

PC Logic Chip Sets--Product Analysis

PRODUCT MARKET SHARE ANALYSIS

The PC logic chip set product market share analysis is broken down by bus architecture, microprocessor type, speed, and region. In each case the data are presented in figure form for the comparison of 1987 actual with 1989 forecast, and in tabular form for 1987 through 1993.

Market Share by Bus Architecture

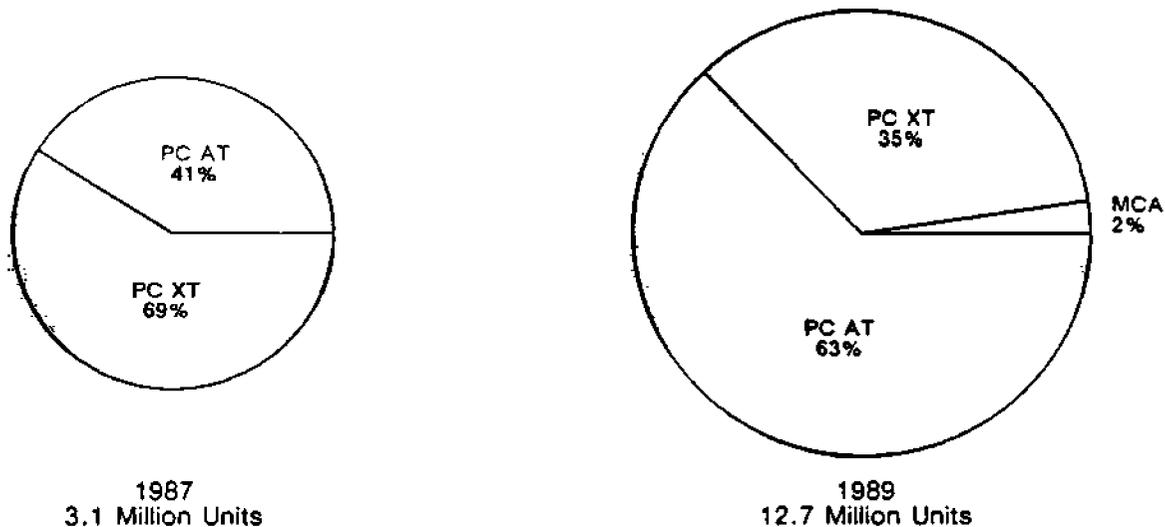
The Dataquest estimates for PC logic chip set unit market share by bus architecture are presented in Figure 1 and Table 1. Points worth noting include the following:

- The PC XT bus is expected to lose 24 points of market share from 1987 through 1989, going from 59 percent to 35 percent of all chip set shipments. By 1993, the PC XT bus is expected to slip to approximately 5 percent market share, being virtually displaced by the PC AT bus.
- The PC XT bus is losing market share to the PC AT bus, which is expected to gain 22 points of market share between 1987 and 1989, going from 41 percent to 63 percent of all chip set shipments. By 1993, the PC AT bus is expected to make up the bulk of the market, with about 74 percent of the chip set shipments.
- Dataquest believes that the EISA bus will not be successful in competing against MCA for the high-end PC market. No EISA products are available at this time, and when they do become available, they will be forever in a catch-up mode with MCA. The MCA bus currently has about 2 percent market share and is expected to make up about 17 percent of all chip set shipments by 1993.

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Figure 1

**Estimated PC Logic Chip Set Unit Market Share
by Bus Architecture**



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Source: Dataquest
June 1989

Table 1

**Estimated PC Logic Chip Set Unit Market Share
by Bus Architecture
(Percent Share)**

	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>
PC XT	58.7%	49.6%	35.2%	21.7%	14.7%	9.0%	5.1%
PC AT	41.3	49.6	63.0	64.4	67.6	71.6	74.3
MCA	0	0.8	1.7	11.4	14.9	16.3	17.4
EISA	<u>0</u>	<u>0</u>	<u>0.1</u>	<u>2.4</u>	<u>2.9</u>	<u>3.1</u>	<u>3.2</u>
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Dataquest
June 1989

