GLOBAL ELECTRONICS

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JAPAN, INC. MEASURED AGAINST IBM

From the mass media, one might think that Japan had dislodged the U.S. as the master of high technology. Indeed, there are segments of the electronics industry, such as 3.5-inch disk drives, "DRAM" memory circuits, and VCR's, where Japanese-owned companies are dominant. Overall, however, U.S.-based firms remain in the lead. In fact, one U.S.-based company, IBM, easily outpaces all Japan-based computer and chip producers, combined. The recent rise in the value of the yen has inflated the Japanese share of the world high-tech market, but not enough to threaten IBM.

In 1986 IBM's worldwide revenue totalled $51,250 million. Of that, $49,591 million was in data processing and related fields. IBM Japan, with sales of $3,821 million, ranked as the third largest computer company in Japan.

In that year, the top ten Japanese-owned computer firms amassed global data processing revenues of $27,639 million. This total does not include other income, such as telecommunications services, chip sales, or consumer electronics sales. (Figures are from **Datamation**, September 1, 1987.)

Top Ten Japanese-Owned Computer Companies

Company	Worldwide EDP Revenues $US millions (1986)
Fujitsu	6,575.7
NEC	6,324.6
Hitachi	4,728.8
Toshiba	2,605.0
Matsushita	1,944.0
Mitsubishi	1,345.0
Nippon Tel. & Tel.	1,160.5
Seiko Epson	1,035.7
Nippon Univac Kaisha	985.9
Ricoh	933.8

Also in 1986, the top ten Japanese-owned semiconductor companies produced semiconductors worth a total of ¥2,258.3 billion, or about $13.4 billion (using **Datamation**'s conversion rate). Like most data on the Japanese chip industry, the figures shown below include captive production as well as open-market sales. A substantial portion of this chip production is also counted in computer sales, so one cannot combine computer and chip totals for a grand total.

Note that the top six semiconductor firms are the same as the top six computer firms. (Figures are from **SEMI News**, July-August, 1987.)

Top Ten Japanese-Owned Semiconductor Firms

Company	Worldwide Semiconductor Production ¥ billions (1986)
NEC	460
Toshiba	410
Hitachi	385
Fujitsu	201
Matsushita	201
Mitsubishi	176
Sharp	145
Sanyo	130
Sony	76
Rohm	74

INTELLECTUAL PROPERTY

Since the earliest days of high-tech industry, companies have fought over the ownership of technology. Today, however, copyright and patent battles have reached a new high. Dataquest's Andy Prophet told the **San Jose Mercury News** (September 14, 1987), "The hottest job in Silicon

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Valley right now is in intellectual property."

As Congress and the courts have increased the applicability of copyrights and patents to chip designs, computer software, and semiconductor production technology, innovative firms have invested great effort in restricting use of or obtaining payments for use of proprietary technology.

This September, the U.S. International Trade Commission ruled that Korea's Samsung Semiconductor and Telecommunications was violating patents held by Texas Instruments. Samsung may be barred from shipping memory chips to the U.S. unless its reaches a licensing agreement with TI, which reportedly wants royalties equalling fifteen percent of sales. In fact, any product containing the suspect chips could be barred from the U.S. (**Far Eastern Economic Review**, October 8, 1987)

Meanwhile, Intel's attempt to enlist the US Customs Service in its effort to keep NEC from using copied, or very similar (to Intel's) microcode in its microprocessors, is stalled for now. Fortunately for the Customs Service, which is ill-equipped to monitor high-tech imports, a Federal judge has blocked Customs jurisdiction in the long-standing case.

It's easy to see why the drug-sniffing dogs at Custom may have trouble identifying copyrighted chip microcode, but the problem runs much deeper. The entire U.S. legal system—as well as its counterparts in other countries—is not designed to evaluate or enforce claims to technological intellectual property.

For example, it is relatively easy to see how copyright law applies to the written word. Most people can read. However, few people—and fewer judges or members of Congress—can program. Yet much of the intellectual property law that governs high technology today is a mere extension of copyright law. And the expanded coverage is not the product of a systematic review of the impact of such law on technology. Rather, it has come at the behest of computer and semiconductor firms that identified specific threats to their continued profit and innovation.

One of the biggest such threats is now being resolved in an *ad hoc* fashion, because both parties felt that the U.S. courts could not efficiently resolve highly technical questions. In 1982, IBM accused Fujitsu, a manufacturer of mainframe computers that are "plug-compatible" with IBM's, of copying its system software. In 1983 lawyers from both companies reached a settlement, but it soon broke down. In 1985, IBM requested arbitration, and in December, 1986, the two arbitrators suggested that the computer giants dispense with normal legal procedures and allow the arbitrators to resolve the case informally.

This September the arbitrators, Stanford law professor Robert Mnookin and retired computer expert John L. Jones, announced a solution. Fujitsu would have access to IBM software, but would pay for it. Who would monitor the settlement? The arbitrators, who even have the power to levy penalties.

In essence, both companies preferred writing a blank check of authority to the two arbitrators rather than continue to work within the adversarial legal system. The current settlement gives the arbitrators enormous power to shape the computer industry, with no real checks or balances. And there is no provision for resolving disputes with third parties, such other computer companies that feel injured by cooperation between the world's largest computer company and Japan's largest computer company.

No one considers the solution ideal: "The two men say they hope the copyright law catches up with computer technology to the point that their private regime won't be necessary.

