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THE COUNTRYLESS COMPUTER INDUSTRY

For years, leaders of U.S.-based high-tech industry and their political allies have been warning that foreign, particularly Japanese, performance in computer and chip manufacturing was undermining American competitiveness. A recent, thought-provoking article in the *Harvard Business Review* (July-August, 1991) challenges that perception, and it has kindled an energetic debate in high-tech circles.

Andrew Rappaport and Shmuel Halevi of Boston's Technology Research Group contend, in "The Computerless Computer Company," that hardware manufacturing is not only unnecessary for corporate success, but that it gets in the way. They argue: "This competitive erosion is unsettling—but the dread is misplaced. In fact, computer executives should encourage the trend. It is good news for the leading U.S. computer companies—provided they escape the past and redirect their technology, manufacturing, and marketing to embrace the new realities. The strategic goal of U.S. companies should not be to build computers. It should be to create persistent value in computing."

Rappaport and Halevi do us all a great service, pointing out to lobby-blinded policy-makers that the U.S. computer business isn't slumping into the Pacific Ocean. They are right that software, design, and services are the heart of computer industry value added. However, while their prescription may work for some U.S.-based computer companies, it does not adequately serve the long-term U.S. national interest.

Harnessing the Power

The authors retell the constant improvement in the power of computer hardware. They note that the average price per millions of instructions per second (MIPS) fell from $250,000 to $25,000 from 1980 to 1985. The cost continue to drop during the second half of the 1980's, to less than $2,500 in 1990.

They say, however, that "these advances no long directly enable new applications. Put simply, computers have become too powerful for the uses to which they are being put.... Value derives from scarcity. In the computer industry, scarcity now resides in the gap between power—what computers and their underlying semiconductor technologies are capable of doing—and utility—what human imagination and software engineering are capable of enabling computers to do. And that is the good news. U.S. companies lead the world in most of the technologies that bridge that gap..."

Halevi and Rappaport offer several examples of successful computerless computer companies—enterprises that bridge that gap while producing little or no hardware, such as Mentor Graphics and Grid Systems, a subsidiary of Tandy.

The best known is Microsoft, provider of operating systems for IBM and compatible personal computers and top-selling applications software for both IBM and Macintosh machines. (This newsletter, for example, is written and laid out using Microsoft products.) Seattle-based Microsoft has never manufactured hardware, yet it generates annual revenues of $1.5 billion, employs over 4,500 people, and is pegged at a market value of $13 billion.

In contrast, Apple Computer chose in the latter 1980's to focus its attention on developing, producing, and selling hardware, despite its software leadership—in the form of the pace-setting Macintosh operation system. Rappaport and Halevi believe Apple would have been more successful if it had licensed other firms to build Macintosh clones, manufacturing only high-performance machines in house.

Similarly, they praise the performance of five "fabless" chipmakers, firms that hire others to manufacture chips that they design and service. While most U.S.-based chip manufacturers are in financial trouble, the fabless five reported solid profits. They dismiss the importance of production to Intel, the most profitable major U.S. chipmaker: "Intel's chips are so successful and its near monopoly position in microprocessors so powerful that it can afford the luxury of manufacturing them."

(continued on page 2)

The authors conclude, "The computer companies that prosper into the next century will be those that focus on inventing new markets rather than on building new products. And what's good for computer companies is good for the country. The United States cannot regain its place in world competition by investing in lost and backward-looking hardware technologies—no matter their one-time prominence. Reversing America's technology fortunes requires reversing its national technology priorities....

"Investing to regain lost strength in hardware technologies is risky and unrewarding. Investing to capitalize on applications strength and to leverage the investments of other countries in enabling technologies is more likely to allow the United States to extend its leadership—and more likely to result in U.S. control of high-technology markets. Companies and countries that control markets hold power, profit, and employment advantages over those that merely control technology."

Clear Hindsight

As a manifesto on corporate strategy, "The Computerless Computer Company" benefits from hindsight. Microsoft has succeeded, *ergo* its strategy worked. But that approach wouldn't necessarily have worked for others. In fact, it didn't.

