



THE FREE-FOR-ALL HAS BEGUN

SOFTWARE COMPANIES LARGE AND SMALL ARE INVADING ONE
ANOTHER'S TURF

It was March, 1986, and executives at Cullinet Software Inc. were alarmed. Once the bellwether of the entire software industry, Cullinet was heading for its first quarterly loss since going public in 1978. Slackening demand for IBM mainframes was hurting sales of Cullinet's data-base management programs, and IBM was about to introduce a competing program. Besides that, about half of Cullinet's customers were in the process of shifting work to less expensive minicomputers made by Digital Equipment Corp. So founder and Chair-man John J. Cullinane and newly appointed President David L.

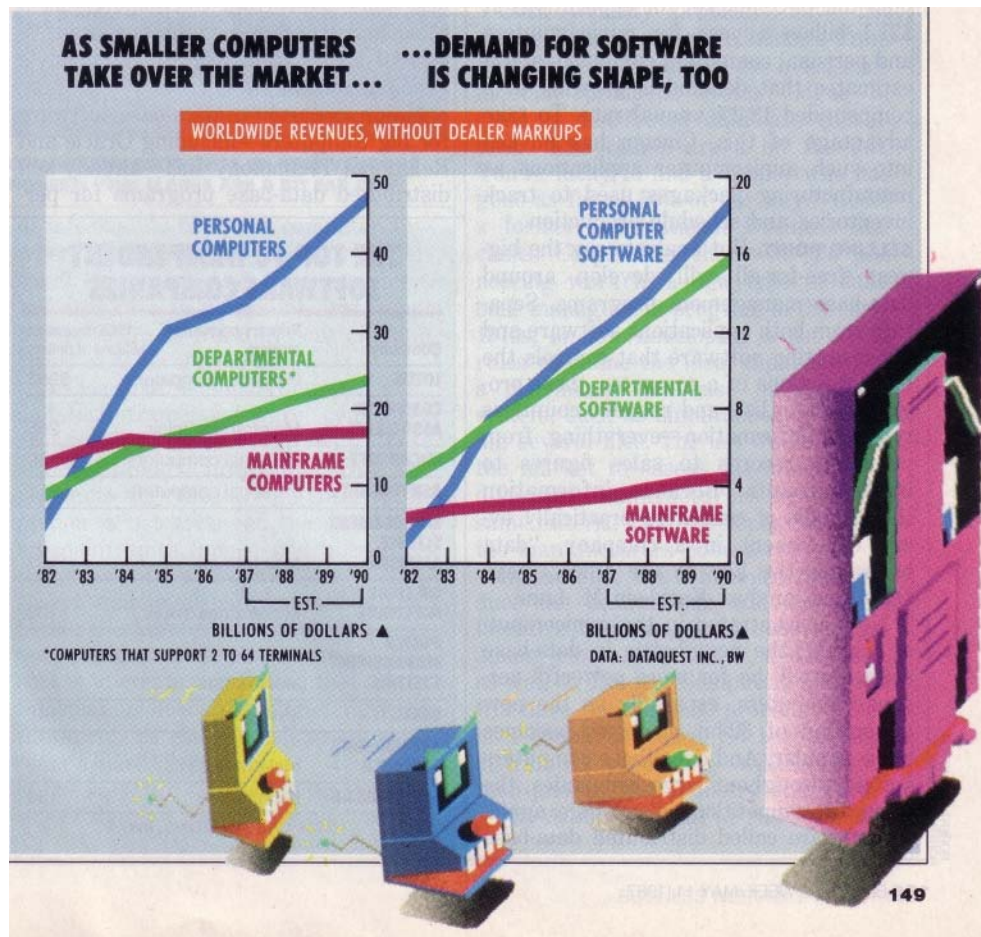
Chapman decided on a fundamental change in strategy: Cullinet would plunge into the market for minicomputer software.

