994 Growth (%)	1994 Share of Market (%)
1	EDS Unigraphics	60.5	80.6	110.4	36.9	19.8
2	Parametric Technology	52.5	91.5	97.8	6.8	17.5
3	IBM	27.4	37.0	47.9	29.5	8.6
4	SDRC	26.7	26.3	45.7	73.8	8.2
5	MacNeal-Schwendler	33.8	34.8	37.4	7.7	6.7
6	Computervision	21.9	20.1	29.4	46.2	5.3
7	Intergraph	32.0	34.6	20.6	-40.6	3.7
8	Alias Research	15.3	15.9	19.5	23.0	3.5
9	Applicon	14.4	12.1	13.7	14.0	2.5
10	Ansys	5.2	8.9	11.7	31.2	2.1
11	Hewlett-Packard	14.6	11.3	10.4	-7.9	1.9
12	Rasna Corporation	5.8	8.8	10.3	17.2	1.8
13	Sherpa Corp.	5.9	7.2	8.3	14.6	1.5
14	ADRA Systems	5.9	6.1	6.8	11.5	1.2
15	Concentra	6.7	5.4	6.7	24.0	1.2
16	Formtek	2.3	3.6	6.4	80.3	1.2
17	Gerber Systems	4.7	6.8	6.4	-5.9	1.2
18	Deneb Robotics	4.0	5.0	5.6	12.5	1.0
19	CIMLINC	4.5	4.7	5.5	16.2	1.0
20	Matra Datavision	4.5	4.8	5.2	8.6	0.9
21	Autodesk	3.9	4.6	5.0	9.8	0.9
22	CAMAX Manufacturing	4.3	4.4	4.4	-0.8	0.8
23	ICEM Technologies	3.8	2.5	3.8	50.1	0.7
24	Engineering Mechanics	2.5	2.8	3.4	18.7	0.6
25	Auto-Trol	4.3	2.5	3.3	36.5	0.6
26	Workgroup Tech.	1.5	2.0	3.0	50.0	0.5
27	MCS	3.7	4.0	2.5	-37.7	0.5
28	GRAFTEK	1.9	2.0	2.2	10.6	0.4
29	Mechanical Dynamics	2.7	1.8	2.1	20.6	0.4
30	MARC	1.2	1.6	2.1	30.3	0.4
	All North American Companies	381.6	462.1	543.5	17.6	97.5
	All European Companies	11.2	10.3	12.9	25.5	2.3
	All Asian Companies	-	1.0	1.3	22.3	0.2
	All Companies	392.8	473.4	557.7	17.8	100.0

Note: OEM revenue removed to prevent double-counting the market
Source: Dataquest (August 1995)

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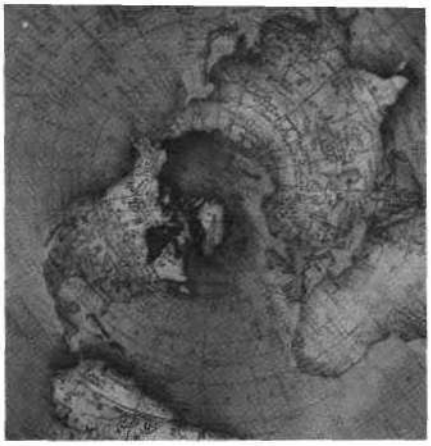

Dataquest

1994 CAD/CAM/CAE/GIS Mechanical Market Share

Market Statistics

Program: Mechanical Applications Worldwide
Product Code: CMEC-WW-MS-9501
Publication Date: March 27, 1995
Filing: Market Analysis

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Note: All tables show estimated data.

1994 CAD/CAM/CAE/GIS Mechanical Market Share

Introduction

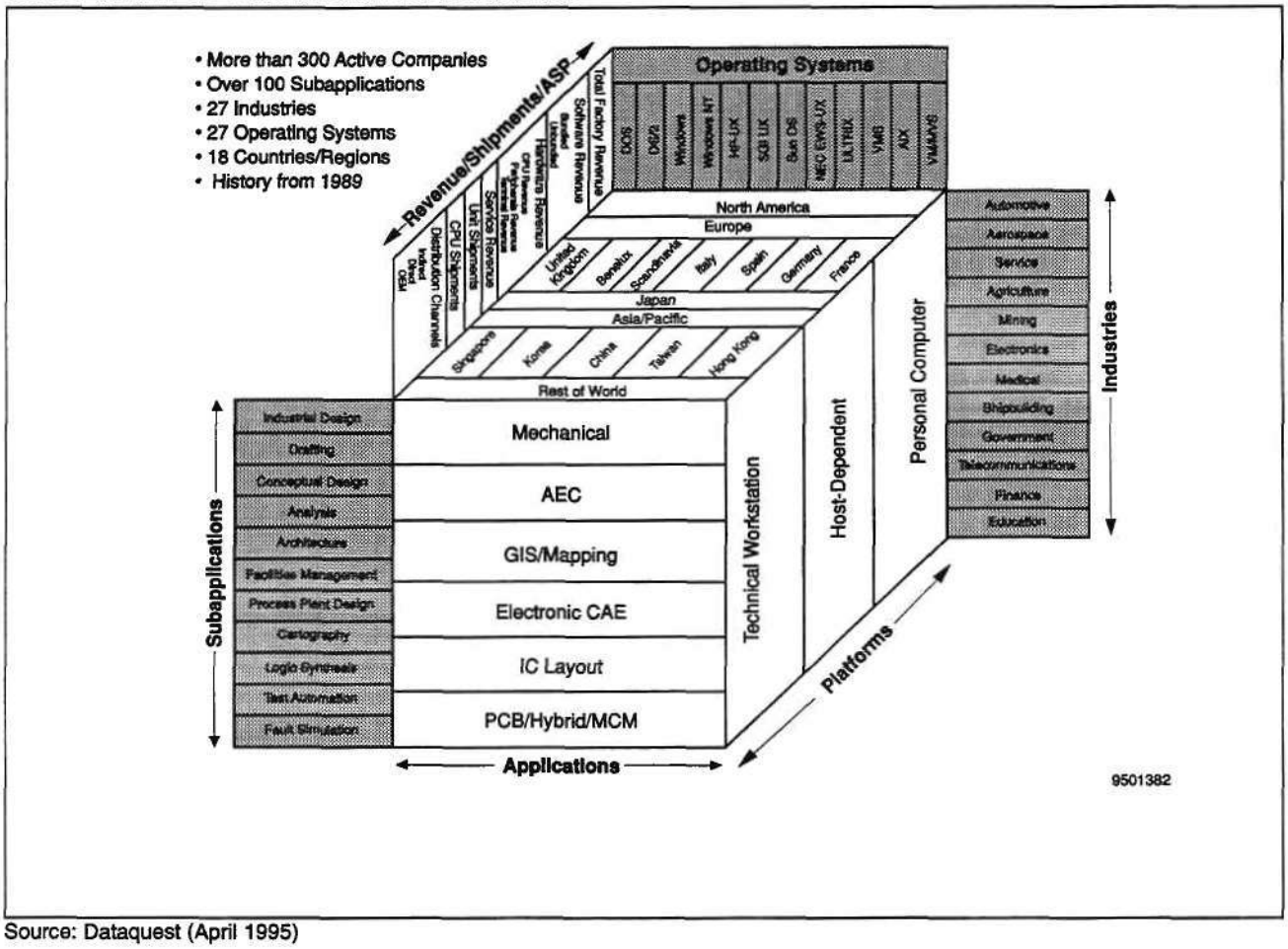
CAD/CAM/CAE/GIS systems have dramatically changed the methods by which designers and production managers originate and implement products. CAD and CAE systems allow designers to create, draft, analyze, test, and manipulate products on a screen in two and three dimensions. As CAD/CAM/CAE/GIS systems continue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

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

A companion article detailing the results of 1994 market share was published in our *Dataquest Alert* dated March 14, 1995.

Table 1 summarizes the performance in various segments of the CAD/CAM/CAE/GIS markets in 1994 versus 1993.

Figure 1
CAD/CAM/CAE/GIS Market Database



Source: Dataquest (April 1995)

Table 1
CAD/CAM/CAE/GIS Market Summary, 1993 to 1994

	Software Revenue		1993-1994	Total Factory Revenue		1993-1994	Seat Shipments		1993-1994
	1993	1994	Growth (%)	1993	1994	Growth (%)	1993	1994	Growth (%)
Applications									
Mechanical	2,213.2	2,417.4	9.2	7,424.4	7,917.0	6.6	284,051	303,320	6.8
AEC	777.2	865.2	11.3	2,306.8	2,506.6	8.7	195,941	222,152	13.4
GIS/Mapping	651.9	727.1	11.5	1,982.0	2,160.9	9.0	83,384	105,919	27.0
Electronic CAE	814.2	910.4	11.8	2,302.0	2,586.8	12.4	92,437	98,000	6.0
IC Layout	204.0	240.7	18.0	630.0	741.7	17.7	10,760	12,565	16.8
PCB/MCM/Hybrid	264.3	269.5	2.0	827.3	818.8	-1.0	32,955	33,639	2.1
All Applications	4,924.8	5,430.2	10.3	15,472.5	16,731.9	8.1	699,528	775,596	10.9
Regions									
North America	1,755.7	1,973.8	12.4	5,545.6	6,219.2	12.1	313,278	353,196	12.7
Europe	1,606.3	1,738.9	8.3	5,193.5	5,460.8	5.1	226,778	243,161	7.2
Japan	1,288.0	1,398.6	8.6	4,031.8	4,258.6	5.6	133,425	144,913	8.6
Asia/Pacific	153.6	178.2	16.0	375.2	449.6	19.8	14,849	18,484	24.5
Rest of World	121.2	140.7	16.1	326.3	343.7	5.3	11,198	15,842	41.5
Worldwide	4,924.8	5,430.2	10.3	15,472.5	16,731.9	8.1	699,528	775,596	10.9
Platforms									
Technical Workstation	3,428.2	3,884.3	13.3	10,866.2	12,064.9	11.0	196,310	222,656	13.4
Host Dependent	354.1	254.0	-28.3	1,795.2	1,529.5	-14.8	35,804	39,293	9.7
Personal Computer	1,142.4	1,292.0	13.1	2,811.1	3,137.5	11.6	467,414	513,647	9.9
All Platforms	4,924.8	5,430.2	10.3	15,472.5	16,731.9	8.1	699,528	775,596	10.9

Source: Dataquest (March 1995)

About This Document

This document contains Dataquest's detailed market share information on the CAD/CAM/CAE/GIS industry. The following list contains descriptions of the companies included in the Market Share books. See Tables 2, 3, 4, and 5 for changes from our 1993 report.

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

We no longer publish top-level market statistics for the entire CAD/CAM/CAE/GIS industry. This data is available by calling Suzanne Snygg at (408) 437-8124. More detailed data on these markets may be requested through our client inquiry service.

We recognize that final bookeeping is not yet complete for all companies. This document represents our best effort to get early, accurate information to our subscribers. We will follow up with primary and secondary research through April 30 to verify and cross-tabulate and refine, producing our market share update by June 30.

