

## P.C. STANDARDS

When IBM came out with its first personal computer in 1981, it established an industry standard. IBM's hardware was easy to make or buy. Microsoft, the designer of the IBM PC's operating system, willingly licensed it to other manufacturers. And IBM's design was open, allowing—in fact encouraging—other manufacturers to build add-on equipment to enhance the power of the PC. But it was IBM's size—its dominance of the entire data processing market—that allowed Big Blue to define the standard.

Soon, software developers were producing huge quantities of software for the PC. New companies, such as Compaq, sprang up to build PC-compatible computers, or clones. By the mid 1980's, the IBM standard was so prevalent that most major producers of personal computers, such as Tandy and Hewlett-Packard, had shelved their own designs in favor of PC-compatibles. Finally, as specialized components suppliers such as Chips and Technologies put PC circuitry on the open market, virtually any efficient Asian assembler or U.S. marketer could clone even the most recent IBM product.

IBM's share of the market that it standardized was declining, so in April, 1987 it announced a new family of computers, the Personal System/2 (PS/2). PS/2 computers can run existing PC software, but its new Micro Channel data bus is not compatible with the add-on cards and peripheral equipment on the market for even the most sophisticated of IBM's PC line.

The Micro Channel offers some technical advantages over the PC, but IBM's reason for switching appears to have been commercial. Seeking patents for the Micro Channel, IBM was attempting to establish a new industry standard which could not be cloned without its permission. It aggressively monitored the efforts of others to offer compatibility while raising its license fees on the technology from 1% of sales maximum to as much as 5%.

Although specialized chipmakers quickly came out with circuitry for cloning the central processing units of the new computers, most of the major

clonemakers did not come out with PS/2-compatible machines. Compaq, the largest—and historically one of the first companies to match (and even surpass) IBM's PC designs—entered negotiations with IBM to license Micro Channel technology, but in September it went public with an alternative approach.

Compaq lined up eight other top manufacturers of PC clones, including H-P, Tandy, Zenith, NEC, Wyse Technology, and AST Research, to form the Extended Industry Standard Architecture (EISA). Though no single EISA company approaches IBM in size, even in the personal computer market, together they do have clout. Reportedly they hold nearly 27% percent of the worldwide PC-compatible market, compared to IBM's 22%.

The EISA standard is supposed to provide the advantages—primarily speed—of the Micro Channel without restricting hardware compatibility to older PC's and circuit boards. Should the standard be accepted, EISA manufacturers will be able to maintain their challenge to IBM without forking over 5% in fees to IBM. By offering backwards compatibility, they also may achieve a competitive edge.

But EISA is still a twinkle in Compaq's eye. No one is expected to ship an EISA machine until late 1989. IBM may be having trouble developing new operating system for its PS/2 family, but it is shipping Micro Channel computers in volume now.

Consequently, many in the PC industry doubt that Compaq and its allies are committed to EISA. The new design may be a bargaining chip to force IBM to allow clone-makers to copy the Micro Channel for little or no charge.

The confusion over the design of mainline PC's for the corporate market is creating an opening for Apple Computer's Macintosh, which is designed so restrictively that it can't be cloned, and for low-end UNIX-based work stations, which are already strong in the scientific and academic markets.

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No matter whose standard comes out on top, however, the EISA challenge illustrates a shift in the nature of computer production. Design and software, not the ability to slap circuitry and other components into a shell, determine competitive strength in the highly competitive world of high technology.

(Sources include *Business Week*, September 19, 1988; *San Jose Mercury News*, September 14, 1988; and *San Jose Business Journal*, September 19, 1988)

## COMPUTERS IN BRAZIL

For more than ten years, Brazil has been following a nationalist information technology program. By restricting foreign access to its market for minicomputers, microcomputers, and peripherals, the Brazilian government has achieved some success in promoting domestic computer manufacture and domestic ownership of information technology. In general, however, Brazilian products lag behind the state of the art, and they are much more costly than their international counterparts.