Since then, Cullinet has bought four companies that write programs for DEC's Vax line of minicomputers. These companies are bringing in \$25 million a year, some 15% of Cullinet's revenues. Analysts say that the No. 6 software company is close to breaking even, and Cullinet expects its minicomputer software business to take off. To make this happen, the Westwood (Mass.) company has expanded its sales force by 30% and put it through a major retraining program. Says Chapman: "We could see the Digital market exploding. It became clear that was an important market for us."

Cullinet's new strategy is just one sign of a dramatic restructuring that is beginning to shake the \$27 billion worldwide software industry. Until recently, software makers tended to be neatly pigeonholed, specializing in mainframe, minicomputer, or personal-computer software. But advances in technology are starting to produce more powerful minicomputers and personal computers that are able to take on more of the jobs once done by mainframes—for considerably less cost. And that is putting irresistible pressure on software makers to go where the action is.

Of the top 10 independents (table, page 150), 7 traditionally have specialized in mainframe products. Six of these now are starting to turn out programs for smaller computers. And personal-computer software companies see new opportunities in software for larger machines. On Apr. 27, Lotus Development Corp. announced a mainframe version

of its best-selling 1-2-3 spreadsheet for personal computers. It is due out in early 1988 and is to be distributed jointly with International Business Machines Corp. Ultimately, the two companies plan to develop and sell more programs together—boosting Lotus' growth. In short, software makers are heading for an unprecedented battle for



market share. "They're on a collision course," says S. Jerrold Kaplan, principal technologist at Lotus.

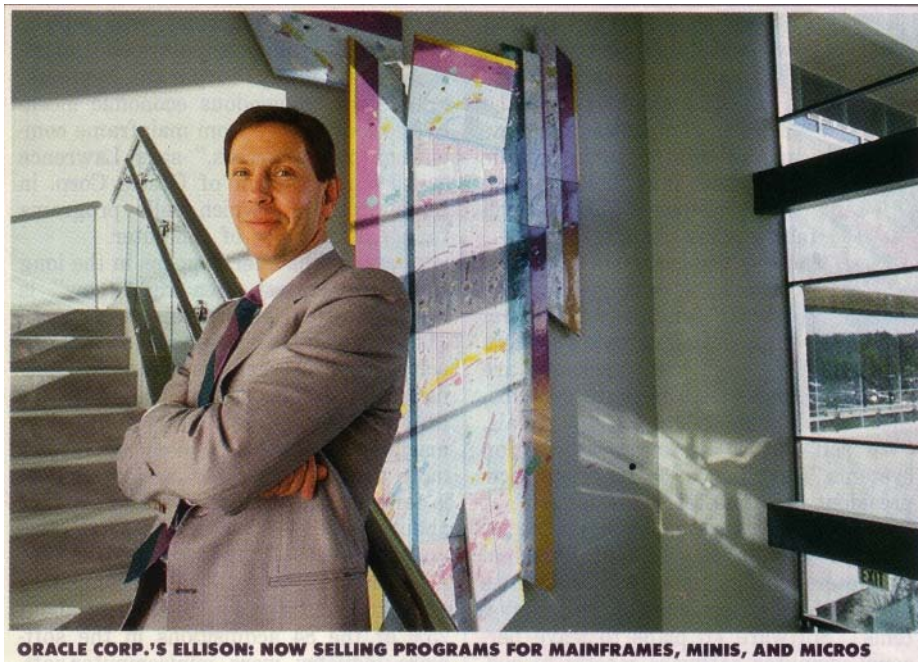
For customers, the new competition in software may be a windfall. The more bruising the battle, the more likely it is that prices will decline—or that software buyers will get more for their money. For software makers, the news isn't as good. The bottom line, says Microsoft Corp. Chairman William H. Gates III, is that profit margins will suffer.

Mainframe software companies almost certainly will drop their average prices as they start selling less-specialized software for smaller computers. A typical Cullinet mainframe program, for example, now costs about \$300,000. Personal-computer software companies may be able to keep prices up for their pro-grams, which typically sell for less than \$600, but costs will rise. Lotus and Ashton-Tate Co. are already expanding their sales forces to reach more corporate customers, and Microsoft will follow suit. PC software companies also will have to spend a much greater share of revenues on research and development, since they'll be designing more complex pro-grams than ever before.