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

Table 2
Companies Renamed

Original Company Name	New Company Name
ACDS Graphic System	Geomax International
Genrad	VEDA
GeoVision	SHL Systemhouse
Graphisoft Software Dev	Graphisoft Group
Kohns & Poppenhaeger	Poppenhaeger Grips GmbH
Microway	M.O.C.
Scientific & Engineering Software	SES Inc.
Silvar-Lisco	SVRI (Silicon Valley Research Inc.)
Smallworld Systems	SmallworldWide
Swanson Analysis	Ansys
Tactics International	Tactician Corporation

Source: Dataquest (March 1995)

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

Company Name	Acquired by/Merged with
Aries Technology	MacNeal-Schwendler
ANACAD-EES	Mentor Graphics
Betronex & Visionics	Norlinvest Ltd.
Digital—Mechanical Software	PROCAD GmbH
Chronological Simulation	Viewlogic
Computervision—GIS	Unisys
Control Data—Mechanical Software	ICEM Technologies
Foresight Resources	Softdesk
Generation 5 Technology	Geo/SQL Corporation
Kork Systems	Autometric
LandCadd	Eagle Point
Logic Modeling Corp	Synopsys
Model Technology	Mentor Graphics
PDA Engineering	MacNeal-Schwendler
Point Control	CAMAX Manufacturing
Racal-Redac	Zuken-Redac
Sunrise	Viewlogic
Syscan	Sysdeco Innovation

Source: Dataquest (March 1995)

Table 4
Companies Deleted from Database

Region/Company	
American	European
A.I. Systems	Aplein*
Aura CAD/CAM Systems	Aucos elektronische
CAE-link	BATISOFT
Claris	CAD-Capture
Control Data—Hardware	CAD TECH Iberica*
Data General	CAMTEK
ECOM Associates	Caroline Informatique
Georgia Tech Research	Contract Data Research
GEOVISION Inc.	Data Technology/DATECH*
Innovative Data Design	Datagraphic
Intrinsix	DELTA CAD*
Land Innovation	EME
Maptech	FEA
Massteck	FEGS
MC2 Engineering Software	ItalCad
Phase Three Logic	Kreon
Synercom	Lamp Software
Teradyne	Logic Systems Designers*
Understanding Systems	Macao Systems
Asian	MEDESIGN
Kanematsu Semiconductor*	Mucke Software
	S.T.L.D.s.r.l.
	Soft*

*Distributors
Source: Dataquest (March 1995)

Table 5
Companies Added to Database

Region/Company	
American	European
3Soft	Abstract Hardware
ArcSys	ACA Ltd.
Chronology	Speed
Claritas/NPDC	Spot Image Corp.
Design Acceleration	ULTimate Technology
Eagle Point	
EOSAT	
Equifax/NDS	
Fintronic	
Geographic Data Technology	
Integrity Engineering	
InterHDL	
Intusoft	
Nextwave DA	
OEA International	
Optem Engineering	
Simulation Technology	
Rebis (merger of EDA and ADev)	
T D Technology	
Veritools	
VISTA Environmental Inf.	

*Distributors
Source: Dataquest (March 1995)

Segmentation Definitions

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

Applications

Mechanical

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

are included in this segment, as well as user-defined application programming.

Architecture, Engineering, and Construction (AEC)

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

Geographic Information Systems (GIS)/Mapping

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

Electronic Design Automation (EDA)

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

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

Regions

The following paragraphs define the regions.

North America

North America includes United States, Mexico, and Canada.

Europe

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

Japan

Asia/Pacific

Asia includes Singapore, Taiwan, Korea, China, and Hong Kong.

Rest of World

Rest of World includes all other countries including Australia, New Zealand, India, Africa, Central America, South America, and the Middle East.

Platforms

The following paragraphs define the platforms.

Technical Workstation

A technical workstation is a single-user computer distinguished from a personal computer by its features and by the user's potential range of expansion on the platform. Features include a virtual, multitasking operating system (UNIX, VMS, or Domain); the computer is designed by the manufacturer to run high-performance graphics applications in a multiuser/multitasking environment.

Host-Dependent

Host-dependent is a shared logic system in which the external workstations' functions are dependent on a host computer.

Personal Computer

A personal computer is a single-user computer distinguished from a technical workstation by its features and by the user's potential range of expansion on the platform. Features found in technical workstations (such as a virtual operating system, networking, high-performance graphics, multiuser/multitasking capability) are optional rather than integrated by the manufacturer.

Metrics

The following paragraphs define measurements.

- Total factory revenue is defined as the amount of money received by a manufacturer for its goods and services measured in U.S. dollars. Total factory revenue does not include revenue that a company may receive from products that are sold to another company for resale (OEM revenue). Total factory revenue is the sum of software revenue, hardware revenue, and service revenue.
- Unit shipment is defined as the number of seats delivered (number of possible simultaneous users of product delivered) excluding OEM shipments.
- Hardware revenue is revenue derived from sales of CPUs (including operating systems), terminals (for host-dependent systems), and peripherals.
- Software revenue is revenue derived from the sale of application software that exists on a company's standard price list.
- Service revenue is defined as all revenue derived from the service and support of CAD/CAM/CAE/GIS systems. Service revenue can be calculated in the tables by subtracting hardware and software revenue from total revenue.
  - Maintenance fees for hardware and software
  - Management and operations services—help desk, education and training, disaster recovery, vaulting, and configuration management.

- Service bureau—project work, including construction of database, data conversion, product design, analysis, or manufacturing.
- Application development—design and development of customized software applications or the modification, enhancement of customization of existing software applications, adding new functionality.
- Consulting revenue—assessment of CAD/CAM/CAE/GIS business and information technology needs and the formulation of a plan based on needs identification.
- Implementation and integration services—planning, implementation, migration, and integration of software products (software network support and integration, account integration management, data center design, and construction).

Market Share Methodology

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

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

The Audit Process

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

- Revenue published by major industry participants
- Estimates made by knowledgeable and reliable industry spokespersons
- Government data or trade association data
- Published product literature and price lists

- Interviews with knowledgeable manufacturers, distributors, and users
- Relevant economic data
- Information and data from online data banks
- Articles in both the general and trade press
- Annual reports, SEC documents, credit reports
- Company publications and press releases
- Reports from financial analysts
- User studies
- Reseller and supplier reports and reports from a vendor's competitors

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

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

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

Publishing Schedule

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

- Market will be published and distributed to clients by March 31.
- Forecasting from the market share tables provides a five-year forecast period, available after April 30. The books will be shipped by May 31.
- Final updated market share tables, based on additional data collection and analysis, will be completed by June 30. At this point, the market share database is frozen and will not be changed until the end of the year. For the next six months, supplementary market data will be based on this final market data. Books will be shipped by July 31.
- We provide complete final forecast tables by July 31. These tables take into consideration changes in the market share during the previous six months. Books will be shipped by September 31.

Table A-1
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Worldwide, All Platforms

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	308.5	337.7	373.7	10.7	15.5
2	Parametric Technology	81.2	150.2	201.2	33.9	8.3
3	Autodesk	142.3	161.5	177.1	9.7	7.3
4	EDS Unigraphics	113.1	144.4	163.5	13.2	6.8
5	Computervision	193.5	141.1	140.6	-0.4	5.8
6	MacNeal-Schwendler	105.5	115.9	113.1	-2.5	4.7
7	SDRC	83.7	85.6	111.4	30.1	4.6
8	Fujitsu	46.9	72.9	73.3	0.5	3.0
9	Hewlett-Packard	72.8	70.9	72.0	1.5	3.0
10	Hitachi	54.8	61.8	66.4	7.5	2.7
11	Intergraph	71.9	70.8	61.0	-13.9	2.5
12	NEC	50.4	54.3	57.3	5.5	2.4
13	Matra Datavision	47.7	49.8	54.3	9.0	2.2
14	Nihon Unisys	38.0	51.5	54.2	5.3	2.2
15	Toshiba—No OEM	41.9	45.3	49.0	8.2	2.0
16	Ansys	24.1	26.7	30.7	14.8	1.3
17	Alias Research	23.5	24.4	29.6	21.3	1.2
18	Applicon	40.2	29.4	29.6	0.6	1.2
19	Sharp System Products—No OEM	14.3	22.3	26.3	17.7	1.1
20	Mutoh Industries—No OEM	24.6	18.8	19.6	4.0	0.8
21	ADRA Systems	13.4	16.2	18.7	15.5	0.8
22	Straessle Informationssysteme	24.8	15.7	17.0	8.1	0.7
23	Cisigraph	15.7	16.0	16.7	4.3	0.7
24	Siemens Nixdorf Info systeme	28.3	16.2	16.5	2.0	0.7
25	CAMAX Manufacturing	11.3	12.4	15.8	27.4	0.7
26	MARC	11.8	13.1	15.0	14.5	0.6
27	Delcam International	12.6	12.2	14.7	20.7	0.6
28	Rasna Corporation	8.8	12.2	14.5	18.6	0.6
29	Tokyo Electron—No OEM	16.0	12.6	14.3	13.5	0.6
30	CIMLINC	9.8	12.0	14.1	17.5	0.6
	All N.A. Companies	1,405.7	1,525.2	1,690.7	10.9	69.9
	All European Companies	331.1	278.5	285.3	2.4	11.8
	All Asian Companies	356.5	410.1	441.5	7.6	18.3
	All Companies	2,093.3	2,213.9	2,417.4	9.2	100.0

OEM revenue removed to prevent double-counting the market
Source: Dataquest (March 1995)

Table A-2
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Worldwide, Technical Workstation

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	109.8	188.5	235.9	25.2	13.2
2	Parametric Technology	81.2	143.5	183.3	27.7	10.3
3	EDS Unigraphics	101.6	121.2	163.5	35.0	9.2
4	Computervision	179.6	132.2	126.0	-4.7	7.1
5	SDRC	80.8	84.8	111.4	31.4	6.2
6	MacNeal-Schwendler	58.5	64.2	80.7	25.6	4.5
7	Hewlett-Packard	72.8	70.9	72.0	1.5	4.0
8	Matra Datavision	47.7	48.8	53.1	8.8	3.0
9	Hitachi	39.5	47.1	52.9	12.3	3.0
10	Intergraph	60.8	60.6	48.8	-19.4	2.7
11	Fujitsu	25.8	41.7	47.6	14.1	2.7
12	Nihon Unisys	13.3	40.7	45.7	12.3	2.6
13	NEC	30.8	36.4	40.8	12.3	2.3
14	Toshiba—No OEM	25.1	31.7	35.6	12.3	2.0
15	Alias Research	23.5	24.4	29.6	21.3	1.7
16	Applicon	40.2	29.4	28.6	-2.6	1.6
17	Sharp System Products—No OEM	14.0	22.3	26.3	17.7	1.5
18	Ansys	14.8	17.2	20.5	19.3	1.1
19	Straessle Informationssysteme	24.8	15.7	17.0	8.1	1.0
20	Cisigraph	14.1	16.0	16.7	4.3	0.9
21	MARC	9.0	11.1	15.0	34.7	0.8
22	Tokyo Electron—No OEM	16.0	12.6	14.3	13.5	0.8
23	CIMLINC	9.8	12.0	14.1	17.5	0.8
24	Siemens Nixdorf Info systeme	28.3	13.6	13.8	1.0	0.8
25	Toshiba Engineering—No OEM	8.9	12.1	13.7	13.2	0.8
26	ADRA Systems	11.1	11.5	13.7	19.7	0.8
27	Delcam International	11.5	11.7	13.1	12.0	0.7
28	Rasna Corporation	7.3	10.1	12.9	27.2	0.7
29	ISD Software	9.7	11.0	11.5	4.4	0.6
30	GRAFTEK	8.2	9.7	11.2	16.0	0.6
	All N.A. Companies	926.8	1,054.1	1,239.0	17.5	69.5
	All European Companies	238.1	199.5	204.7	2.6	11.5
	All Asian Companies	228.1	295.7	338.0	14.3	19.0
	All Companies	1,393.0	1,549.3	1,781.7	15.0	100.0