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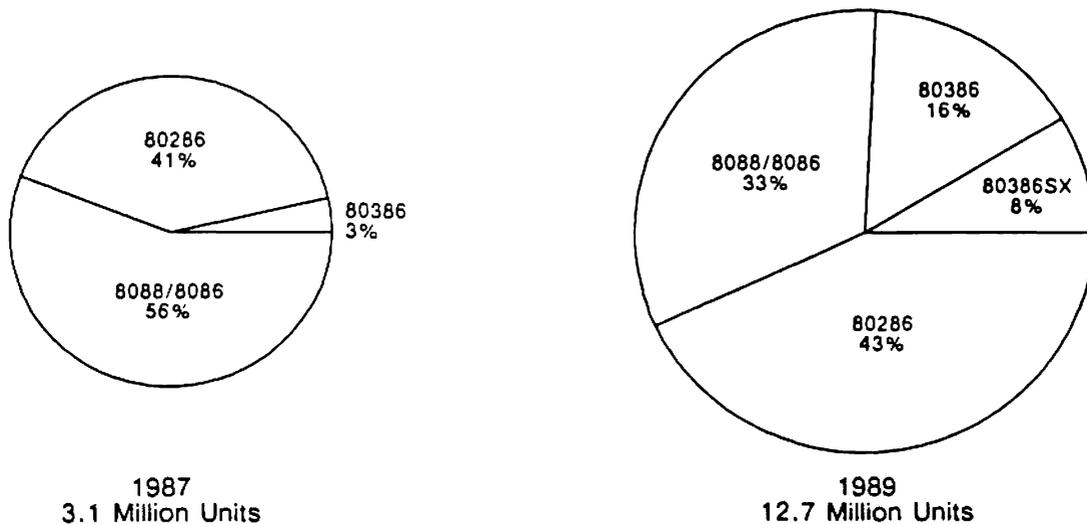
Market Share by Microprocessor Type

The Dataquest estimates for PC logic chip set unit market share by microprocessor type are presented in Figure 2 and Table 2. Points worth noting include the following:

- The 8088/8086 segment is expected to lose 23 points of market share between 1987 and 1989, going from 56 percent to 33 percent of all chip set shipments.
- The 80286 segment should grow slightly, from 41 percent to 43 percent of all chip set shipments. The 80286 will be losing share at the high end but will make up for it by displacing the 8088/8086 at the low end.
- The 80386 and 80386SX are the fastest-growing segments, displacing the 80286 segment at the high end. The 80386 is expected to go from 3 percent of all chip set shipments in 1987 to 16 percent in 1989.

Figure 2

Estimated PC Logic Chip Set Unit Market Share
by Microprocessor Type



0003949-2

Source: Dataquest
June 1989

PC Logic Chip Sets--Product Analysis

Table 2

**Estimated PC Logic Chip Set Market Share
by Microprocessor Type
(Percent Share)**

	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>
8088	25.3%	18.8%	13.9%	7.4%	4.5%	1.4%	0.7%
8086	<u>31.5</u>	<u>27.5</u>	<u>18.7</u>	<u>14.0</u>	<u>10.3</u>	<u>7.6</u>	<u>4.4</u>
Total 8088/8086	56.8%	46.3%	32.6%	21.4%	14.8%	9.0%	5.1%
80286	40.7%	44.9%	43.1%	41.0%	37.0%	32.7%	27.7%
80386	2.5%	8.2%	16.3%	20.0%	20.4%	20.4%	19.8%
80386SX	<u>0</u>	<u>0.7</u>	<u>8.0</u>	<u>17.0</u>	<u>26.1</u>	<u>33.5</u>	<u>38.7</u>
Total 80386/ 80386SX	2.5%	8.9%	24.3%	37.0%	46.5%	53.9%	58.5%
80486	<u>0</u>	<u>0</u>	<u>0</u>	<u>0.6%</u>	<u>1.8%</u>	<u>4.4%</u>	<u>8.7%</u>
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: Columns may not add to totals shown because of rounding.