TRANSITION TROUBLES. The restructuring of the software industry holds implications for hardware makers, too. Many analysts argue that as worldwide competition heats up, computer companies will have to venture further and further from hardware. They'll have to expand current services, such as setting up computer networks, to include tailoring whole systems to a customer's business. "It used to be there were product companies and service companies," says Ruthann Quindlen, an analyst with Alex. Brown & Sons. "Soon, they'll all be combined." To offset pressures on profits, computer makers will also have to sell far more high-margin software than they are selling now—and they'll be trying this just as competition in software heats up. The troubles that the software companies are having in restructuring their businesses may yield clues to what hardware makers will face as they change theirs.

There is disagreement over how extreme the changes in the software business will be.

Some mainframe software makers argue that since their packages are for big, complicated corporate systems, they aren't vulnerable to new rivals. "We sell \$40,000 strategic information systems," says Bruce R. Mancinelli, vice-president of market



development at mainframe software maker Software AG Systems Inc. in Reston, Va. Personal computers, he argues, will never be more "than extensions of these systems." Software AG plans to leave personal-computer software mostly to current leaders such as Lotus, Microsoft, and Ashton-Tate.

But a lot of executives aren't sure that's the right strategy. Based on new 32-bit microprocessors from Intel or Motorola, Compaq Computer's Deskpro 386, Apple Computer's Macintosh SE, and IBM's new Model 80 personal computers can process information at twice the rate of the 16-bit personal computers most customers now use. Networks of these \$6,000-to-\$10,000 machines will replace higher-priced minicomputers or mainframes in many corporate systems. "There's a tremendous economic incentive to move away from mainframe computing toward micros," says Lawrence J. Ellison, president of Oracle Corp. in Belmont, Calif., which sells programs for all three types of computer.

HOT MINIS. Whatever happens in the long run, "the hottest area right now" is minicomputer software, says E. L. Pierce, executive vice-president at Software AG. Last year his company modified its two best-selling programs for IBM mainframes to run on DEC's Vax machines, and it will convert several more this year. Pierce adds that his goal is for minicomputer software to produce about 15% of Software AG's total revenues by yearend, and as much as 50% eventually, vs. 5% now. Other companies want to do the same. Last year about 25% of the 84 acquisitions in the software industry were minicomputer-software companies, according to Broadview Associates, a research firm in Fort Lee, N. J. That's up from 20% in 1984.

The mainframe software company that moved earliest into minicomputer products may have been Cincom Systems Inc., a privately held Cincinnati-based publisher. When it entered the market in 1975, "people laughed at us," recalls President Dennis Yablonsky. Now, about 15% of the company's expected \$120 million in sales for the year ending Sept. 30 will be from these programs. Yablonsky expects that figure to increase to 20% in fiscal 1988—even as his overall sales jump by 20%.

Initially, the most intense competition in minicomputer software is in applications programs. This is the software that enables a computer to do something useful, such as word processing or tax planning. Market researcher Dataquest Inc. puts the U. S. market for applications at \$21.1 billion a year for minicomputers and personal computers combined, and it estimates that demand is growing at a compounded 13.2% annual rate. To take advantage of this, Cincom has pushed into such minicomputer applications as manufacturing packages used to track inventories and schedule production.

SELLING POINT. But analysts say the biggest free-for-all will develop around data-base management programs. Separate from both applications software and the operating software that controls the basic functions of a computer, these programs store, list, and retrieve countless types of information—everything from personnel records to sales figures to

THE TOP 10 INDEPENDENT SOFTWARE COMPANIES

Company	Primary computer market	1986 revenues Millions of dollars
LOTUS	Personal computers	\$283
COMPUTER ASSOCIATES	Mainframes/minis	265
MICROSOFT	Personal computers	260
ASHTON-TATE	Personal computers	211
MANAGEMENT SCIENCE AMERICA	Mainframes	193
CULLINET SOFTWARE	Mainframes/minis	163
POLICY MANAGEMENT SYSTEMS	Mainframes	150
UCCEL	Mainframes	142
APPLIED DATA RESEARCH	Mainframes	132
SOFTWARE AG	Mainframes	130

DATA: DATAQUEST INC., BW

bank accounts. Because information they handle is crucial to practically every department in a company, "data bases are the key to the office," says Dataquest analyst Kathleen M. Lane.