OEM revenue removed to prevent double-counting the market
Source: Dataquest (March 1995)

Table A-3
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Worldwide, Host Dependent

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	120.4	98.6	93.6	-5.0	53.4
2	MacNeal-Schwendler	45.3	50.6	31.4	-38.0	17.9
3	Fujitsu	14.1	25.5	20.1	-21.3	11.5
4	Nihon Unisys	24.7	10.8	8.5	-21.3	4.9
5	NEC	9.0	6.1	4.8	-21.3	2.8
6	Hitachi	5.5	4.9	3.8	-21.2	2.2
7	Ansys	4.6	3.4	3.4	0.9	2.0
8	Exapt	3.1	2.7	2.0	-23.9	1.2
9	Mechanical Dynamics	1.0	2.3	2.0	-13.7	1.1
10	GRAFTEK	2.3	2.0	1.7	-13.2	1.0
11	Toyo Information Systems—No OEM	1.3	1.2	0.9	-20.3	0.5
12	Kubota Computer	-	1.1	0.9	-19.4	0.5
13	Computational Mechanics	1.5	0.6	0.5	-12.9	0.3
14	Framasoft	0.4	0.5	0.5	3.6	0.3
15	Whessoe Computing Systems	0.8	0.5	0.5	-13.5	0.3
16	Century Research Center	0.6	0.5	0.4	-22.2	0.2
17	debis Systemhaus	0.2	0.3	0.3	11.1	0.2
18	PROCAD GmbH	-	0	0	-	0
19	EDS Unigraphics	11.5	23.3	-	-100.0	-
20	ICEM Technologies	13.4	3.0	-	-100.0	-
21	MARC	2.8	2.0	-	-100.0	-
22	Intergraph	3.5	1.9	-	-100.0	-
23	SDRC	2.9	0.9	-	-100.0	-
24	Han Dataport	0.3	0.2	-	-100.0	-
25	Georgia Tech Research Corp.	0.1	0.2	-	-100.0	-
26	FEA	0.1	0.1	-	-100.0	-
27	Accugraph	0	0	-	-100.0	-
	All N.A. Companies	196.5	185.0	132.1	-28.6	75.3
	All European Companies	21.6	8.0	3.8	-51.9	2.2
	All Asian Companies	58.2	50.1	39.4	-21.2	22.5
	All Companies	276.2	243.0	175.4	-27.8	100.0

OEM revenue removed to prevent double-counting the market
Source: Dataquest (March 1995)

Table A-4
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Worldwide, Personal Computer

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	133.7	151.8	166.5	9.7	36.2
2	IBM	78.2	50.6	44.2	-12.7	9.6
3	Parametric Technology	-	6.8	17.9	165.0	3.9
4	Computervision	11.9	8.9	14.6	63.6	3.2
5	Toshiba—No OEM	13.8	13.6	13.4	-1.5	2.9
6	Intergraph	7.6	8.3	12.2	46.3	2.6
7	NEC	10.6	11.8	11.6	-1.5	2.5
8	Mutoh Industries—No OEM	15.3	11.5	11.4	-1.2	2.5
9	Investronica SA	7.7	8.3	10.5	26.7	2.3
10	Hitachi	9.9	9.8	9.7	-1.5	2.1
11	Wiechers Datentechnik	6.5	7.7	8.1	5.6	1.8
12	MCS	4.0	4.1	7.6	84.8	1.6
13	Ansys	4.7	6.2	6.8	10.1	1.5
14	Design Automation	7.6	6.5	6.7	3.1	1.5
15	CAMAX Manufacturing	5.0	5.5	6.7	21.8	1.4
16	CNC Software	4.6	5.8	6.6	12.9	1.4
17	Tebis	10.1	6.5	6.2	-3.9	1.4
18	Ziegler Informatics	5.8	6.1	5.8	-4.6	1.3
19	CADKEY	6.1	6.2	5.7	-7.3	1.2
20	Fujitsu	7.0	5.7	5.6	-1.6	1.2
21	Cimatron	3.5	4.0	5.4	34.0	1.2
22	Serbi	4.3	4.5	5.0	12.0	1.1
23	ADRA Systems	2.3	4.7	5.0	5.3	1.1
24	American Small Business Comp.	2.9	4.3	4.7	10.8	1.0
25	Wacom	5.3	4.7	4.7	0.6	1.0
26	Algor Interactive Systems	3.5	4.1	4.6	10.9	1.0
27	CAD Distribution	4.1	3.4	4.1	18.7	0.9
28	CAD Lab	2.5	2.5	3.5	39.9	0.8
29	Whessoe Computing Systems	2.5	2.8	3.1	13.8	0.7
30	RoboCAD Solutions	2.5	2.6	2.8	6.9	0.6
	All N.A. Companies	282.4	286.0	319.7	11.8	69.4
	All European Companies	71.4	71.1	76.7	7.9	16.7
	All Asian Companies	70.2	64.4	64.0	-0.5	13.9
	All Companies	424.1	421.5	460.4	9.2	100.0

OEM revenue removed to prevent double-counting the market
Source: Dataquest (March 1995)

Table A-5
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, North America, All Platforms

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Parametric Technology	52.5	95.8	112.0	16.8	14.7
2	EDS Unigraphics	69.5	88.6	104.7	18.1	13.7
3	Autodesk	65.2	75.9	81.5	7.3	10.7
4	IBM	71.0	73.5	78.9	7.3	10.3
5	MacNeal-Schwendler	55.6	59.5	63.1	5.9	8.3
6	SDRC	27.6	26.5	45.7	72.0	6.0
7	Computervision	27.8	23.8	40.8	71.4	5.3
8	Intergraph	39.1	42.4	34.6	-18.4	4.5
9	Alias Research	15.3	15.9	19.5	23.0	2.6
10	Ansys	9.8	13.4	15.6	16.7	2.0
11	Applicon	14.4	12.1	14.2	17.7	1.9
12	Hewlett-Packard	14.6	11.3	11.5	1.0	1.5
13	Rasna Corporation	7.3	10.1	10.6	4.5	1.4
14	GRAFTEK	8.2	9.0	10.0	10.5	1.3
15	ADRA Systems	8.1	8.3	9.9	19.5	1.3
16	CAMAX Manufacturing	8.9	9.6	9.5	-1.1	1.2
17	CIMLINC	5.9	6.7	8.1	21.2	1.1
18	MCS	6.6	6.4	8.1	25.6	1.1
19	Concentra	6.7	5.7	7.5	31.7	1.0
20	Gerber Systems	4.7	6.8	6.7	-2.1	0.9
21	Engineering Mechanics	4.7	5.3	6.1	15.0	0.8
22	Mechanical Dynamics	3.2	5.0	5.7	14.7	0.7
23	Algor Interactive Systems	3.6	4.8	5.4	12.7	0.7
24	CNC Software	3.6	4.9	5.4	10.7	0.7
25	CADKEY	6.8	6.0	5.2	-11.9	0.7
26	Auto-Trol	4.3	4.4	4.6	6.0	0.6
27	American Small Business Comp.	2.8	4.1	4.6	10.9	0.6
28	ICEM Technologies	9.6	3.6	3.8	5.7	0.5
29	Cimatron	0.4	1.1	3.7	236.2	0.5
30	Matra Datavision	3.1	3.5	3.3	-7.2	0.4
	All N.A. Companies	563.2	652.6	743.5	13.9	97.4
	All European Companies	19.2	15.2	18.5	22.3	2.4
	All Asian Companies	-	1.2	1.5	17.7	0.2
	All Companies	582.4	669.0	763.5	14.1	100.0

OEM revenue removed to prevent double-counting the market
Source: Dataquest (March 1995)

Table A-6
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, North America, Technical Workstation

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	EDS Unigraphics	59.7	75.6	104.7	38.5	19.0
2	Parametric Technology	52.5	91.5	100.8	10.1	18.3
3	SDRC	26.7	26.3	45.7	73.7	8.3
4	MacNeal-Schwendler	33.8	34.8	45.2	30.0	8.2
5	IBM	24.4	34.7	42.4	22.2	7.7
6	Computervision	21.9	20.7	36.6	76.8	6.6
7	Intergraph	32.0	36.3	27.0	-25.7	4.9
8	Alias Research	15.3	15.9	19.5	23.0	3.5
9	Applicon	14.4	12.1	13.7	14.0	2.5
10	Hewlett-Packard	14.6	11.3	11.5	1.0	2.1
11	Ansys	5.2	9.0	11.1	23.0	2.0
12	Rasna Corporation	5.8	8.1	9.0	11.4	1.6
13	GRAFTEK	6.3	7.5	8.6	15.7	1.6
14	CIMLINC	5.9	6.7	8.1	21.2	1.5
15	Concentra	6.7	5.7	7.5	31.7	1.4
16	ADRA Systems	5.9	5.9	7.3	23.1	1.3
17	Gerber Systems	4.7	6.8	6.7	-2.1	1.2
18	CAMAX Manufacturing	4.3	4.5	5.5	20.7	1.0
19	Autodesk	3.9	4.6	4.9	7.3	0.9
20	Auto-Trol	4.3	4.4	4.6	6.0	0.8
21	Mechanical Dynamics	2.7	3.6	4.4	23.0	0.8
22	ICEM Technologies	3.8	2.5	3.8	50.0	0.7
23	Engineering Mechanics	2.5	2.8	3.4	18.7	0.6
24	MCS	3.7	3.3	3.2	-3.4	0.6
25	Matra Datavision	3.1	3.4	3.2	-7.4	0.6
26	Cimatron	0.3	0.7	2.2	236.2	0.4
27	Delcam International	1.8	1.7	2.2	26.1	0.4
28	MARC	1.2	1.6	2.0	24.7	0.4
29	CADSI	1.6	1.5	2.0	30.0	0.4
30	Cisigraph	1.4	1.6	1.7	4.2	0.3
	All N.A. Companies	361.1	436.6	536.4	22.8	97.2
	All European Companies	11.2	11.3	14.3	27.0	2.6
	All Asian Companies	-	1.0	1.3	22.3	0.2
	All Companies	372.3	449.0	552.0	23.0	100.0

OEM revenue removed to prevent double-counting the market
Source: Dataquest (March 1995)

Table A-7
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, North America, Host Dependent

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	35.2	34.5	34.8	0.7	62.3
2	MacNeal-Schwendler	20.5	24.3	17.4	-28.5	31.1
3	GRAFTEK	1.9	1.5	1.3	-14.3	2.4
4	Ansys	1.9	1.3	1.2	-12.1	2.1
5	Mechanical Dynamics	0.5	1.0	0.9	-12.5	1.6
6	Computational Mechanics	0.5	0.2	0.2	-10.5	0.3
7	Kubota Computer	-	0.2	0.1	-12.5	0.3
8	PROCAD GmbH	-	0	0	-	0
9	Framasoft	-	-	0	n/a	0
10	EDS Unigraphics	9.8	13.1	-	-100.0	-
11	Intergraph	3.0	1.6	-	-100.0	-
12	ICEM Technologies	5.8	1.1	-	-100.0	-
13	MARC	0.4	0.3	-	-100.0	-
14	SDRC	1.0	0.3	-	-100.0	-
15	Georgia Tech Research Corp.	0.1	0.2	-	-100.0	-
16	Accugraph	0	0	-	-100.0	-
	All N.A. Companies	74.3	78.1	55.5	-28.9	99.4
	All European Companies	6.4	1.3	0.2	-85.4	0.3
	All Asian Companies	-	0.2	0.1	-12.5	0.3
	All Companies	80.7	79.5	55.8	-29.8	100.0