Source: Dataquest
June 1989

Market Share By Speed Grade

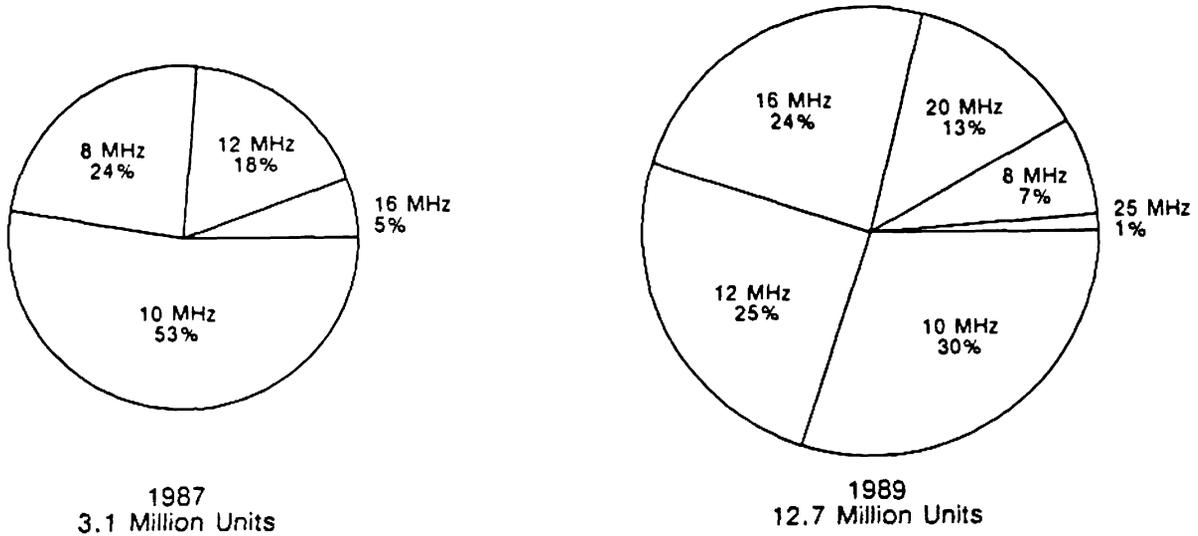
The Dataquest estimates for PC logic chip set unit market share by speed grade for all chip sets are presented in Figure 3. The estimates for speed grades by individual microprocessor are presented in Figures 4 through 6. Data for these figures are presented in Table 3. Points worth noting include the following:

- In general, we expect lower speed grades in each segment to be phased out as higher speed grades are introduced. This will cause a secular shift in the speed profile for all microprocessors toward higher speeds.
- In 1987, 10-MHz chip sets accounted for more than half of all chip set shipments. By 1989, the median is expected to be 12 MHz. Dataquest estimates that the median will step up approximately one speed grade every two years, reaching 20 MHz by 1993.

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Figure 3

Estimated PC Logic Chip Set Unit Market Share by Speed for All Microprocessors

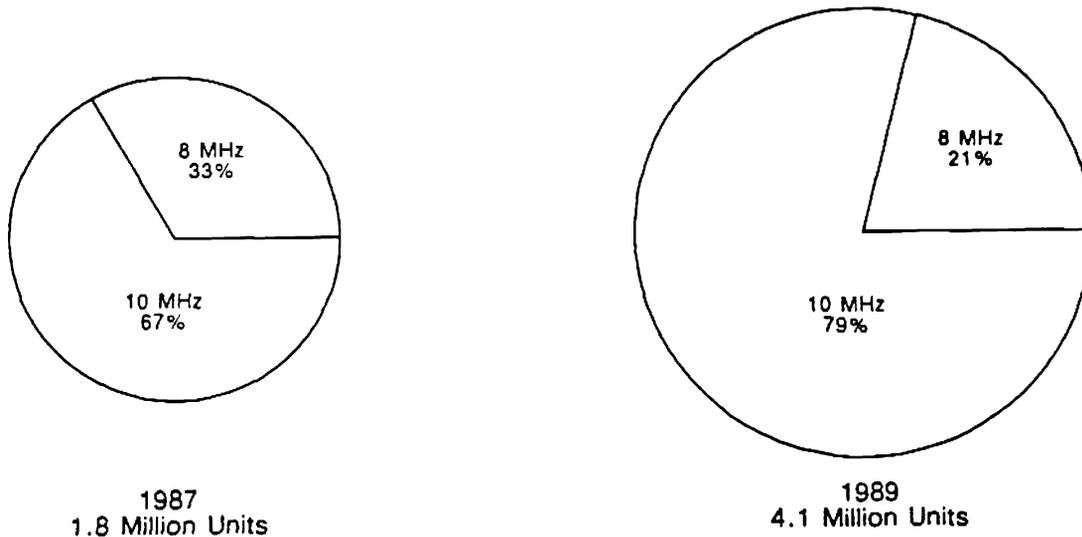


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Source: Dataquest
June 1989

Figure 4

Estimated PC Logic Chip Set Unit Market Share by Speed for 8088/8086 Microprocessors