Now concentrated in the minicomputer market, the next battle in data-base software will be for more powerful personal computers, especially as the new generation of 32-bit machines becomes more popular. And once these computers spread throughout large companies, the focus of competition will change again, to software called distributed data-base programs (page 151). These will not only send information from a host computer to machines hooked to it, they will enable all the machines on the system to trade information back and forth. It won't even be necessary to know where the information is stored—the program will retrieve it. At the touch of a button, for instance, the manager of a ware-house in Dallas will get regional sales data from personal computers in his office, plus data from a computer at a Cleveland warehouse, plus corporate financial information from his company's headquarters in New York.

Major producers of data-base software for big computers—including Oracle and Relational Technology Inc.—already sell distributed data-base programs for personal computers. And they have just announced programs to run on 32-bit microcomputers. The big selling point for these programs is that they also will work on many other computers: Oracle boasts that its program, ORACLE, runs on 40 different machines, from IBM main-frames to DEC Vax minicomputers. This has struck a responsive chord with customers: Oracle's revenues and profits both more than doubled for the fiscal nine months ended Feb. 28, and its stock has risen 20% to 24 since a 2-for-1 split in late March. RTI, started in 1980 by three professors at the University of California at Berkeley, already is providing a distributed version of its INGRES data-base software that American Telephone & Telegraph, Apollo Systems, and Sun Microsystems, among others, sell with their hardware.

'A TOY.' The company on the hot seat will be Ashton-Tate, the current leader in personal-computer data-base programs. The Torrance (Calif.) company has updated its dBase program four times since introducing it in 1981. But turning dBase into a distributed data-base program, or even a data-base program that can handle more sophisticated computer systems, will require incorporating into it something called Structured Query Language, a complex set of commands used by IBM data-base systems. "The mini guys have serious software," says Richard G. Sherlund, an analyst with Goldman, Sachs & Co. "They look on dBase as a toy." It may also be hard to persuade data-processing managers to buy a program their entire computer system will depend on from a maker of personal-computer software. "People will never buy a pacemaker from Mattel," says Kenneth I. Cohen, director of product marketing at Oracle.

The extent to which Ashton-Tate is worried showed up recently in its reaction to WordTech Systems, a cloner of dBase. Other software makers, notably Lotus, recently have sued cloners of their products. But in February, Ashton-Tate agreed not to sue WordTech over its clone, called dbXL. The reason: Ashton-Tate wanted to hire WordTech scientist Harry K. T. Wong, an expert in Structured Query Language and other data-base technology. Wong was named senior scientist at Ashton-Tate.

The data-base race won't be confined to these companies. Computer Corp. of America in Cambridge, Mass., expects to have distributed mainframe and minicomputer products by next year. And there is talk that Microsoft may ally itself with, or even buy, a

minicomputer software company. "The best strategy is to team up with one that has the right expertise," says Jeffrey Raikes, Microsoft's director of applications marketing.

One target frequently mentioned by industry observers is Sybase Inc. in Berkeley, which already has a distributed data-base program. "Microsoft would have to pay a lot, but I know they're having discussions," says one industry analyst. And Bill Gates's company does have \$140 million in cash—and no debt. Both companies deny plans for a merger. But if Microsoft acquires Sybase, it will up the ante to Lotus, its archrival. By early 1988, Lotus expects to come out with a distributed data-base product for IBM's new generation of personal computers. "We're going to be on the cutting edge of the cutting edge," says Lotus Chairman Jim P. Manzi.