OEM revenue removed to prevent double-counting the market
Source: Dataquest (March 1995)

Table A-8
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, North America, Personal Computer

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	61.3	71.3	76.6	7.3	49.2
2	Parametric Technology	-	4.3	11.2	159.6	7.2
3	Intergraph	4.0	4.5	7.6	68.9	4.9
4	CNC Software	3.6	4.9	5.4	10.7	3.5
5	CADKEY	6.1	5.7	5.2	-7.3	3.4
6	MCS	3.0	3.1	4.8	57.1	3.1
7	American Small Business Comp.	2.8	4.1	4.6	10.9	2.9
8	Algor Interactive Systems	3.5	4.1	4.5	10.8	2.9
9	Computervision	5.7	3.1	4.2	35.5	2.7
10	CAMAX Manufacturing	4.6	5.0	4.0	-20.7	2.6
11	Ansys	2.7	3.1	3.4	10.7	2.2
12	Softdesk	2.1	2.8	2.7	-4.9	1.7
13	Engineering Mechanics	2.2	2.4	2.7	10.7	1.7
14	ADRA Systems	2.1	2.4	2.6	10.6	1.7
15	Moda CAD	2.0	2.2	2.4	10.6	1.5
16	Micrografx	1.7	2.1	2.3	10.6	1.5
17	IBM	11.4	4.3	1.7	-59.2	1.1
18	Rasna Corporation	1.5	2.0	1.6	-23.1	1.0
19	Cimatron	0.2	0.4	1.5	236.2	1.0
20	Pathtrace Engineering Systems	0.5	1.1	1.2	10.4	0.8
21	GRAPHSOFT	0.7	1.2	0.8	-27.2	0.5
22	Evolution Computing	0.9	1.1	0.8	-31.1	0.5
23	Investronica SA	0.5	0.6	0.6	8.6	0.4
24	IMSI	0.4	0.4	0.6	42.9	0.4
25	MacNeal-Schwendler	1.4	0.5	0.5	5.5	0.3
26	Applicon	-	-	0.4	n/a	0.3
27	Mechanical Dynamics	-	0.4	0.4	11.4	0.3
28	Engineered Software	0.1	0.3	0.3	10.7	0.2
29	Delcam International	0.2	0.1	0.3	237.6	0.2
30	Technische Computer Systeme	-	0.2	0.2	9.5	0.1
	All N.A. Companies	127.8	137.9	151.6	10.0	97.4
	All European Companies	1.6	2.6	4.0	54.3	2.6
	All Asian Companies	-	0.1	0.1	20.0	0
	All Companies	129.4	140.5	155.7	10.8	100.0

OEM revenue removed to prevent double-counting the market
Source: Dataquest (March 1995)

Table A-9
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Europe, All Platforms

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	130.3	140.6	152.3	8.3	18.8
2	Computervision	126.8	86.5	77.3	-10.6	9.5
3	Parametric Technology	18.1	40.4	67.2	66.2	8.3
4	Autodesk	53.1	53.3	60.2	13.0	7.4
5	Matra Datavision	42.8	43.1	46.7	8.3	5.8
6	EDS Unigraphics	31.1	36.3	40.9	12.8	5.0
7	Hewlett-Packard	42.2	38.3	39.0	2.0	4.8
8	MacNeal-Schwendler	28.9	34.3	33.0	-3.8	4.1
9	SDRC	26.0	24.8	27.8	12.1	3.4
10	Intergraph	27.1	20.4	19.5	-4.2	2.4
11	Siemens Nixdorf Info systeme	27.7	16.0	16.3	1.9	2.0
12	Straessle Informationssysteme	22.7	14.3	15.4	8.0	1.9
13	Applicon	24.6	16.2	14.2	-12.2	1.7
14	ISD Software	13.4	13.0	13.5	3.1	1.7
15	CAD Lab	15.2	11.4	11.7	3.0	1.4
16	Cisigraph	11.5	11.4	11.3	-0.1	1.4
17	ASCAD/ASCAM	8.4	8.7	9.3	6.7	1.1
18	Wiechers Datentechnik	8.1	8.5	8.9	4.6	1.1
19	Ansys	9.1	7.8	8.3	6.7	1.0
20	Radan Computational	7.9	8.1	8.1	-0.2	1.0
21	Delcam International	9.5	6.4	7.0	9.3	0.9
22	Tebis	10.1	6.3	6.4	1.6	0.8
23	ICEM Technologies	10.7	5.7	6.2	9.2	0.8
24	Investronica SA	6.2	6.2	6.2	-1.0	0.8
25	Ziegler Informatics	5.7	6.0	5.8	-4.8	0.7
26	PROCAD GmbH	4.6	4.6	5.6	22.3	0.7
27	Han Dataport	5.4	4.4	5.5	26.4	0.7
28	Serbi	4.3	4.5	5.0	12.0	0.6
29	Cimatron	6.3	5.7	4.9	-13.9	0.6
30	PAFEC	6.0	4.9	4.9	-0.6	0.6
	All N.A. Companies	543.5	526.5	572.6	8.8	70.6
	All European Companies	295.6	242.7	238.9	-1.6	29.4
	All Asian Companies	-	-	-	NA	-
	All Companies	839.0	769.3	811.5	5.5	100.0

OEM revenue removed to prevent double-counting the market
NA = Not applicable
Source: Dataquest (March 1995)

Table A-10
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Europe, Technical Workstation

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	60.7	94.0	112.5	19.7	18.4
2	Computervision	119.2	81.5	69.3	-15.0	11.3
3	Parametric Technology	18.1	38.6	60.5	56.6	9.9
4	Matra Datavision	42.8	42.3	45.7	8.0	7.5
5	EDS Unigraphics	31.1	29.0	40.9	41.1	6.7
6	Hewlett-Packard	42.2	38.3	39.0	2.0	6.4
7	SDRC	25.0	24.6	27.8	13.2	4.5
8	MacNeal-Schwendler	13.7	19.1	23.6	23.5	3.9
9	Intergraph	24.0	17.4	16.5	-5.6	2.7
10	Straessle Informationssysteme	22.7	14.3	15.4	8.0	2.5
11	Applicon	24.6	16.2	13.7	-15.0	2.2
12	Siemens Nixdorf Info systeme	27.7	13.5	13.6	0.9	2.2
13	ISD Software	9.7	11.0	11.5	4.4	1.9
14	Cisigraph	10.3	11.4	11.3	-0.1	1.9
15	ASCAD/ASCAM	8.2	8.5	9.1	7.0	1.5
16	CAD Lab	12.7	8.9	8.2	-7.5	1.3
17	Radan Computational	7.8	8.0	7.9	-0.9	1.3
18	Delcam International	8.6	6.2	6.2	1.4	1.0
19	ICEM Technologies	4.2	4.0	6.2	54.9	1.0
20	PROCAD GmbH	4.6	4.6	5.6	22.3	0.9
21	Han Dataport	4.8	3.8	5.5	44.3	0.9
22	Ansys	5.3	4.9	5.4	9.4	0.9
23	CIMLINC	3.4	4.2	4.6	9.9	0.7
24	Alias Research	3.8	3.7	4.0	10.1	0.7
25	Framasoft	3.5	3.6	3.9	8.1	0.6
26	MARC	2.4	2.6	3.7	41.5	0.6
27	Autodesk	3.2	3.2	3.6	13.0	0.6
28	PAFEC	4.5	3.8	3.6	-4.0	0.6
29	ICL	3.6	3.4	3.2	-5.5	0.5
30	ADRA Systems	2.7	2.8	3.0	6.7	0.5
	All N.A. Companies	391.6	391.3	441.3	12.8	72.1
	All European Companies	215.5	172.2	170.7	-0.9	27.9
	All Asian Companies	-	-	-	NA	-
	All Companies	607.1	563.5	612.0	8.6	100.0

OEM revenue removed to prevent double-counting the market
NA = Not applicable
Source: Dataquest (March 1995)

Table A-11
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Europe, Host Dependent

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	54.5	39.5	36.8	-6.8	72.9
2	MacNeal-Schwendler	15.1	14.9	9.1	-38.7	18.1
3	Exapt	3.1	2.7	2.0	-23.9	4.0
4	Ansys	1.8	0.8	0.7	-3.9	1.5
5	Framasoft	0.4	0.4	0.4	0.7	0.9
6	Mechanical Dynamics	0.2	0.4	0.4	-9.3	0.8
7	debis Systemhaus	0.2	0.3	0.3	11.1	0.6
8	Whessoe Computing Systems	0.6	0.3	0.3	-15.2	0.6
9	Computational Mechanics	1.1	0.3	0.2	-14.3	0.5
10	GRAFTEK	-	0.1	0.1	12.5	0.2
11	EDS Unigraphics	-	7.3	-	-100.0	-
12	ICEM Technologies	6.4	1.7	-	-100.0	-
13	MARC	0.8	0.5	-	-100.0	-
14	SDRC	0.9	0.2	-	-100.0	-
15	Han Dataport	0.3	0.2	-	-100.0	-
16	FEA	0.1	0.1	-	-100.0	-
17	Georgia Tech Research Corp.	0	0	-	-100.0	-
	All N.A. Companies	75.0	63.6	47.1	-25.9	93.4
	All European Companies	13.4	6.0	3.3	-45.3	6.6
	All Asian Companies	-	-	-	NA	-
	All Companies	88.4	69.7	50.4	-27.6	100.0

OEM revenue removed to prevent double-counting the market
NA = Not applicable
Source: Dataquest (March 1995)

Table A-12
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Europe, Personal Computer

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	49.9	50.1	56.6	13.0	38.0
2	Wiechers Datentechnik	6.5	7.7	8.0	4.5	5.4
3	Computervision	5.9	5.0	8.0	60.6	5.4
4	Parametric Technology	-	1.8	6.7	269.4	4.5
5	Investronica SA	6.2	6.2	6.2	-1.0	4.1
6	Ziegler Informatics	5.7	6.0	5.8	-4.8	3.9
7	Tebis	10.1	6.3	5.7	-8.8	3.8
8	Serbi	4.3	4.5	5.0	12.0	3.4
9	CAD Distribution	4.1	3.4	4.1	18.7	2.7
10	CAD Lab	2.5	2.5	3.5	39.9	2.4
11	Intergraph	3.0	2.9	3.1	4.2	2.0
12	IBM	15.2	7.1	3.0	-57.4	2.0
13	RoboCAD Solutions	2.5	2.6	2.8	6.9	1.9
14	Whessoe Computing Systems	2.2	2.5	2.8	12.7	1.9
15	Siemens Nixdorf Info systeme	-	2.5	2.7	7.1	1.8
16	Ansys	2.0	2.1	2.2	4.3	1.5
17	Anilam Electronics	1.6	1.8	2.0	14.6	1.4
18	Cimatron	2.6	2.3	2.0	-13.9	1.3
19	ISD Software	3.7	2.1	2.0	-3.4	1.3
20	Kloeckner-Moeller	1.9	1.9	1.9	-1.6	1.3
21	MCS	1.0	1.0	1.5	49.7	1.0
22	Vero International Software	2.0	1.0	1.4	45.4	0.9
23	Technische Computer Systeme	-	1.2	1.3	7.4	0.9
24	ADRA Systems	-	1.3	1.3	0.8	0.9
25	Pathtrace Engineering Systems	1.3	1.0	1.3	30.9	0.9
26	PAFEC	1.5	1.1	1.3	10.6	0.8
27	Superdraft	1.1	1.0	1.2	12.6	0.8
28	CAMAX Manufacturing	-	-	1.1	NA	0.7
29	Matra Datavision	-	0.8	1.0	23.8	0.7
30	Softronics	1.7	1.3	0.9	-26.6	0.6
	All N.A. Companies	76.9	71.6	84.2	17.5	56.5
	All European Companies	66.6	64.5	64.9	0.6	43.5
	All Asian Companies	-	-	-	NA	-
	All Companies	143.6	136.1	149.1	9.5	100.0