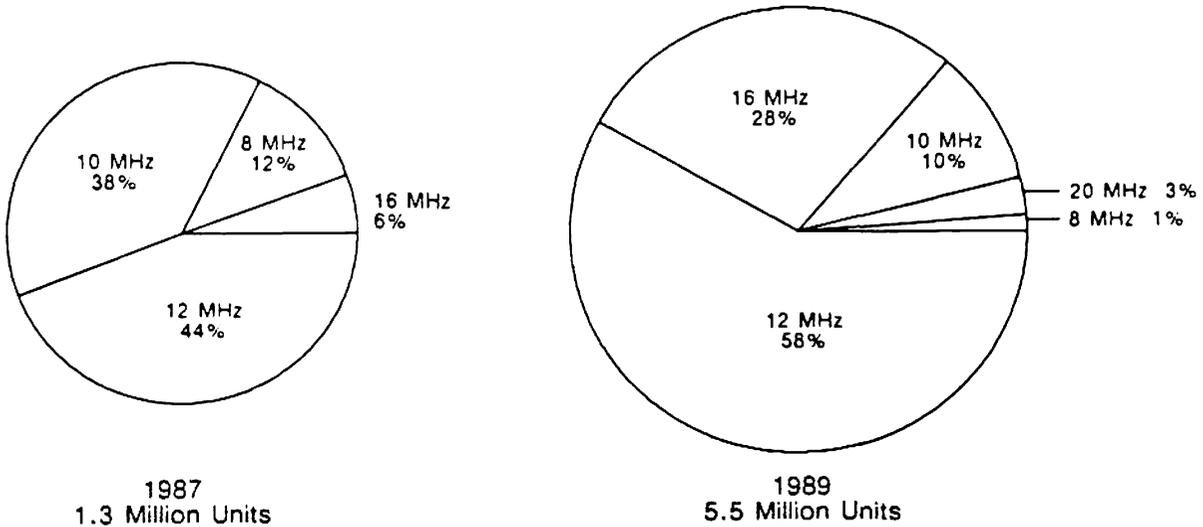
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Source: Dataquest
June 1989