LOTS OF SUCCESS. Meanwhile, no independent software company is immune to competition from IBM. The No. 1 computer maker has proved more adept at buying applications software from third parties than in producing such programs itself. But it's had a great deal of success with its own data-base programs, which bring in about \$1.4 billion in revenues a year. And data bases are becoming more important as one way to tie together IBM machines. "They're an integral part of our overall strategy, period," says J. R. Henderson, who directs IBM'S data-base marketing operation. Last year, IBM invested about \$1 billion in software production. Already, Cullinet software has been hit hard by IBM's 1986 enhancement of its DB2 program, a mainframe data base. Moreover, the new personal computers that IBM announced on Apr. 2 are designed for a new operating system that will include a data base. After that bombshell, Ashton-Tate called off a 2 million-share public offering. Its stock dropped 8% to 21 on Apr. 27, after Lotus announced its deal with IBM.

It isn't just in data bases that IBM poses a threat. Increasingly, software companies are trying to sell more pro-grams by selling more consulting services along with them. Last year, Ross-data Corp. in Palo Alto (Calif.), a maker of financial software for minicomputers, started a professional services division to help customers use their software. That group now accounts for 16% of Rosssdata's \$17 million in annual sales. "It's really a cutthroat market out there in packaged software," says Rosssdata President Kenneth Ross. "Professional services gives us an edge."

That was true in the case of Arvin/ Calspan, a government and industrial contractor in Buffalo that tests the safety and reliability of products. Stanley F. Siembada, manager of information systems, recently bought a \$100,000 line of accounting products from Rosssdata partly because the company also sent in a consultant to help adapt the package to stringent government reporting requirements. Says Siembada: "It's a lot more reliable than anything else we've had. We're not just buying a product. We're buying how to use it."

LINKING ALL THE COMPANY DATA. WE'RE NOT THERE YET



CONSULTANT CODD TRIES TO KEEP VENDORS HONEST: "THE CLAIMS ARE A BIT FAR OUT"

It's about to become the hottest part of the software market. "The battleground for the latter part of the '80s will be around the technology of distributed data bases," says Gary J. Morganthaler, chief executive of Relational Technology Inc. But it'll take software companies several more years to fully develop the advanced programs that will let you snatch bits of information from any computer anywhere in your company using your personal computer. And then customers will still have to figure out how to put the software to work without creating chaos in their companies.

An array of personal-computer, mini, and mainframe software companies are starting to come up with these state-of-the-art programs. But the problems they face are gigantic. Information is not arranged the same way on mainframes, minis, and micros, so the new software has to be able to search among disparate systems. For personal-computer operators who are not sophisticated programmers, the idea is to create the

illusion that all the information needed is stored right on the micro, as easy to call up as a file from a hard disk.

The software also has to work simultaneously for many people, all of whom want not only to look at information but also to change it. If that doesn't sound complicated, think of it this way: What happens when two salesmen call up overlapping parts lists to see how many units are in stock, then simultaneously place orders that would each reduce the size of the inventory by 75%? The program must make sure not to give out more parts than are available and to update all inventory information immediately, systemwide, to avoid further problems.

HEADY PROMISES. With headaches like that, customer acceptance of the new distributed systems may take longer to create than the software itself. Corporate buyers will have to work out who should be given access to information, how people can be kept from calling up information they are not supposed to see, and how much the technology might decentralize decision-making. That will require a big change in the way they manage their information—and their entire business. Distributed processing "will take probably another five years in technology, says Aaron C. Goldberg, an analyst with International Data Corp. "It'll take another 20 years in human beings."

Such weighty problems have not stopped eager software makers from making heady promises for often rudimentary products. Notes Edgar F. Codd, a distributed

data-base consultant: "The claims are a bit far out. You're lucky to find a vendor who has gone as far as 50% of the way." Codd, a former International Business Machines Corp. researcher who did pioneering work in a new type of data-base management program in the early 1970s, is now developing a list of 12 rules to define the ideal capabilities of a distributed data-base management system, such as simultaneously updating several files. The list would enable the market to assess the offerings of different manufacturers using the same criteria. That, he hopes, will be the manufacturers honest.

In the end, the companies that produce the desired mix will find some lucrative business. Codd believes that among other, RTI, Oracle, and Sybase, as well as Tandem Computers and IBM, will have the technical problems licked in a couple of years. So before long, distributed processing will be more than just another industry buzzword.