OEM revenue removed to prevent double-counting the market
NA = Not applicable
Source: Dataquest (March 1995)

Table A-13
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Japan, All Platforms

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	91.6	105.7	121.1	14.6	16.6
2	Fujitsu	46.9	72.9	73.3	0.5	10.0
3	Hitachi	54.8	61.8	66.4	7.5	9.1
4	NEC	50.4	54.3	57.3	5.5	7.8
5	Nihon Unisys	38.0	51.5	54.2	5.3	7.4
6	Toshiba—No OEM	41.9	45.3	49.0	8.2	6.7
7	SDRC	28.3	26.7	29.5	10.5	4.0
8	Sharp System Products—No OEM	14.3	22.3	26.3	17.7	3.6
9	Hewlett-Packard	14.6	19.8	20.0	1.0	2.7
10	Mutoh Industries—No OEM	24.6	18.8	19.6	4.0	2.7
11	Autodesk	21.0	17.1	18.7	9.7	2.6
12	Tokyo Electron—No OEM	16.0	12.6	14.3	13.5	2.0
13	Toshiba Engineering—No OEM	8.8	12.0	13.6	13.4	1.9
14	Computervision	21.7	20.0	12.1	-39.2	1.7
15	MacNeal-Schwendler	11.5	14.5	12.1	-16.6	1.7
16	MARC	-	8.2	9.3	14.3	1.3
17	EDS Unigraphics	8.9	10.8	9.3	-14.3	1.3
18	Graphtec Engineering	6.9	7.0	7.9	12.4	1.1
19	Toyo Information Systems—No OEM	6.0	6.9	7.6	10.0	1.0
20	Kubota Computer	7.3	6.1	7.1	15.3	1.0
21	Adam Net	1.6	3.6	6.8	88.5	0.9
22	Design Automation	7.5	5.8	5.9	2.2	0.8
23	Wacom	6.2	5.7	5.9	3.7	0.8
24	Omron	5.8	4.6	5.2	12.4	0.7
25	Mitsui Engineering	5.3	4.5	5.0	11.3	0.7
26	Hitachi Zosen Info Systems	4.6	4.3	4.9	12.2	0.7
27	CADIX	3.5	4.1	4.6	12.3	0.6
28	Ansys	-	4.0	4.3	9.0	0.6
29	Cisigraph	2.5	2.7	3.3	21.2	0.5
30	ADRA Systems	-	2.8	3.3	17.9	0.5
	Other Companies	39.5	27.4	34.1	24.4	4.7
	All N.A. Companies	201.5	237.5	249.4	5.0	34.1
	All European Companies	4.6	6.0	8.7	45.5	1.2
	All Asian Companies	356.2	408.0	439.1	7.6	60.0
	All Companies	601.8	678.9	731.3	7.7	100.0

OEM revenue removed to prevent double-counting the market
Source: Dataquest (March 1995)

Table A-14
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Japan, Technical Workstation

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	20.2	49.8	66.9	34.5	12.2
2	Hitachi	39.5	47.1	52.9	12.3	9.7
3	Fujitsu	25.8	41.7	47.6	14.1	8.7
4	Nihon Unisys	13.3	40.7	45.7	12.3	8.4
5	NEC	30.8	36.4	40.8	12.3	7.5
6	Toshiba—No OEM	25.1	31.7	35.6	12.3	6.5
7	SDRC	27.3	26.4	29.5	11.7	5.4
8	Sharp System Products—No OEM	14.0	22.3	26.3	17.7	4.8
9	Hewlett-Packard	14.6	19.8	20.0	1.0	3.7
10	Tokyo Electron—No OEM	16.0	12.6	14.3	13.5	2.6
11	Toshiba Engineering—No OEM	8.8	12.0	13.6	13.4	2.5
12	Computervision	21.7	19.6	10.9	-44.4	2.0
13	MARC	-	6.9	9.3	34.5	1.7
14	EDS Unigraphics	7.7	9.2	9.3	0.6	1.7
15	MacNeal-Schwendler	4.7	5.5	8.2	50.3	1.5
16	Mutoh Industries—No OEM	9.3	7.3	8.2	12.3	1.5
17	Graphtec Engineering	6.9	7.0	7.9	12.4	1.4
18	Toyo Information Systems—No OEM	4.7	5.8	6.7	16.2	1.2
19	Adam Net	1.6	3.6	6.6	82.9	1.2
20	Kubota Computer	7.3	4.9	6.0	22.9	1.1
21	Omron	5.8	4.6	5.2	12.4	0.9
22	Hitachi Zosen Info Systems	4.6	4.3	4.9	12.2	0.9
23	Mitsui Engineering	4.9	4.2	4.7	12.4	0.9
24	CADIX	3.5	4.1	4.6	12.3	0.8
25	Cisigraph	2.3	2.7	3.3	21.2	0.6
26	Ansys	-	2.3	2.9	23.4	0.5
27	ADRA Systems	-	2.0	2.5	23.5	0.5
28	Intergraph	1.6	3.0	2.4	-19.8	0.4
29	Ricoh—No OEM	3.6	1.5	1.9	23.3	0.3
30	Concentra	1.0	0.9	1.8	96.1	0.3
	Other Companies	34.6	25.6	33.6	31.4	6.1
	All N.A. Companies	100.9	150.0	168.3	12.2	30.8
	All European Companies	4.2	5.6	7.8	39.0	1.4
	All Asian Companies	227.9	294.5	336.6	14.3	61.6
	All Companies	367.7	475.7	546.3	14.8	100.0

OEM revenue removed to prevent double-counting the market
Source: Dataquest (March 1995)

Table A-15
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Japan, Host Dependent

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Fujitsu	14.1	25.5	20.1	-21.3	31.8
2	IBM	24.3	20.3	18.2	-10.5	28.8
3	Nihon Unisys	24.7	10.8	8.5	-21.3	13.5
4	NEC	9.0	6.1	4.8	-21.3	7.7
5	Hitachi	5.5	4.9	3.8	-21.2	6.1
6	MacNeal-Schwendler	6.6	8.8	3.8	-57.4	6.0
7	Toyo Information Systems—No OEM	1.3	1.2	0.9	-20.3	1.5
8	Ansys	-	1.0	0.8	-20.4	1.2
9	Kubota Computer	-	0.9	0.7	-20.7	1.2
10	Century Research Center	0.6	0.5	0.4	-22.2	0.6
11	Framasoft	-	0	0	46.0	0
12	EDS Unigraphics	1.3	1.6	-	-100.0	-
13	MARC	-	1.2	-	-100.0	-
14	SDRC	1.0	0.3	-	-100.0	-
15	Intergraph	0.2	0.1	-	-100.0	-
	Other Companies	4.3	1.5	1.1	-30.4	1.7
	All N.A. Companies	33.4	33.4	22.7	-31.9	36.0
	All European Companies	0.3	0	0	46.0	0
	All Asian Companies	58.2	49.9	39.3	-21.2	62.3
	All Companies	96.1	84.8	63.1	-25.6	100.0

OEM revenue removed to prevent double-counting the market
Source: Dataquest (March 1995)

Table A-16
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Japan, Personal Computer

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	47.1	35.6	36.0	1.0	29.4
2	Autodesk	19.7	16.0	17.6	9.7	14.4
3	Toshiba—No OEM	13.8	13.6	13.4	-1.5	10.9
4	NEC	10.6	11.8	11.6	-1.5	9.5
5	Mutoh Industries—No OEM	15.3	11.5	11.4	-1.2	9.3
6	Hitachi	9.9	9.8	9.7	-1.5	7.9
7	Design Automation	7.5	5.8	5.9	2.2	4.8
8	Fujitsu	7.0	5.7	5.6	-1.6	4.6
9	Wacom	5.3	4.7	4.7	0.6	3.8
10	Computervision	-	0.4	1.3	236.5	1.0
11	ADRA Systems	-	0.8	0.8	3.7	0.7
12	CAMAX Manufacturing	-	-	0.8	NA	0.6
13	Ansys	-	0.7	0.7	2.9	0.6
14	Intergraph	0.2	0.4	0.7	67.5	0.5
15	Cimatron	0.1	0.3	0.6	138.2	0.5
16	MCS	-	-	0.5	NA	0.4
17	Mitsui Engineering	0.4	0.3	0.3	-2.9	0.3
18	Kubota Computer	-	0.3	0.3	3.2	0.3
19	Adam Net	-	-	0.2	NA	0.2
20	MacNeal-Schwendler	0.2	0.2	0.1	-39.6	0.1
21	Delcam International	-	0	0.1	214.6	0.1
22	Wiechers Datentechnik	-	-	0.1	NA	0.1
23	Uchida Yoko	0.1	0.1	0.1	-	0.1
24	Matra Datavision	-	0	0	11.5	0
25	Applicon	-	-	0	NA	0
26	Pathtrace Engineering Systems	-	0	0	-	0
	Other Companies	-	0.5	-	-100.0	-
	All N.A. Companies	67.2	54.1	58.4	7.9	47.7
	All European Companies	0.1	0.3	0.9	149.2	0.7
	All Asian Companies	70.1	63.6	63.2	-0.6	51.6
	All Companies	137.4	118.5	122.4	3.3	100.0

OEM revenue removed to prevent double-counting the market
NA = Not applicable
Source: Dataquest (March 1995)

Table A-17
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Asia/Pacific, All Platforms

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	8.4	9.1	10.4	14.2	15.5
2	Autodesk	0.2	8.8	9.6	9.7	14.4
3	SDRC	1.8	7.5	8.3	10.5	12.4
4	EDS Unigraphics	1.3	5.8	5.4	-6.6	8.1
5	Computervision	9.3	7.8	4.7	-39.3	7.1
6	Investronica SA	0.6	0.9	3.0	247.1	4.4
7	Delcam International	-	2.0	2.5	24.0	3.7
8	Matra Datavision	0.1	1.5	2.3	52.0	3.4
9	Ansys	-	1.1	1.8	73.3	2.7
10	CAMAX Manufacturing	-	0.6	1.5	172.9	2.2
11	Intergraph	0.9	1.7	1.4	-13.4	2.1
12	MCS	-	-	1.3	NA	1.9
13	MacNeal-Schwendler	2.7	2.2	1.2	-43.2	1.9
14	Gerber Systems	-	0.5	1.0	99.9	1.5
15	ADRA Systems	-	0.7	0.8	21.2	1.2
16	Design Automation	0.2	0.7	0.8	9.9	1.2
17	Cimatron	0.2	0.7	0.7	2.1	1.0
18	Straessle Informationssysteme	-	-	0.7	NA	1.0
19	Concentra	0.2	0.2	0.4	96.1	0.7
20	Tebis	-	0.2	0.4	114.3	0.6
21	Cisigraph	0.1	0.3	0.3	16.2	0.5
22	Applicon	0.3	0.3	0.3	0.6	0.5
23	Vero International Software	-	0.1	0.2	45.4	0.3
24	Toshiba Engineering—No OEM	0.1	0.1	0.1	-8.3	0.2
25	Framasoft	-	0.1	0.1	58.7	0.1
26	CAD Centre	0.1	0.2	0.1	-44.7	0.1
27	Hitachi Zosen Info Systems	0.1	0	0	-25.0	0
	Other Companies	5.3	6.6	7.5	13.9	11.2
	All N.A. Companies	25.2	46.2	48.4	4.7	72.2
	All European Companies	1.1	5.9	10.2	74.1	15.2
	All Asian Companies	0.3	0.9	0.9	5.7	1.4
	All Companies	31.8	59.5	67.0	12.6	100.0