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Figure 5

**Estimated PC Logic Chip Set Unit Market Share
by Speed for 80286 Microprocessors**

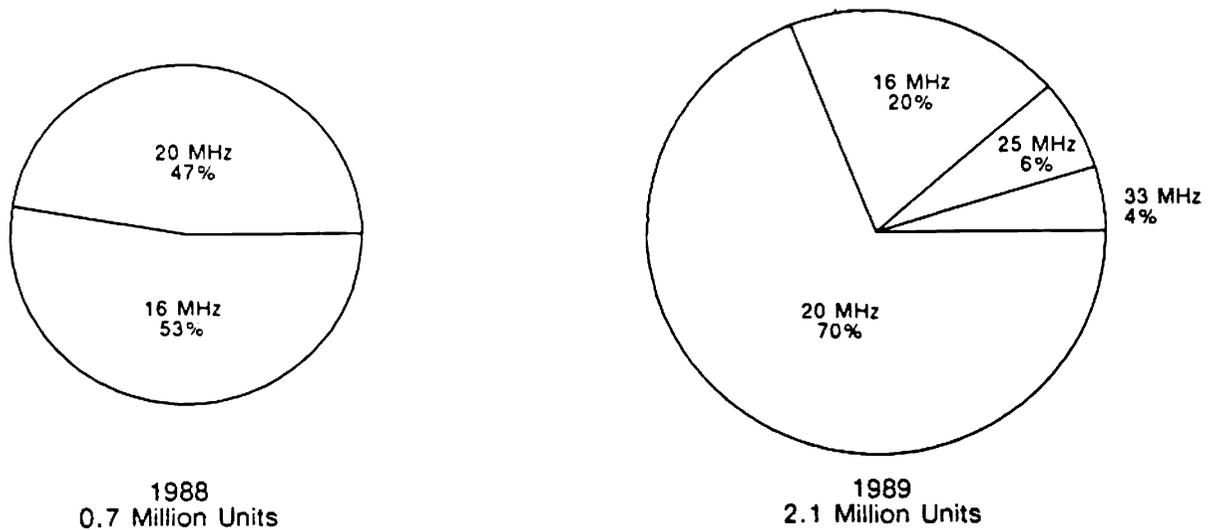


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Source: Dataquest
June 1989

Figure 6

**Estimated PC Logic Chip Set Unit Market Share
by Speed for 80386 Microprocessors**



0003949-6

Source: Dataquest
June 1989

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Table 3

**Estimated Worldwide PC Logic Chip Set Unit Market Share
by Microprocessor by Speed
(Percent Share)**

Speed	1987	1988	1989	1990	1991	1992	1993
Units by Speed							
8088/8086							
8 MHz	33.3%	20.3%	20.7%	12.0%	5.0%	0	0
10 MHz	<u>66.7</u>	<u>79.7</u>	<u>79.3</u>	<u>88.0</u>	<u>95.0</u>	<u>100.0%</u>	<u>100.0%</u>
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
80286							
8 MHz	11.9%	3.4%	1.0%	0	0	0	0
10 MHz	37.9	18.4	10.1	5.0%	0	0	0
12 MHz	43.9	62.4	58.1	50.0	41.0%	36.0%	32.0%
16 MHz	6.3	15.4	28.3	36.0	43.0	44.0	41.0
20 MHz	<u>0</u>	<u>0.4</u>	<u>2.5</u>	<u>9.0</u>	<u>16.0</u>	<u>20.0</u>	<u>27.0</u>
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
80386SX							
16 MHz	0	100.0%	100.0%	78.0%	65.0%	48.0%	38.0%
20 MHz	0	0	0.0	22.0	30.0	35.0	38.0
25 MHz	0	0	0.0	0	5.0	17.0	24.0
33 MHz	<u>0</u>	<u>0</u>	<u>0.0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	0	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
80386							
16 MHz	100.0%	53.0%	20.0%	0	0	0	0
20 MHz	0	47.0	70.0	40.0%	25.0%	20.0%	15.0%
25 MHz	0	0	6.0	50.0	40.0	35.0	30.0
33 MHz	<u>0</u>	<u>0</u>	<u>4.0</u>	<u>10.0</u>	<u>35.0</u>	<u>45.0</u>	<u>55.0</u>
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
80486							
25 MHz	0	0	75.0%	62.0%	50.0%	35.0%	28.0%
33 MHz	0	0	25.0	34.0	40.0	47.0	44.0
40 MHz	0	0	0	4.0	10.0	16.0	21.0
50 MHz	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>2.0</u>	<u>7.0</u>
Total	0	0	100.0%	100.0%	100.0%	100.0%	100.0%
Speed Totals							
8 MHz	23.8%	10.9%	7.2%	2.6%	0.7%	0	0
10 MHz	53.3	45.1	30.2	20.9	14.0	9.0%	5.1%
12 MHz	17.9	28.0	25.1	20.5	15.2	11.8	8.9
16 MHz	5.1	11.9	23.5	28.1	32.9	30.5	26.1
20 MHz	0	4.0	12.5	15.4	18.8	22.4	25.2
25 MHz	0	0	1.0	10.3	10.4	14.4	17.7
33 MHz	0	0	0.7	2.2	7.9	11.2	14.7
40 MHz	0	0	0	0	0.2	0.7	1.8
50 MHz	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0.1</u>	<u>0.6</u>
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Dataquest
June 1989

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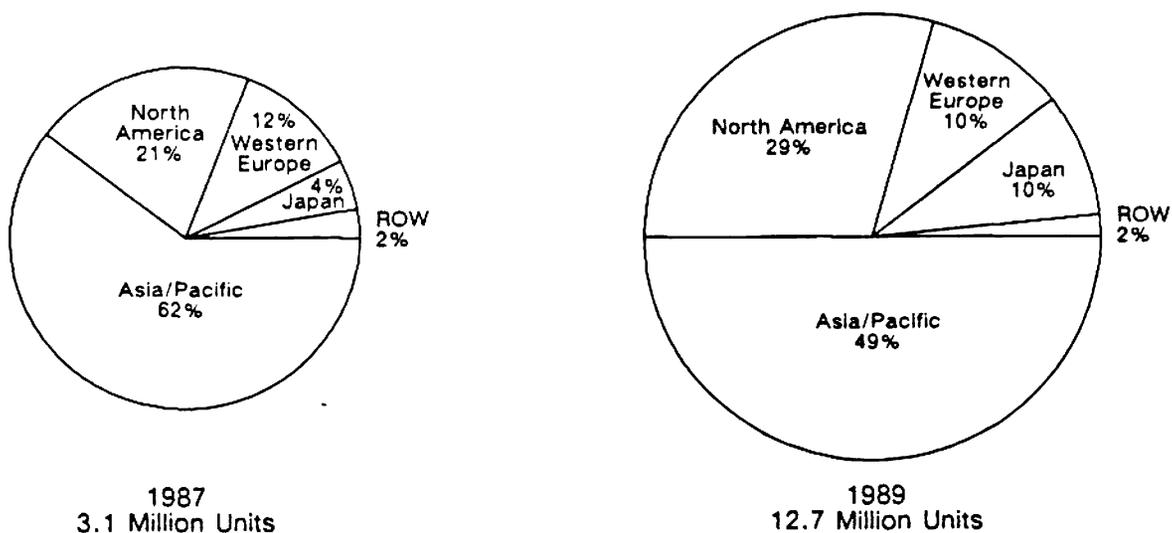
Market Share By Region of Consumption