By Richard Brandt in San Francisco

SERVICE

SELLS. IBM has gotten the message and is putting a lot more emphasis on selling software and services. "Most customers don't really care what kind of hardware they buy," says John E. Steuri, assistant group executive of mm Information Systems. "A lot of hardware



ARVIN/CALSPAN'S SIEMBIEDA NEEDED GOOD SERVICE: "WE'RE NOT JUST BUYING A PRODUCT"

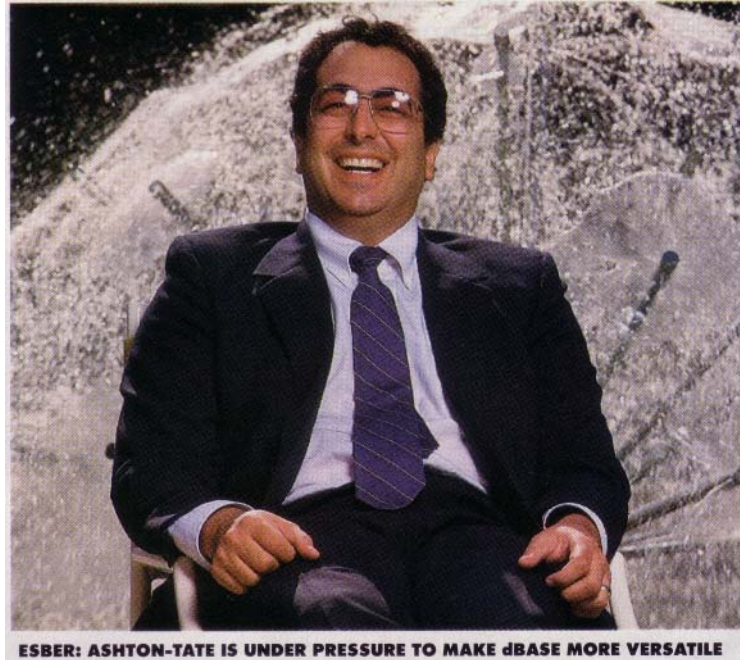
won't get sold without solid solutions behind it." Without giving figures, Steuri says that his group is one of the fastest-growing in IBM. The company hopes to increase its sales of software and computer services to 30% of total revenues, from 20% today, by 1990.

Even if independent software companies can dodge IBM, increased competition will create another tough task for them: developing and managing new types of marketing organizations. "The advantage will go to the companies with the best direct-sales forces," says Dataquest's Lane. This poses a particular problem for personal-computer software companies, which until now have relied almost entirely on retail stores and mail order outlets to make sales.

Completely replacing retailers with direct-sales forces would risk cutting off a primary source of distribution. But personal computer makers are hiring big staffs to promote their software—and to refer corporate buyers to retailers. Lotus has hired roughly 150 such employees. Ashton-Tate is increasing its sales force by 35% next year,

to an estimated 500. Microsoft hasn't started yet, but Gates concedes that he will have to follow his competitors.

It's these labor-intensive sales groups that will raise costs sharply for the normally lean personal-computer software companies. And these costs aren't likely to be offset by income from consulting on PC programs any time soon. Starting last July, Ashton-Tate tried charging customers a lump sum to answer questions over the phone. Customer reaction has been "mixed," concedes Chairman Edward M. Esber.



ESBER: ASHTON-TATE IS UNDER PRESSURE TO MAKE dBASE MORE VERSATILE

"Personal-computer software customers are conditioned to expect lifetime free support," says Ronald Posner, president of Ansa Software, an Ashton-Tate competitor.

Mainframe and minicomputer software companies have other marketing problems. Many are used to selling to corporate data-processing managers but don't know much about reaching the people who actually use their products—from a corporate accountant to a manufacturing supervisor in a factory. As these types of employees increasingly depend on computers, they exert more influence on which software is bought. "They're the driving force behind software sales," says John P. Imlay Jr., chief executive officer of Management Science America Inc., an Atlanta main-frame software company.