OEM revenue removed to prevent double-counting the market
NA = Not applicable
Source: Dataquest (March 1995)

Table A-18
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Asia/Pacific, Technical Workstation

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	SDRC	1.7	7.5	8.3	11.7	18.9
2	IBM	2.1	4.4	5.8	33.6	13.3
3	EDS Unigraphics	1.1	5.0	5.4	9.4	12.4
4	Computervision	9.3	7.6	4.2	-44.4	9.6
5	Matra Datavision	0.1	1.5	2.2	53.8	5.1
6	Delcam International	-	1.9	2.2	14.9	5.0
7	Intergraph	0.8	1.4	1.1	-20.5	2.5
8	Gerber Systems	-	0.5	1.0	99.9	2.3
9	CAMAX Manufacturing	-	0.6	0.9	57.8	2.0
10	MacNeal-Schwendler	1.1	0.8	0.8	2.4	1.9
11	Ansys	-	0.6	0.8	33.3	1.8
12	Straessle Informationssysteme	-	-	0.7	NA	1.5
13	ADRA Systems	-	0.5	0.7	42.6	1.5
14	Autodesk	0	0.5	0.6	9.7	1.3
15	MCS	-	-	0.5	NA	1.1
16	Concentra	0.2	0.2	0.4	96.1	1.0
17	Cimatron	0.1	0.4	0.4	2.1	0.9
18	Cisigraph	0.1	0.3	0.3	16.2	0.8
19	Applicon	0.3	0.3	0.3	-2.6	0.7
20	Toshiba Engineering—No OEM	0.1	0.1	0.1	-8.3	0.3
21	CAD Centre	0.1	0.2	0.1	-44.7	0.2
22	Framasoft	-	0.1	0.1	71.0	0.2
23	Tebis	-	-	0	NA	0.1
24	Hitachi Zosen Info Systems	0.1	0	0	-25.0	0.1
	Other Companies	5.5	6.0	6.8	13.8	15.4
	All N.A. Companies	16.7	29.8	31.0	3.8	70.4
	All European Companies	0.4	4.3	6.1	42.2	13.8
	All Asian Companies	0.2	0.2	0.1	-12.5	0.3
	All Companies	22.8	40.2	44.0	9.3	100.0

OEM revenue removed to prevent double-counting the market
NA = Not applicable
Source: Dataquest (March 1995)

Table A-19
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Asia/Pacific, Host Dependent

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	2.5	1.9	1.7	-10.5	57.2
2	Ansys	-	0.3	0.7	155.6	23.7
3	MacNeal-Schwendler	1.5	1.3	0.4	-71.0	13.3
4	Framasoft	-	0	0	-2.6	0.3
5	EDS Unigraphics	0.2	0.9	-	-100.0	-
6	SDRC	0.1	0.1	-	-100.0	-
7	Intergraph	0.1	0.1	-	-100.0	-
	Other Companies	0.4	0.3	0.2	-49.4	5.4
	All N.A. Companies	4.3	4.5	2.7	-38.6	94.3
	All European Companies	-	0	0	-2.6	0.3
	All Asian Companies	-	-	-	NA	-
	All Companies	4.8	4.8	2.9	-39.2	100.0

OEM revenue removed to prevent double-counting the market
NA = Not applicable
Source: Dataquest (March 1995)

Table A-20
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Asia/Pacific, Personal Computer

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	0.2	8.3	9.1	9.7	46.3
2	Investronica SA	0.6	0.9	3.0	247.1	15.1
3	IBM	3.8	2.9	2.9	1.0	14.9
4	Design Automation	0.2	0.7	0.8	9.9	4.0
5	MCS	-	-	0.8	NA	3.9
6	CAMAX Manufacturing	-	-	0.6	NA	3.2
7	Computervision	-	0.2	0.5	205.3	2.5
8	Tebis	-	0.2	0.4	92.3	1.9
9	Ansys	-	0.2	0.3	83.3	1.7
10	Intergraph	0.1	0.2	0.3	75.1	1.6
11	Cimatron	0.1	0.3	0.3	2.1	1.4
12	Delcam International	-	0.1	0.3	239.7	1.4
13	Vero International Software	-	0.1	0.2	45.4	1.0
14	ADRA Systems	-	0.2	0.1	-31.6	0.7
15	Matra Datavision	-	0.1	0.1	0.4	0.3
16	MacNeal-Schwendler	0.1	0	0	-58.8	0.1
17	Applicon	-	-	0	NA	0.1
	Other Companies	-	0.1	-	-100.0	-
	All N.A. Companies	4.1	11.9	14.6	23.3	74.9
	All European Companies	0.6	1.6	4.1	160.8	21.1
	All Asian Companies	0.2	0.7	0.8	9.9	4.0
	All Companies	4.9	14.3	19.5	36.8	100.0

OEM revenue removed to prevent double-counting the market
NA = Not applicable
Source: Dataquest (March 1995)

Table A-21
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Rest of World, All Platforms

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	7.2	8.8	11.0	25.8	24.9
2	Autodesk	2.8	6.5	7.1	9.7	16.0
3	Computervision	7.9	3.1	5.6	84.3	12.7
4	EDS Unigraphics	2.3	2.9	3.3	12.8	7.4
5	Intergraph	2.9	2.9	2.4	-16.5	5.5
6	Cimatron	1.3	1.8	2.4	35.1	5.4
7	MacNeal-Schwendler	3.4	2.3	2.3	-2.5	5.1
8	Delcam International	1.1	1.3	1.9	51.6	4.4
9	Hewlett-Packard	1.5	1.4	1.4	1.0	3.2
10	CNC Software	1.1	1.0	1.2	24.2	2.7
11	Investronica SA	0.4	0.7	0.8	19.7	1.8
12	Ansys	0.7	0.5	0.6	13.0	1.4
13	Matra Datavision	0.4	0.3	0.5	59.4	1.2
14	Whessoe Computing Systems	0.3	0.4	0.5	18.6	1.2
15	CAMAX Manufacturing	0.4	0.5	0.5	-1.3	1.1
16	CADKEY	-	0.5	0.5	-11.9	1.1
17	Rasna Corporation	0.3	0.4	0.5	13.1	1.0
18	ADRA Systems	0.5	0.3	0.4	15.2	0.9
19	Siemens Nixdorf Info systeme	0.6	0.2	0.2	9.5	0.5
20	Computational Mechanics	-	0.2	0.2	9.5	0.5
21	GRAFTEK	0.1	0.2	0.2	6.7	0.4
22	American Small Business Comp.	0.1	0.1	0.2	10.0	0.3
23	Tebis	-	-	0.1	NA	0.3
24	Superdraft	0.1	0.1	0.1	-21.3	0.2
25	Algor Interactive Systems	0	0.1	0.1	16.7	0.2
26	Ziegler Informatics	0	0.1	0.1	16.2	0.1
27	Moda CAD	0	0	0	33.3	0.1
28	Softdesk	0	0	0	33.3	0.1
29	Vero International Software	0.9	0	0	45.4	0.1
30	Pathtrace Engineering Systems	0.3	0	0	-	0
	All N.A. Companies	31.6	31.6	37.2	17.8	84.2
	All European Companies	6.6	5.6	7.0	23.7	15.8
	All Asian Companies	-	-	-	NA	-
	All Companies	38.2	37.2	44.2	18.7	100.0

OEM revenue removed to prevent double-counting the market
NA = Not applicable
Source: Dataquest (March 1995)

Table A-22
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Rest of World, Technical Workstation

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	2.5	5.7	8.3	45.9	30.1
2	Computervision	7.5	2.8	5.0	81.1	18.4
3	EDS Unigraphics	1.9	2.5	3.3	33.0	11.9
4	Intergraph	2.4	2.5	1.9	-24.1	6.9
5	Delcam International	1.1	1.2	1.7	40.3	6.2
6	MacNeal-Schwendler	2.2	1.3	1.6	25.6	5.9
7	Hewlett-Packard	1.5	1.4	1.4	1.0	5.2
8	Cimatron	0.8	1.1	1.4	35.1	5.2
9	Matra Datavision	0.4	0.3	0.5	60.9	1.9
10	Autodesk	0.2	0.4	0.4	9.7	1.5
11	Ansys	0.5	0.4	0.4	11.1	1.5
12	Rasna Corporation	0.2	0.3	0.4	20.6	1.4
13	CAMAX Manufacturing	0	0.1	0.3	448.2	1.0
14	ADRA Systems	0.4	0.2	0.3	12.5	1.0
15	Siemens Nixdorf Info systeme	0.6	0.2	0.2	6.3	0.6
16	GRAFTEK	0.1	0.1	0.1	8.3	0.5
17	Computational Mechanics	-	0.1	0.1	9.1	0.4
18	Whessoe Computing Systems	0	0.1	0.1	20.0	0.2
19	Tebis	-	-	0	NA	0.1
20	Algor Interactive Systems	-	0	0	-	0
21	Accugraph	-	-	0	NA	0
22	CAD Centre	-	0.3	-	-100.0	-
23	ICEM Technologies	0.2	0.2	-	-100.0	-
24	CADKEY	-	0	-	-100.0	-
	All N.A. Companies	19.4	17.6	23.4	32.9	85.3
	All European Companies	3.7	3.4	4.0	19.8	14.7
	All Asian Companies	-	-	-	NA	-
	All Companies	23.2	21.0	27.4	30.8	100.0

OEM revenue removed to prevent double-counting the market
NA = Not applicable
Source: Dataquest (March 1995)

Table A-23
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Rest of World, Host Dependent

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	IBM	3.9	2.4	2.2	-6.5	72.4
2	MacNeal-Schwendler	1.1	1.0	0.6	-38.0	20.5
3	Whessoe Computing Systems	0.1	0.1	0.1	-	2.3
4	Ansys	0.2	0.1	0.1	-	2.0
5	Computational Mechanics	-	0.1	0.1	-	2.0
6	GRAFTEK	0	0	0	-	1.0
7	EDS Unigraphics	0.3	0.4	-	-100.0	-
8	Intergraph	0.2	0.1	-	-100.0	-
9	ICEM Technologies	0.3	0.1	-	-100.0	-
	All N.A. Companies	5.9	4.0	2.9	-27.2	95.8
	All European Companies	0.3	0.2	0.1	-36.9	4.2
	All Asian Companies	-	-	-	NA	-
	All Companies	6.2	4.2	3.1	-27.7	100.0

OEM revenue removed to prevent double-counting the market
NA = Not applicable
Source: Dataquest (March 1995)

Table A-24
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
Top 30 Mechanical Software Companies, Rest of World, Personal Computer