The Dataquest estimates for PC logic chip set unit market share by region of consumption for all chip sets are presented in Figure 7 and Table 4. Points worth noting include the following:

- The Asia/Pacific region accounted for 62 percent of all chip set consumption in 1987 and is expected to account for 49 percent in 1989. The high Asian consumption should be no surprise and simply reflects the high concentration of clone PC manufacturers in Asia. The decrease in Asian consumption is reflected in an increase in consumption by the North America and Japan regions.
- North America consumed 21 percent of all chip sets in 1987. Dataquest expects North American market share to rise to 29 percent in 1989. This increase is believed to be caused partly by U.S. manufacturers gradually shifting the onshore and offshore production mix toward increased domestic manufacturing. Also, evidence indicates that some non-U.S. PC manufacturers are shifting a portion of their production to the United States.
- Japan's consumption is expected to increase from 4.2 percent share to 9.4 percent between 1987 and 1989. We believe that this reflects wider penetration and acceptance of PC use in Japan, and we expect to see a continuation of this trend.

Figure 7

Estimated Worldwide PC Logic Chip Set Unit Consumption by Region



0003949-7

Source: Dataquest
June 1989

PC Logic Chip Sets--Product Analysis

Table 4

Estimated Worldwide PC Logic Chip Set Unit Shipments
by Region
(Thousands of Units)

	<u>1987</u>	<u>1988</u>	<u>1989</u>
North America Share	648 20.8%	2,041 25.4%	3,663 28.8%
Japan Share	131 4.2%	450 5.6%	1,196 9.4%
Western Europe Share	361 11.6%	667 8.3%	1,297 10.2%
Asia Pacific Share	1,919 61.6%	4,636 57.7%	6,270 49.3%
Rest of World Share	56 1.8%	241 3.0%	293 2.3%
Total	3,115	8,034	12,719

Source: Dataquest
June 1989

PRICING

Average Selling Price Analysis and Forecast

The Dataquest estimates for average selling prices (ASPs) for all chip sets and for chip sets by bus architecture are presented in Figure 8 and Table 5. Points worth noting include the following:

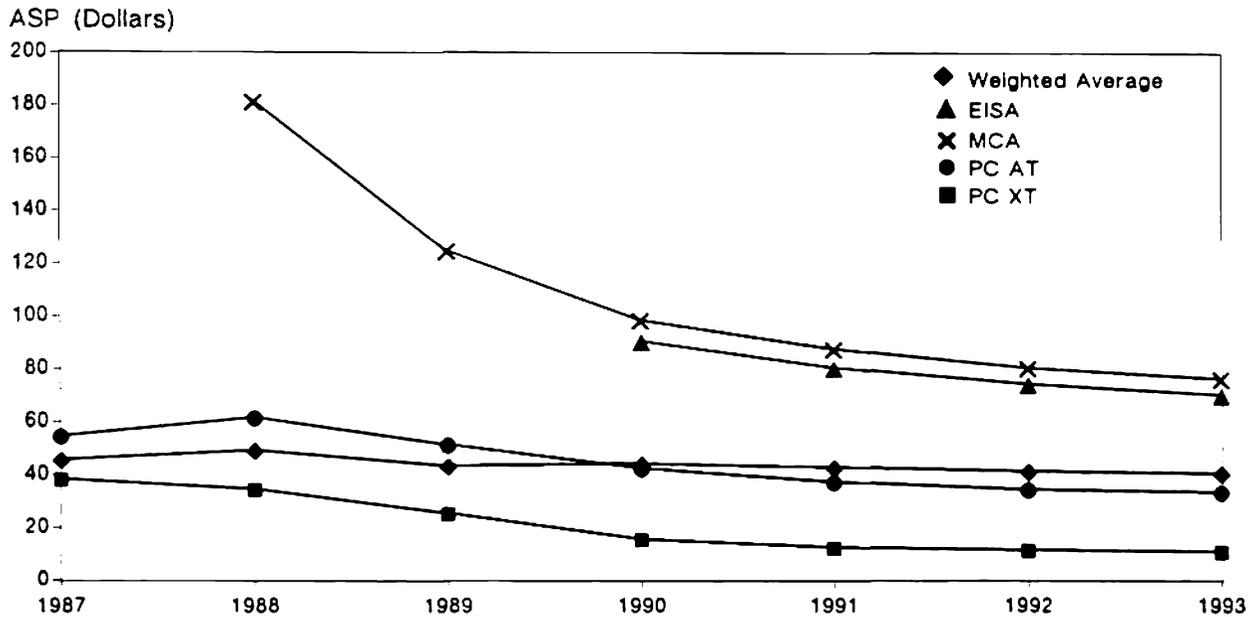
- ASPs rose by 7.7 percent between 1987 and 1988, as a result of the increased share of the higher-priced PC AT products and the fact that the PC AT ASPs rose as the mix moved toward higher-priced, higher-speed chip sets.
- Dataquest believes that ASPs will fall by about 11 percent from 1988 to 1989, as a result of new vendors entering the market, creating pricing pressure as they compete for market share.