"'There will hopefully be in place a much clearer, cleaner structure as to the protection of intellectual property in the computer field,' Jones says." (**Wall Street Journal**, printed in **San Jose Mercury News**, September 20, 1987)

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edited by Lenny Siegel

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COMMERCIALIZING MILITARY CHIPS

One might think, as the Pentagon prepares to fund the Sematech manufacturing research consortium, that the merchant semiconductor industry and the Department of Defense (DOD) have patched up their long-standing feud over the Pentagon's rigid requirements for the design, production, and testing of military specification ("mil-spec") chips. In fact, the chip industry is working hard, with help from its friends in the military establishment, to circumvent the entire mil-spec system. Industry wants the DOD to authorize the increased use of commercial chips in weapons systems.

The centerpiece in that effort is a report by a Defense Science Board 1986 Summer Study group headed by former Pentagon official (and now Silicon Valley venture capitalist) William J. Perry, as well as James Burnett. The Burnett-Perry report, "Use of Commercial Components in Military Equipment," recommended that the Pentagon save money by adopting commercial procurement practices and by purchasing commercial products.

The report notes that the Department of Defense accounted for about $1.3 billion, or roughly eight percent of the worldwide market for integrated circuits, in 1985. (It appears that these figures refers to chips that qualified for some type of military specification.) In addition, the military and its prime contractors bought $700 million in commercial chips in 1985.

That eight percent in dollar value represents a minuscule one or two percent of the units sold in that year. This is because military chips cost much more than commercial chips. The highest class of military chip, based upon source control drawings (SCD), makes up the greatest share of military chips. SCD chips typically cost fifteen times as much as comparable "rugged commercial" chips, such as those used under-the-hood by automobile manufacturers.

The report describes the origins of mil-spec procedures, "Military quality and reliability management philosophy was established at a time when the DOD was *the* major semiconductor users, components were relatively simple, and semiconductor physics poorly understood. Exhaustive testing was necessary."

The task force contrasts the current situation: "Tremendous industry-wide gains have now been achieved in product quality and reliability—these advances are being driven largely by the demands of commercial IC customers. Many advances are being reported by manufacturers who are not current suppliers to the DOD. A key component of these improvements is statistical process control, which requires significant production volumes and quality feedback."

If the report's recommendations are implemented, semiconductor producers will be free to assemble overseas some 95% of what the Pentagon requires, as opposed to 75% today. The task force considers this foreign dependence a problem, but it refers policy-makers to another Defense Science Board study headed by Martin-Marietta's Norm Augustine. Of course, the Augustine report (see **Global Electronics**, March, 1987) recommended funds for what is now known as Sematech, to support US-owned wafer fabrication, but it offered nothing to bring chip assembly into the U.S.

Defense Electronics magazine and the Military Logistics Forum sponsored a symposium this June to promote the findings fo the Burnett-Perry task force. Perry was the keynote speaker.

Defense Electronics (August, 1987), laid out the opposing views of military and industry participants: "One issue clearly confronting the military is the quality and reliability of commercial semiconductors. 'The Air Force had observed considerable rework of lower level electronic assemblies at contractor plants...attributed to poor quality levels of devices received from suppliers,' said an Air Fore official. However, Ron Marfil, director of marketing for National Semiconductor's military aerospace division, said, "Sixty-five to 70 percent of the parts returned to National military group from customers for "failure to meet electrical specification" have in fact been proven to be electrostatically damaged due to mishandling at the customer site. The vast majority of the remaining 30 percent are due to non-correlation between testers.'"

SCANDINAVIAN AUTOMATION EXPERIMENTS

In the U.S., computers are introduced into most large workplaces without significant input from employees. Consequently, new technologies frequently reduce both the financial and psychological rewards of work, and they often the degrade the quality of goods or services as well.

This negative impact is not the necessary

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consequence of computer technology itself. However, there are few examples of positive alternatives.

Computers in Context, a 1987 video available from California Newsreel, portrays three such examples, not from the U.S., but from Scandinavia, where workers have been direclty involved in designing new forms of automation.

In Norway, a multifunctional computer workstation gives "tellers" at savings banks full access to data on a customer's accounts. Its software is designed to make a wide range of financial services available.

The UTOPIA project, involving graphics unions from throughout the Nordic area, has developed page-design hardware and software that enhances, rather than displaces, the newspaper graphic artist's work.

At the Swedish maintenance facility of the Scandinavian Airlines System (SAS), workers use a "system for experts," to augment their skills, rather than an expert system that places authority in the hands of a computer.

Given the Scandinavian tradition of seeking workplace democracy, it may be difficult to replicate such experiments in the U.S. However, in each of the three cases, computer technology has been adapted to improve both the quality of work and the quality of output, offering employers a competitive reason to rethink computerization.

Computers in Context does not critique any of the Scandinavian experiments. Still, it is a welcome portrait of approaches to technology that we rarely see.

Computers in Context is available (as a rental for $60; for sale for $295) from California Newsreel, 630 Natoma Street, San Francisco, CA, 94103, USA (phone: 415/621-6196).

GOLDEN TRIANGLE HOUSING

The so-called Golden Triangle area of Silicon Valley, the flatlands bounded by highways 101, 237, and 880 (formerly 17), is known today primarily as the site of vacant industrial buildings and increasingly congested roadways. Ironically, just as high-tech business in Silicon Valley is picking up, developers are deciding that housing development is likely to be more profitable. If cities such as Santa Clara and San Jose approve, builders could quickly construct apartments or condominiums capable of housing more than 20,000 people.

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Pacific Studies Center
222B View Street
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