One of the goals of Brazilian policy has been to *develop domestic expertise in information technology*. Data presented here suggests that domestic firms have put more effort into research and development than foreign-owned firms with operations in Brazil.

Presently (1986 data), Brazilian-owned or controlled firms hold 55% of the Brazilian market for general data processing equipment. Transnational corporations, centered in the mainframe computer market, account for 45% of the market. Not only do Brazilian companies employ many more people than the transnationals, but they employ ten times as many research and development professionals per dollar of sales.

### Brazilian Data Processing Equipment Industry Employment—1986

<u>Ownership:</u>	<u>Domestic</u>	<u>Foreign</u>	<u>Total</u>
Total	34,586	7,425	42,011
Professionals	8,308	3,156	11,464
R&D Professionals	2,484	200	2,684
Sales (US\$ millions)	1,315	1,060	2,375
R&D Professionals per \$100 million sales	189	19	113

The Inter-American Development Bank concludes, "These data undoubtedly reflect the fact that the local firms engage in engineering and design whereas the foreign firms do not." (Quote and data both from *Economic and Social Progress in*

*Latin America*, 1988 edition, Inter-American Development Bank, p. 147.)

This is not merely because foreign-owned firms don't want to do R&D in Brazil. Foreign computer companies are allowed to do business in Brazil only in areas where there is limited domestic expertise.

## C.F.C.'s and ELECTRONICS

Global concern about the breakdown of the Earth's atmospheric ozone layer is already having an impact on the electronics industry. When released into the atmosphere, chemicals such as cholofluorocarbon-113 (CFC-113), marketed as Freon by Du Pont, appear to break down the protective, high-altitude ozone layer. More cancer-causing ultraviolet rays are reaching the Earth's surface than ever before, and the entire planet appears to be warming gradually (the "greenhouse effect").

Consequently, 50 nations signed an agreement last year to cut drastically the production and use of CFC-113. Worldwide, production is supposed to be halved by the end of the century, and some leading manufacturers, such as Du Pont, have announced plans to halt CFC-113 production entirely by that date.

Though Freon is best known as a coolant, it is widely used as a solvent by high-tech companies. Electronics companies, reports SRI International, account for more than a third of U.S. consumption (1984 data).

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IBM's Silicon Valley complex, for example, purchased more than 2.6 million pounds of high-grade (pure) CFC's, costing some \$2.5 million, in 1987. It uses the chemical to clean disk drives and their components. About half evaporates in the process!

The contaminated residue is shipped to recyclers, who distribute it to manufacturers of cooling equipment and others not needing the high grade demanded by electronics companies.

To cut its Freon use and emissions, IBM has over the past two years developed an alternative method of cleaning components. The new method uses de-ionized water, ultrasound waves, and hot air. (San Jose Mercury News, July 11, 1988).

As restrictions on the production and use of CFC's increase, many high-tech companies will switch to other solvents, most of which are hazardous but which have not yet been subjected to stringent testing or regulation. Hopefully, a growing number will find it worth their while to develop methods, such as IBM's new cleaning procedure, which eliminate solvent use altogether.

## SUBSIDIZED VENTURE CAPITAL IN THE PHILIPPINES

The Asian Development Bank (ADB), an international consortium of Asian and developed capitalist governments, has strayed from its focus on financing infrastructure construction in less development member countries. This September the ADB announced plans to make an equity investment of \$2.5 million in H&Q Philippine Ventures (H&QPV), a new venture capital company.

ADB is providing one sixth of the capital in H&QPV. The largest amount presumably will come from Hambrecht and Quist Philippines (H&QPI), which is managing H&QPV. H&QPI is majority-owned by Hambrecht and Quist, one of the San Francisco Bay Area's leading venture capital firms.

The ADB hopes that the venture will "help develop the capital market and financial system, and become a medium to transfer venture capital skills from H&QPV and H&QPI to counterpart domestic beneficiaries." (Asian Development Bank News Release No. 126/88, September 15, 1988.)