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- Dataquest expects ASPs to rise slightly in 1990 as the introduction of EISA chip sets and increased penetration of the MCA chip sets shifts the product mix toward the high end. ASPs will then come down slowly through the rest of the period as price decreases are partially offset by the continued move in product mix toward the higher-priced high-end products.

Figure 8

PC Logic Chip Set Average Selling Price Forecast



0003949-8

Source: Dataquest
June 1989

PC Logic Chip Sets--Product Analysis

Table 5

PC Logic Chip Set Average Selling Price Forecast
(Dollars)

	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>CAGR</u> <u>1987 to 1993</u>
PC XT	\$39.84	\$ 35.07	\$ 25.87	\$15.85	\$12.90	\$11.92	\$11.42	(18.8%)
Change		(12.0%)	(26.2%)	(38.7%)	(18.6%)	(7.6%)	(4.2%)	
PC AT	\$55.07	\$ 62.23	\$ 52.08	\$43.12	\$38.71	\$35.25	\$33.76	(7.8%)
Change		13.0%	(16.3%)	(17.2%)	(10.2%)	(8.9%)	(4.2%)	
MCA		\$182.84	\$124.83	\$98.80	\$88.45	\$81.40	\$77.35	(15.8%)
Change			(31.7%)	(20.9%)	(10.5%)	(8.0%)	(5.0%)	
EISA				\$91.29	\$81.20	\$74.80	\$70.80	(8.1%)
Change					(11.1%)	(7.9%)	(5.3%)	
Weighted								
Average	\$46.13	\$ 49.66	\$ 44.09	\$44.71	\$43.53	\$41.89	\$41.38	(1.8%)
Change		7.7%	(11.2%)	1.4%	(2.6%)	(7.6%)	(4.2%)	

Source: Dataquest
June 1989

Product Characteristics

Technical Areas of Product Competition

For the most part, the configuration and technical aspects of these products is transparent to the end-user because a great deal of standardization in both form factor and function exists at the systems level. To a large degree, this also is true at the OEM level. The performance and functionality of a given chip set family are highly specified, which means that it becomes difficult for vendors to differentiate their products. Dataquest believes that these products will become standardized to the point where they may be considered commodities. The competition for these products will then be based more on pricing and support than on technical differentiation.

PC Logic Chip Sets--Product Analysis

The general product characteristics for PC logic chip sets are integration, compatibility, memory support, and performance. Descriptions of these characteristics are as follows:

- **Integration**—Products will vary both in the level of integration and in the design or layout of the integrated functions.
 - The number of chips in the chip set is one aspect of integration. Vendors have been working toward higher integration and have been lowering the number of chips per set. Newer designs have fewer chips, but many older designs with less integration still are available. Currently, PC XT chip sets are available with from one to four chips. PC AT chip sets have from two to seven chips and MCA chip sets range from three to seven.
 - The number of nonmemory chips required to implement the system, other than those in the chip set, also is an aspect of the integration level. The amount of nonmemory chips required in newer designs has come down too, but a wide range still exists. PC XT designs are available that require from 12 to 58 nonmemory chips for implementation. The range for PC AT designs is 5 to 40, and the range for MCA is 29 to 98.
- **Compatibility**—Chip sets must be compatible with various hardware and software. Hardware compatibility means accepting both peripheral devices and add-in cards. Software compatibility is required for the operating systems and applications.
- **Memory Support**—The chip set must support some board level memory, with the typical configurations being 256KB, 1MB, and 4MB memory modules. Extended memory support through Paged Interleave or EMS is a typical feature. The design of the chip set also will determine the performance of the system, given a certain DRAM speed. Better implementations will require slower and less expensive DRAMs to achieve higher performance.
- **Performance**—Within a product family it is the technology of manufacture, the design and efficiency of integration, the compatibility of the chip set, and the system implementation that will determine the overall level of performance of a product.