Microsoft's niche may have been big enough for only one company. Its early competitor, Digital Research—the developer of the CPM operating system—was left in the dust when the industry's largest hardware producer, IBM, decided to team up with Microsoft.

There are several other major vendors of applications software for personal computers, such as Lotus, Borland, Adobe, and Aldus. Their position in the market, as software-only firms, may have been by choice or by accident. But there is no guarantee that such firms will continue to be industry leaders, or even viable companies, just because they don't build hardware. Ashton-Tate, for example, declined rapidly from the top gun in the PC database field to a corporate carcass to be gobbled up by Borland.

Halevi and Rappaport may be right that firms such as Intel and Apple could have done better by limiting manufacturing at specific junctures in their corporate history, but again they benefit from hindsight. Now it appears that other firms would have rushed to pay large fees to produce Macintosh computers, but that was only true after Apple established the product line itself. Furthermore, though Apple continues to make and market computers and peripherals, few of its employees are directly involved in production. Abandoning manufacturing would not have freed up significant corporate resources.

Maybe Intel could reduce its current capital needs by relying on other wafer fabricators, but the firm appears to have created problems for itself by taking the Halevi-Rappaport approach in the past It licensed microprocessor designs to competitors such as NEC and AMD, and was forced into extended legal action to protect the company's profitability as the other firms introduced new products based on previously licensed technology.

The biggest weakness in the "computerless" strategy is that it assumes that any firm that pursues that approach can find others to make the hardware, not only now, but well into the future. For some firms with a large market presence—established in most cases by manufacturing and marketing—switching to outside sourcing will work. But it is not a strategy for everyone.

In fact, already at least one of the fabless producers of semiconductors, Chips & Technologies, is reporting a quarterly loss. Grid, the authors' ideal laptop computer maker, is laying off workers.

A Value Lesson

The strongest conclusion in the "Computerless Computer Company" is the recognition that good software or design adds more value to a product than slightly improved hardware. Overall, this means that the United States may improve its trade balance without dominating commodities where profit margins are low, such as memory chip and personal computer manufacturing. It means that regions seeking to build or retain high-tech industry may thrive even as official statistics show a leveling or decline in production employment.

As we have pointed out before, traditional conventions for counting jobs arbitrarily lump software production with services that do not create value, such as banking and law, in the catch-all "business services." But software is the heart of computing, with intrinsic value.

But software leadership does not guarantee economic health. First, the cost of reproducing software, once it is developed, is negligible. While some products require significant, ongoing customer support, most lose no value when transferred from a purchaser to a third party. Not only can individuals distribute bootleg versions, but competing suppliers can copy and adapt code.

Thus, software dominance requires an extensive, practical system of intellectual property pro-

tection. But creating, funding, and empowering "software police" is not only likely to be costly, but it is repugnant to many of the creative people who engineer software in the first place.

Furthermore, unless new means are developed for distributing software at a reasonable price to customers who cannot otherwise afford it—the schools, for instance—software piracy will spread.

Second, a software-based economy offers few jobs for the women, non-white ethnic groups, and other immigrants at the bottom of the economic ladder. Manufacturers and their production subcontractors rely on such people for assembly, machine operation, and maintenance. On the other hand, a healthy "computerless" company requires a workforce literate in English and familiar with computers, not just in professional positions, but in technical jobs such as software quality assurance—known as "testers"—and customer support.

The software industry's requirement for an educated workforce would be no problem, however, if the United States renewed its commitment to universal education. Many states have attempted to boost their share of the high-tech pie by subsidizing university-level training, but in most areas the resources for K-12 (kindergarten-through-twelfth grade) schooling are diminishing at a time when needs are rapidly rising.

Global Assembly Line

The most monumental shortcoming of Halevi and Rappaport's analysis, however, is their identification of U.S.-based companies' interests with the American national interest. In fact, U.S.-owned chipmakers have carried out most of their assembly—but not wafer fabrication, the more capital-intensive side of production—in Asia since the birth of the integrated circuit industry. Even computer manufacturers that assemble machines in the United States rely upon foreign suppliers and subcontractors.