It is ironic that venture capitalists, usually in the forefront of apologists for "free-market" capitalism, don't hesitate to take funds from the meddling ADB.

## MILITARY CHIPS

Market research firm Frost & Sullivan anticipates that the U.S. military market for semiconductors will continue to grow over the next five years, despite an anticipated constant-dollar decline in overall military spending. Frost & Sullivan says that military semiconductor sales will rise from \$2.27 billion in 1987 to a projected \$3.8 billion in 1992.

By product type, Frost & Sullivan divides the market as such:

<u>Product Type</u>	<u>Actual 1987</u> (US\$ millions)	<u>1992 (Projected)</u> (US\$ millions)
Bipolar	800	890
MOS	794	1,200
Discrete	610	1,100
Gallium Arsenide	<u>66</u>	<u>620</u>
TOTAL	2,270	3,810

Within those totals, the market for application-specific integrated circuits such as gate arrays and standard cells will jump from \$296 million in 1987 to \$820 million in 1992. (Press release announcing **US Military Semiconductor Market**, September, 1988.)

## COMPANIES MOVE TO SILICON VALLEY

Despite the high cost of housing, inadequate transportation, and other environmental constraints, Silicon Valley remains the world's number-one address in high technology. It is not unusual for a major non-Valley electronics or computer company to set up a lab or software research center in Silicon Valley, but in September two small firms announced plans to move their headquarters to the valley.

MemTech, a bubble memory producer based in Folsom, California (east of Sacramento) announced plans to move its headquarters immediately to Santa Clara, where it operates a manufacturing plant. MemTech is also shutting another production facility in Santa Rosa, in the northern reaches of the San Francisco Bay Area. The company says it is streamlining its operations, which it took over from Intel in 1987. (San Jose Business Journal, September 19, 1988)

Meanwhile, Zycad, a specialized supercomputer manufacturer, is moving its headquarters from Arden Hills, Minnesota to Menlo Park. The

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company is a 1981 spin-off of Control Data, the grandparent of supercomputer firms. It currently employs 130 people in Arden Hills and Cleveland, Ohio. It is moving those jobs to Menlo Park, where it already employs 40. Zycad acquired the Menlo Park operation at the end of 1986, when it bought Silicon Solutions. The company says, "Locating in Silicon Valley will give us better access to strategic partners, emerging technologies, customers, and a larger labor market." (San Jose Mercury News, September 16, 1988)

### A.T.&T.-THAILAND

AT&T has announced plans to manufacture up to five million residential phone sets a year in Thailand by 1990. It is building a 260,000 square foot, US\$40 million factory in Pathum Thani, near Bangkok. When completed, the plant will employ about 1,100 people, mostly Thai.

AT&T has agreed to export at least 95% of its output, which will probably consist entirely of corded phones, but it still expects to supply nearly a quarter of the Thai home phone market.

An AT&T executive assured its American employees that the Thai plant would not cost U.S. jobs: "The manufacture of all residential telephone

products is presently done offshore, so this has no impact on employment levels in the domestic manufacturing plants."

Indeed, most or all of the products to be made in Thailand are currently put together in Singapore, where AT&T's plant is approaching capacity. Singapore is slated to focus on the production of cordless phones. (The Report on AT&T, June 27, 1988)

### SEAGATE STUNNED IN SINGAPORE

Seagate Technology, the disk-drive manufacturer based in the outskirts of Silicon Valley, got a dose of its own medicine this August when one eighth of its 13,600 Singapore employees quit. Seagate has earned the reputation of an uncaring, unreliable employer in the U.S. for its mass layoffs, but in Singapore it was running at such a high capacity that it responded to a business downturn by reducing hours by 30% to a normal work week.

Apparently overtime production work is both available and desirable in Singapore, so 1,800 disgruntled workers merely went shopping for jobs elsewhere. (San Jose Mercury News, September 14, 1988)

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