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	Autodesk	2.7	6.1	6.7	9.7	48.8
2	CNC Software	1.1	1.0	1.2	24.2	8.7
3	Cimatron	0.6	0.7	1.0	35.1	7.1
4	Investronica SA	0.4	0.7	0.8	19.7	5.8
5	Computervision	0.4	0.3	0.6	118.1	4.3
6	Intergraph	0.3	0.3	0.6	70.6	4.1
7	IBM	0.8	0.7	0.5	-25.4	3.9
8	CADKEY	-	0.5	0.5	-7.3	3.4
9	Whessoe Computing Systems	0.3	0.3	0.4	22.6	2.8
10	Delcam International	-	0.1	0.2	326.3	1.6
11	CAMAX Manufacturing	0.4	0.4	0.2	-53.5	1.5
12	American Small Business Comp.	0.1	0.1	0.2	10.0	1.1
13	Ansys	-	0.1	0.2	25.0	1.1
14	Tebis	-	-	0.1	NA	0.9
15	Superdraft	0.1	0.1	0.1	-21.3	0.8
16	ADRA Systems	0.2	0.1	0.1	22.2	0.8
17	Rasna Corporation	0.1	0.1	0.1	-16.8	0.5
18	Algor Interactive Systems	0	0.1	0.1	20.0	0.4
19	Siemens Nixdorf Info systeme	-	0.1	0.1	20.0	0.4
20	Ziegler Informatics	0	0.1	0.1	16.2	0.4
21	Computational Mechanics	-	0	0.1	25.0	0.4
22	Moda CAD	0	0	0	33.3	0.3
23	Softdesk	0	0	0	33.3	0.3
24	Vero International Software	0.9	0	0	45.4	0.2
25	Pathtrace Engineering Systems	0.3	0	0	-	0.1
26	MacNeal-Schwendler	0.1	0	0	-10.0	0.1
27	Matra Datavision	-	0	0	9.5	0.1
28	MC2 Engineering Software	0.1	0.1	-	-100.0	-
29	Innovative Data Design	0	0	-	-100.0	-
	All N.A. Companies	6.3	9.9	10.8	9.1	79.3
	All European Companies	2.5	2.1	2.8	36.2	20.7
	All Asian Companies	-	-	-	NA	-
	All Companies	8.8	12.0	13.6	13.8	100.0

OEM revenue removed to prevent double-counting the market
NA = Not applicable
Source: Dataquest (March 1995)

Table B-1
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
All Mechanical Software Companies, Worldwide, All Platforms

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
1	A.I. Systems	0.6	0.5	-	-100.0	-
2	Accugraph	0.2	0.3	0.4	48.8	0
3	Adam Net	1.6	3.6	6.8	88.5	0.3
4	ADRA Systems	13.4	16.2	18.7	15.5	0.8
5	Algor Interactive Systems	3.6	5.0	5.6	12.6	0.2
6	Alias Research	23.5	24.4	29.6	21.3	1.2
7	American Small Business Comp.	2.9	4.3	4.7	10.8	0.2
8	Anilam Electronics	1.6	1.8	2.0	14.6	0.1
9	Ansys	24.1	26.7	30.7	14.8	1.3
10	Applicon	40.2	29.4	29.6	0.6	1.2
11	ASCAD/ASCAM	8.4	8.7	9.3	6.7	0.4
12	Aura CAD/CAM Systems	0.6	0.7	-	-100.0	-
13	Auto-Trol	6.4	6.5	6.8	5.4	0.3
14	Autodesk	142.3	161.5	177.1	9.7	7.3
15	CAD Centre	1.7	1.7	1.1	-35.0	0
16	CAD Distribution	4.1	3.6	4.2	17.5	0.2
17	CAD Lab	15.2	11.4	11.7	3.0	0.5
18	CAD-Capture	0.2	0.1	-	-100.0	-
19	CADIX	3.5	4.1	4.6	12.3	0.2
20	CADKEY	6.9	6.5	5.7	-12.7	0.2
21	CADSI	2.9	2.7	3.2	17.9	0.1
22	CAMAX Manufacturing	11.3	12.4	15.8	27.4	0.7
23	CAMTEK	1.1	1.2	-	-100.0	-
24	Caroline Informatique	1.2	1.4	-	-100.0	-
25	CATALPA groupe Missler	1.5	1.2	1.1	-10.3	0
26	Century Research Center	1.3	1.1	1.1	-1.9	0
27	Cimatron	8.5	10.0	13.3	34.0	0.6
28	CIMLINC	9.8	12.0	14.1	17.5	0.6
29	Cisigraph	15.7	16.0	16.7	4.3	0.7
30	CLARIS	1.6	0.7	-	-100.0	-
31	CNC Software	4.6	5.8	6.6	12.9	0.3
32	Computational Mechanics	2.4	2.0	2.2	6.9	0.1
33	Computervision	193.5	141.1	140.6	-0.4	5.8
34	Concentra	9.1	7.5	11.0	47.1	0.5
35	debis Systemhaus	1.7	2.0	2.1	6.1	0.1
36	Delcam International	12.6	12.2	14.7	20.7	0.6
37	Design Automation	7.6	6.5	6.7	3.1	0.3

(Continued)

Table B-1 (Continued)
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
All Mechanical Software Companies, Worldwide, All Platforms

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
38	EDS Unigraphics	113.1	144.4	163.5	13.2	6.8
39	EME	0.4	0.3	-	-100.0	-
40	Engineered Software	0.1	0.3	0.3	10.7	0
41	Engineering Mechanics	5.5	6.2	7.2	15.0	0.3
42	Evolution Computing	0.9	1.1	0.8	-31.1	0
43	Exapt	4.2	3.8	3.2	-17.4	0.1
44	FEA	0.7	0.9	-	-100.0	-
45	FEGS	1.0	0.9	-	-100.0	-
46	Framasoft	4.6	4.4	4.8	8.7	0.2
47	Fujitsu	46.9	72.9	73.3	0.5	3.0
48	Georgia Tech Research Corp.	0.2	0.5	-	-100.0	-
49	Gerber Systems	8.6	11.4	10.9	-4.6	0.4
50	GRAFTEK	10.4	11.6	12.9	11.0	0.5
51	GRAPHSOFT	0.7	1.2	0.8	-27.2	0
52	Graphtec Engineering	6.9	7.0	7.9	12.4	0.3
53	Han Dataport	5.4	4.4	5.5	26.4	0.2
54	Hewlett-Packard	72.8	70.9	72.0	1.5	3.0
55	Hitachi	54.8	61.8	66.4	7.5	2.7
56	Hitachi Zosen Info Systems	4.7	4.4	4.9	11.9	0.2
57	IBM	308.5	337.7	373.7	10.7	15.5
58	ICEM Technologies	22.2	10.3	10.9	5.7	0.5
59	ICL	3.6	3.4	3.2	-5.5	0.1
60	IMSI	0.4	0.4	0.6	42.9	0
61	Innovative Data Design	0.2	0.2	-	-100.0	-
62	Intergraph	71.9	70.8	61.0	-13.9	2.5
63	Investronica SA	7.7	8.3	10.5	26.7	0.4
64	ISD Software	13.4	13.0	13.5	3.1	0.6
65	Isicad CAD/CAM Systeme	10.2	4.6	-	-100.0	-
66	ISKA	0.9	0.9	0.9	-1.6	0
67	ItalCad	6.7	3.5	-	-100.0	-
68	Kloeckner-Moeller	1.9	1.9	1.9	-1.6	0.1
69	Kreon	0.2	0.2	-	-100.0	-
70	Kubota Computer	7.3	7.2	8.3	15.6	0.3
71	Lamp Software	0.1	0.1	-	-100.0	-
72	MacNeal-Schwendler	105.5	115.9	113.1	-2.5	4.7
73	MARC	11.8	13.1	15.0	14.5	0.6
74	Marcus Computer Systeme	6.8	3.1	1.6	-48.9	0.1

(Continued)

Table B-1 (Continued)
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
All Mechanical Software Companies, Worldwide, All Platforms

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
75	Matra Datavision	47.7	49.8	54.3	9.0	2.2
76	MC2 Engineering Software	0.3	0.3	-	-100.0	-
77	MCS	9.8	9.4	12.6	34.5	0.5
78	Mechanical Dynamics	6.8	10.4	11.7	13.0	0.5
79	Micrografx	1.7	2.1	2.3	10.6	0.1
80	Mitsui Engineering	5.3	4.5	5.0	11.3	0.2
81	Moda CAD	2.0	2.2	2.4	10.9	0.1
82	Mutoh Industries—No OEM	24.6	18.8	19.6	4.0	0.8
83	NEC	50.4	54.3	57.3	5.5	2.4
84	Nihon Unisys	38.0	51.5	54.2	5.3	2.2
85	Omron	5.8	4.6	5.2	12.4	0.2
86	PAFEC	6.1	4.9	4.9	-0.6	0.2
87	Parametric Technology	81.2	150.2	201.2	33.9	8.3
88	Pathtrace Engineering Systems	2.2	2.1	2.5	19.5	0.1
89	PROCAD GmbH	4.6	4.7	5.8	22.2	0.2
90	Radan Computational	7.9	8.7	8.7	0.7	0.4
91	Rasna Corporation	8.8	12.2	14.5	18.6	0.6
92	Ricoh—No OEM	3.6	1.7	2.1	23.4	0.1
93	RoboCAD Solutions	2.5	2.6	2.8	6.9	0.1
94	S.T.L.D. s.r.l.	0.5	0.4	-	-100.0	-
95	SDRC	83.7	85.6	111.4	30.1	4.6
96	Serbi	4.3	4.5	5.0	12.0	0.2
97	Sharp System Products—No OEM	14.3	22.3	26.3	17.7	1.1
98	Siemens Nixdorf Info systeme	28.3	16.2	16.5	2.0	0.7
99	Softdesk	2.1	2.9	2.7	-5.5	0.1
100	Softronics	1.7	1.3	0.9	-26.6	0
101	Straessle Informationssysteme	24.8	15.7	17.0	8.1	0.7
102	Superdraft	1.2	1.2	1.3	8.6	0.1
103	Tebis	10.1	6.5	6.9	7.2	0.3
104	Technische Computer Systeme	2.3	3.3	3.6	10.1	0.1
105	Tokyo Electron—No OEM	16.0	12.6	14.3	13.5	0.6
106	Toshiba Engineering—No OEM	8.9	12.1	13.7	13.2	0.6
107	Toshiba—No OEM	41.9	45.3	49.0	8.2	2.0
108	Toyo Information Systems—No OEM	6.0	6.9	7.6	10.0	0.3
109	Uchida Yoko	0.7	0.7	0.8	11.3	0
110	Vero International Software	2.9	1.1	1.6	45.4	0.1
111	Wacom	6.2	5.7	5.9	3.7	0.2

(Continued)

Table B-1 (Continued)
1994 CAD/CAM/CAE/GIS Software Market Share Table (Revenue in $M)
All Mechanical Software Companies, Worldwide, All Platforms

Rank	Company Name	1992	1993	1994	1993-94 Growth (%)	1994 Share of Market (%)
112	Whessoe Computing Systems	3.8	3.8	4.2	10.2	0.2
113	Wiechers Datentechnik	8.1	8.5	9.0	5.7	0.4
114	Ziegler Informatics	5.8	6.1	5.8	-4.6	0.2
115	Zuken-Redac	0.4	0.5	0.6	18.8	0
	All N.A. Companies	1,405.7	1,525.2	1,690.7	10.9	69.9
	All European Companies	331.1	278.5	285.3	2.4	11.8
	All Asian Companies	356.5	410.1	441.5	7.6	18.3
	All Companies	2,093.3	2,213.9	2,417.4	9.2	100.0

OEM revenue removed to prevent double-counting the market
NA = Not applicable
Source: Dataquest (March 1995)

Table C-1
1994 CAD/CAM/CAE/GIS Total Vendor Market Share Table
(Revenue in $M, Actual Units)
Top 30 Mechanical Vendors, Worldwide, All Platforms