A large portion of the U.S. high-tech economy has been "computerless" for years, even though U.S. firms remain focused on hardware. Not only has that limited the number of domestic production jobs, but it has undermined the earning power of U.S. production workers, who "compete" with assemblers earning one tenth their wages.

U.S. industrial policy—whether orchestrated by a civilian Federal agency or continuing in its present haphazard form—should take into account the growing role of software, but it should support the generation of decent jobs for American workers. This means promoting a balance of hardware and software production; it also means stronger support for education and the targeting of subsidies to firms that promote domestic job growth.

The authors assert that their strategy will help the U.S. regain its "place in world competition," but competitiveness isn't a national goal in itself. It is merely one part of strategy to promote economic activity that generates profits; jobs, and tax revenues. Computerless computer companies and computer-makers both need to be a part of that strategy, but their success won't mean much unless policy-makers address the needs of the entire population.

IBM VS. SCREEN DUTIES

IBM, Apple, Tandy, and Compaq are asking the U.S. Court of International Trade to reverse the International Trade Commission's prohibitive "anti-dumping" duties on active-matrix flat-panel displays, components integral to advanced laptop and notebook computers. (See *Global Electronics* No. 110.) IBM manufactures the displays in Japan, in a joint venture with Toshiba. IBM's Japanese factories assemble some of those displays into small IBM computers.

IBM chairman John Akers warns that IBM can avoid the tariff, which applies only to the unassembled screens, simply by continuing to produce laptops in Japan. He says, "From an American point of view that's an export of jobs that exacerbates the balance of trade." (*San Jose Mercury News,* November 8, 1991) IBM claims that it has plans to assembled active-matrix based computers in the U.S., but that it will not implement them unless the tariff is lifted.

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BOMBAY WOMEN ORGANIZE

The Santacruz Electronics Export Processing Zone in Bombay is India's most significant attempt to join the international high-tech assembly line. Several thousand workers, more than ninety percent of whom are women, assemble electronics products there. Wages are low. Sex discrimination is standard. Transportation is unsafe and time-consuming. Workers suffer from headaches, eyestrain, and back ailments.

Since 1984, workers at several plants have attempted to unionize, but employers, with the aid of police, have systematically suppressed those efforts. Activists are suspended or fired. Since the Export Zone is a barbed-wire enclave, employers can direct security guards to lock out workers, far from the factory gates.

At Tandon Motors, owned by Japan-Servo Company, the company first tried to block organizing by forming an internal grievance committee, while warning against any contact with established unions. However, dissatisfied workers still secretly contacted a union, and they got organized:

"A couple of months later, we submitted our Charter of Demands. The management did not respond immediately. But the following month we did not get our wages on the usual day. When we asked for our pay, the management did not respond. We immediately struck work for a day. When the management assured that we would get our pay, we went back to work.

"Yet not long after, on grounds of lack of demand for the products, the management applied to the Labour Commissioner for permission to lay off 303 out of 319 workers. We went on another strike. The sad thing is that the management succeeded to retrench 106 workers, mostly women. Now they are recruiting new workers." *(Asian Women Workers Newsletter,* September, 1991)

PICO COURT CASE STARTS

The U.S. District Court in Binghampton, New York, was scheduled on October 28 to hear a lawsuit, filed in July, 1990, against Pico Products. The suit, filed by the Center for Constitutional Rights on behalf of Pico's former employees in South Korea, seeks the rehiring of the Korean workers thrown out of work by a surprise plant closure, as well as the completion of negotiations for a collective bargaining agreement. (See *Global Electronics* No. 104.)

The complaint argued that "the parent company's interference in the [South Korean] union talks brought the shutdown under the jurisdiction of U.S. breach-of-contract and collective-bargaining laws." This is the first time that overseas employees of a U.S.-based firm have been able to challenge their employer in a U.S. court. *(Guardian,* October 30, 1991)

Ironically, the workers originally sought a non-litigated settlement, organizing widespread support for their demands in both Korea and North America. Even the South Korean government—whose police have attacked pro-Pico-worker demonstrations—has called for prompt resolution of the dispute.

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