PRODUCT FAMILIES AND SUPPLIER MATRIX

The chip set product families break down along bus types. The PC XT is at the low end of the market. This product, being the older technology and perhaps the easier to implement, was used as an entry point by some vendors entering the market in 1986 and

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1987. All of these vendors have since gone on to introduce products in the PC AT family. Anticipating the decline of the PC XT segment, some entrants to the market in 1988 and 1989 did not offer an XT product; instead, they entered in the midrange of the market using the PC AT as an entry point. Only six vendors offer products on the MCA family, which is at the high end of the market. No EISA products are available at this time, but Dataquest expects several vendors to offer EISA chip sets by the fourth quarter of 1989 or the first quarter of 1990. Table 6 is a product family vendor matrix.

Table 6

PC Logic Chip Set Product Family Vendor Matrix

<u>Vendor</u>	<u>PC XT</u> <u>8088/8086</u>	<u>PC XT</u> <u>80286</u>	<u>PC AT</u> <u>80286</u>	<u>PC AT</u> <u>80386SX</u>	<u>PC AT</u> <u>80386</u>	<u>MCA</u> <u>80286</u>	<u>MCA</u> <u>80386SX</u>	<u>MCA</u> <u>80386</u>	<u>Other</u>
ACC Micro-electronics	X		X	X	X	X	X		
Acer Labs	X		X		X				
Chips & Technology	X	X	X	X	X	X		X	
ERSO			X			X			
G2	X		X	X	X	X	X	X	
GS Technology			X						
Intel			X	X	X		X	X	
Oak Technology	X		X	X					
Texas Instruments			X						
UMC	X		X		X				
Vadem									PC/XT 80C186
VIA Technologies			X	X	X				
VLSI Technology, Inc.	X		X	X	X				
Western Digital/Faraday	X		X	X		X	X	X	
Zymos	X		X	X	X				

Source: Dataquest
June 1989

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PC logic chip set vendors include the following:

- ACC Microelectronics Corp.
3295 Scott Blvd., Suite 400
Santa Clara, CA 95954
Phone: 408-980-0622
Fax: 408-980-0626
- Acer Laboratories, Inc., USA
926 Thompson Place
Sunnyvale, CA 94086
Phone: 408-733-3174
Fax: 408-733-2569
- Chips and Technologies, Inc.
3050 Zanker Road
San Jose, CA 95134
Phone: 408-434-0600
Fax: 408-434-9315
- Electronic Research and Service Organization (ERSO)
315 Song Chiang Rd., 8th Floor
Taipei 10477, Taiwan, R.O.C.
Phone: (02) 502-8212
Fax: (02) 502-8795
- Faraday Electronics, Inc.
Division of Western Digital
2801 Southeast Main Street
Irvine, CA 92714
Phone: 714-757-4250
Fax: 714-553-1904
- GS Technology
201 Ravendale Ave.
Mountain View, CA 94043
Phone: 415-968-6081
Fax: 415-964-9747
- Headland Technology, Inc. (formerly G2)
46335 Landing Parkway
Fremont, CA 94538
Phone: 415-656-7800
Fax: 415-656-0397
- Intel Corp.
3065 Bowers Ave.
Santa Clara, CA 95051
Phone: 408-987-8080

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- Oak Technology, Inc.
139 Kifer Court
Sunnyvale, CA 94086
Phone: 408-737-0888
Fax: 408-737-3838
- United Microelectronics Corp. (UMC)
13th Floor, No. 687
Min-Sheng East Road
Taipei, Taiwan, R.O.C.
Phone: (02) 715-2455
Fax: (02) 716-6291
- Vadem
1885 Lundy Ave.
San Jose, CA 95131
Phone: 408-943-9301
Fax: 408-943-9735
- VIA Technologies, Inc.
4160B Technology Drive
Fremont, CA 94538
Phone: 415-651-2796
Fax: 415-659-9057
- VLSI Technology, Inc.
10220 South 51st Street
Phoenix, AZ 85044
Phone: 602-893-8574
Fax: 602-893-0807
- Zymos Corp.
477 N. Mathilda Ave.
Sunnyvale, CA 94086
Phone: 408-730-5400
Fax: 408-730-5456