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1994 Share of Market (%)
1	IBM	40,553	373.7	708.4	301.3	1,483.6	18.7
2	Hewlett-Packard	35,094	72.0	613.8	150.9	836.8	10.6
3	Digital Equipment	46,187	-	627.6	91.6	719.2	9.1
4	Sun Microsystems	36,831	-	602.9	80.5	683.4	8.6
5	Silicon Graphics	13,545	-	419.8	49.1	469.0	5.9
6	EDS Unigraphics	4,968	166.5	67.2	61.3	295.0	3.7
7	Fujitsu	15,015	73.3	174.3	25.5	292.1	3.7
8	Parametric Technology	-	201.2	-	58.5	259.6	3.3
9	Computervision	-	140.6	-	102.1	242.7	3.1
10	NEC	11,793	57.3	106.0	22.0	239.3	3.0
11	Nihon Unisys	1,764	54.2	110.0	41.8	215.5	2.7
12	Autodesk	-	177.1	-	-	177.1	2.2
13	Intergraph	2,900	61.0	45.4	62.0	177.0	2.2
14	SDRC	-	111.4	-	56.2	167.5	2.1
15	Hitachi	4,184	66.4	53.3	15.3	149.8	1.9
16	Toshiba—No OEM	3,605	49.0	46.0	12.2	118.7	1.5
17	MacNeal-Schwendler	-	113.1	-	5.6	118.7	1.5
18	Matra Datavision	1,947	54.3	29.1	10.2	99.6	1.3
19	Hitachi Zosen Info Systems	984	4.9	59.9	10.2	93.6	1.2
20	Applicon	757	29.6	12.3	19.2	69.2	0.9
21	Siemens Nixdorf Info systeme	1,890	16.5	21.8	21.5	61.2	0.8
22	Sharp System Products—No OEM	451	26.3	12.5	-	47.8	0.6
23	Apple Computer	11,524	-	37.4	-	46.8	0.6
24	Kubota Computer	544	8.3	33.5	3.8	45.6	0.6
25	Investronica SA	1,368	10.5	10.5	3.9	38.3	0.5
26	Mutoh Industries—No OEM	931	19.6	9.3	3.5	36.3	0.5
27	Delcam International	444	17.6	8.4	6.6	35.0	0.4
28	Ansys	-	30.7	-	3.5	34.2	0.4
29	Alias Research	-	29.6	-	2.2	31.8	0.4
30	Cisigraph	403	16.7	8.5	6.3	31.5	0.4
	Other Companies	103,140	-	271.5	11.8	452.3	5.7
	All N.A. Companies	152,006	1,690.7	2,498.4	1,101.4	5,424.6	68.5
	All European Companies	12,439	285.3	161.6	106.2	591.0	7.5
	All Asian Companies	43,773	441.5	677.4	153.7	1,449.0	18.3
	All Companies	311,358	2,417.4	3,609.0	1,373.1	7,917.0	100.0

Vendor data includes OEM revenue and shipments so that sum of vendors is greater than total.
Source: Dataquest (March 1995)

Table C-2
1994 CAD/CAM/CAE/GIS Total Vendor Market Share Table
(Revenue in $M, Actual Units)
Top 30 Mechanical Vendors, Worldwide, Technical Workstation

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1994 Share of Market (%)
1	IBM	17,072	235.9	485.0	193.7	964.1	16.9
2	Hewlett-Packard	23,890	72.0	581.2	147.3	800.5	14.0
3	Sun Microsystems	36,831	-	602.9	80.5	683.4	12.0
4	Silicon Graphics	13,545	-	419.8	49.1	469.0	8.2
5	EDS Unigraphics	4,968	166.5	67.2	61.3	295.0	5.2
6	Digital Equipment	12,502	-	244.6	43.0	287.7	5.0
7	Parametric Technology	-	183.3	-	53.3	236.5	4.1
8	Computervision	-	126.0	-	102.1	228.1	4.0
9	SDRC	-	111.4	-	56.2	167.5	2.9
10	Fujitsu	4,284	47.6	86.8	18.5	164.8	2.9
11	Nihon Unisys	1,697	45.7	78.7	30.0	162.2	2.8
12	Intergraph	1,651	48.8	40.3	57.4	154.0	2.7
13	NEC	4,031	40.8	47.3	12.4	134.5	2.4
14	Hitachi	2,471	52.9	42.4	12.1	118.8	2.1
15	Matra Datavision	1,738	53.1	28.4	10.2	97.6	1.7
16	Hitachi Zosen Info Systems	984	4.9	57.8	9.9	90.4	1.6
17	MacNeal-Schwendler	-	80.7	-	5.2	85.9	1.5
18	Toshiba—No OEM	1,025	35.6	33.2	8.8	85.9	1.5
19	Applicon	757	28.6	12.3	19.1	68.2	1.2
20	Siemens Nixdorf Info systeme	815	13.8	18.4	21.1	54.3	1.0
21	Sharp System Products—No OEM	451	26.3	12.5	-	47.8	0.8
22	Kubota Computer	381	7.1	27.8	3.2	38.1	0.7
23	Delcam International	370	16.0	7.7	6.3	32.0	0.6
24	Alias Research	-	29.6	-	2.2	31.8	0.6
25	Cisigraph	403	16.7	8.5	6.3	31.5	0.6
26	ICEM Technologies	474	10.9	10.0	9.8	31.3	0.5
27	Tokyo Electron—No OEM	141	14.3	7.0	6.2	29.7	0.5
28	ASCAD/ASCAM	458	9.1	13.1	2.6	29.2	0.5
29	Gerber Systems	403	12.1	9.4	5.5	29.1	0.5
30	CIMLINC	47	16.4	0.9	11.3	28.6	0.5
	All N.A. Companies	83,270	1,239.0	1,979.7	922.3	4,212.5	73.9
	All European Companies	7,173	204.7	127.8	87.9	439.9	7.7
	All Asian Companies	19,459	338.0	461.4	114.3	1,049.1	18.4
	All Companies	109,902	1,781.7	2,568.9	1,124.5	5,701.5	100.0

Vendor data includes OEM revenue and shipments so that sum of vendors is greater than total.
Source: Dataquest (March 1995)

Table C-3
1994 CAD/CAM/CAE/GIS Total Vendor Market Share Table
(Revenue in $M, Actual Units)
Top 30 Mechanical Vendors, Worldwide, Host Dependent

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1994 Share of Market (%)
1	IBM	604	93.6	140.4	105.3	390.0	37.2
2	Digital Equipment	3,913	-	299.6	45.6	345.2	33.0
3	Nihon Unisys	68	8.5	31.4	11.8	53.3	5.1
4	Fujitsu	784	20.1	17.6	7.1	50.3	4.8
5	NEC	207	4.8	27.5	4.4	48.3	4.6
6	MacNeal-Schwendler	-	31.4	-	0.4	31.8	3.0
7	Hitachi	557	3.8	3.0	0.9	8.9	0.9
8	Exapt	70	2.0	1.7	1.0	5.9	0.6
9	Kubota Computer	45	0.9	4.1	0.4	5.4	0.5
10	GRAFTEK	116	1.7	1.7	0.7	4.7	0.4
11	Ansys	-	3.4	-	0.8	4.2	0.4
12	Hitachi Zosen Info Systems	-	-	2.1	0.3	3.2	0.3
13	Toyo Information Systems-No OEM	17	0.9	1.3	0.4	2.9	0.3
14	Mechanical Dynamics	-	2.2	-	0.4	2.6	0.2
15	Framasoft	-	0.5	-	0.5	1.0	0.1
16	Century Research Center	2	0.4	0.3	0.1	0.9	0.1
17	Whessoe Computing Systems	-	0.6	-	-	0.6	0.1
18	Computational Mechanics	-	0.5	-	-	0.5	0.1
19	debis Systemhaus	1	0.3	0	0	0.4	0
20	PROCAD GmbH	-	0	-	-	0	0
	Other Companies	233	-	45.1	11.8	225.9	21.6
	All N.A. Companies	2,671	132.1	303.6	153.2	640.2	61.1
	All European Companies	71	3.8	1.7	1.5	8.2	0.8
	All Asian Companies	1,678	39.4	87.2	25.4	173.1	16.5
	All Companies	4,653	175.4	437.7	191.9	1,047.5	100.0

Vendor data includes OEM revenue and shipments so that sum of vendors is greater than total.
Source: Dataquest (March 1995)

Table C-4
1994 CAD/CAM/CAE/GIS Total Vendor Market Share Table
(Revenue in $M, Actual Units)
Top 30 Mechanical Vendors, Worldwide, Personal Computer

Rank	Company Name	CPU Shipments	Software Revenue	CPU Revenue	Service Revenue	Total Distribution Revenue	1994 Share of Market (%)
1	Autodesk	-	166.5	-	-	166.5	14.3
2	IBM	22,877	44.2	83.0	2.3	129.5	11.1
3	Digital Equipment	29,772	-	83.3	3.0	86.3	7.4
4	Fujitsu	9,947	5.6	69.9	-	77.0	6.6
5	NEC	7,556	11.6	31.2	5.3	56.4	4.8
6	Apple Computer	11,524	-	37.4	-	46.8	4.0
7	Investronica SA	1,368	10.5	10.5	3.9	38.3	3.3
8	Hewlett-Packard	11,203	-	32.6	3.6	36.3	3.1
9	Toshiba—No OEM	2,581	13.4	12.8	3.4	32.8	2.8
10	Parametric Technology	-	17.9	-	5.2	23.1	2.0
11	Intergraph	1,249	12.2	5.1	4.6	23.0	2.0
12	Hitachi	1,156	9.7	8.0	2.3	22.0	1.9
13	Mutoh Industries—No OEM	662	11.4	3.1	1.5	18.7	1.6
14	Computervision	-	14.6	-	-	14.6	1.2
15	Tebis	137	6.2	1.8	3.8	13.1	1.1
16	Wiechers Datentechnik	244	8.1	2.5	1.9	12.5	1.1
17	Cimatron	603	5.7	4.1	1.2	12.0	1.0
18	Design Automation	333	8.7	0.4	0.4	10.9	0.9
19	MCS	42	7.6	0.2	1.1	9.1	0.8
20	CAD Lab	324	3.5	2.4	1.9	7.8	0.7
21	Ansys	-	6.8	-	0.9	7.7	0.7
22	CAMAX Manufacturing	-	6.7	-	0.9	7.6	0.6
23	CNC Software	-	7.4	-	-	7.4	0.6
24	Siemens Nixdorf Info systeme	1,075	2.8	3.5	0.3	6.9	0.6
25	Wacom	237	4.7	1.3	0.8	6.7	0.6
26	Serbi	472	5.0	1.4	-	6.5	0.6
27	ADRA Systems	-	5.0	-	1.3	6.2	0.5
28	CADKEY	-	5.8	-	-	5.8	0.5
29	Ziegler Informatics	-	5.8	-	-	5.8	0.5
30	Algor Interactive Systems	-	4.6	-	0.7	5.3	0.5
	Other Companies	102,908	-	226.4	-	226.4	19.4
	All N.A. Companies	66,066	319.7	215.1	26.0	571.9	49.0
	All European Companies	5,195	76.7	32.1	16.8	142.9	12.2
	All Asian Companies	22,635	64.0	128.7	14.0	226.8	19.4
	All Companies	196,803	460.4	602.3	56.7	1,168.0	100.0

Vendor data includes OEM revenue and shipments so that sum of vendors is greater than total.
Source: Dataquest (March 1995)

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