PARTICULAR EXPERTISE. The solution for MSA has been to structure marketing operations along specific industry lines, such as education, health care, and manufacturing. That way, sales staff can become experts in their customers' businesses. The approach worked at Transamerica Insurance Co. in Los Angeles, where a committee of payroll, human-resource, and data-processing managers has asked the board of directors to approve an expenditure of \$700,000 for an MSA payroll program, plus services. "In our organization, the people who use the products have the ultimate say in what to recommend," says Thomas J. Miller, Transamerica's director of human resources. The software company salespeople "have to learn the idiosyncrasies of our business. They can't be techies."

Another key to competing successfully—developing new products—is also starting to cost more. For example, all software companies have to invest more resources in artificial intelligence techniques, which can make software easier to use. "This stuff is harder and harder to produce," says Fred Gibbons, chairman of Software Publishing Corp., a personal computer software company. The number of "man-years" his company needs to develop a product has increased 50% over the past two years. At MSA, Imlay

plans to increase R&D spending by 28% this year, to \$64 million. Ashton-Tate's R&D budget has nearly quadrupled in the past two years, to \$19 million.

The need to spend more may spell especially bad news for minicomputer and mainframe software companies, which may have a harder time holding up prices than personal computer makers. "Mainframe folks have been ripping off people for years with accounting programs costing hundreds of thousands of dollars," asserts Matthew J. Fitzsimmons, owner of a White Plains (N. Y.) ComputerLand store. "If the new lower-end software is as good, these [minicomputer and mainframe] companies are going to feel price pressure."

IBM'S 'BLESSING.' There are several ways around the problem of research and development costs. Because Oracle's software can run on different hardware lines, for instance, it has an opportunity to spread its development costs across a larger number of sales than most companies can. IBM may actually help many other companies gain this advantage when it produces its new set of guidelines called Systems Application Architecture, that software makers will follow in writing applications programs for IBM machines (box). "We see SAA as a blessing," declares Software AG's Mancinelli.

Private companies that don't face constant shareholder pressure for big earnings gains may still spend a lot on R&D. Cincom Systems pumps an unusually high 22% of revenues into R&D, says President Yablonsky. Another way to fund higher R&D is to find a rich parent. Since Applied Data Research Inc. in Princeton (N. J.) was bought last year by Ameritech for \$215 million, the main-frame software maker has raised R&D spending from 16% to 20% of revenues, according to Martin A. Goetz, senior vice-president.

In the end, size is likely to be the key to survival and growth in the more competitive software industry. Five years from now, analysts say, there will likely be fewer, but bigger, companies leading the industry. Chances are that the winners will be those with enough resources to sell a full line of products, support substantial direct-sales forces, and design complex, custom-made systems. "The losers will be single-product companies," says MSA's Imlay. The shakeout to see who will end up in each group has just begun.

By Anne R. Field in New York, with Richard Brandt in San Francisco, Julie Flynn in Los Angeles, Alex Beam in Boston, and bureau reports

IBM'S SOFTWARE 'ROAD MAP': A MAGIC CARPET TO THE FUTURE?

International Business Machines Corp. may be famous for its contributions to charities, schools, and the arts, but in business it's a surprise when IBM hands over a big, fat gift. Yet it may be doing exactly that for independent software companies. A planned design for moving software from one type of IBM computer to another without having to rewrite it completely could vastly expand markets for software makers while reducing development costs. It also could erase barriers between mainframe, mini, and personal-computer software markets: A company that now writes packages for IBM minis will be able to sell the same basic program to IBM mainframe, and PC owners, too. "The software industry is getting a free boost from IBM, says Gartner Group Inc. market researcher Peter A. Levine.

Altruism, of course, has little to do with it. IBM's plan, called Systems Application Architecture (SAA), has mostly to do with Big Blue's current marketing war with Digital Equipment Corp. Several years ago, DEC concentrated on a single hardware design and one set of basic software for all its computers. Not only did that make it easier for DEC machines to communicate with one another, it also made it fairly simple to shift work from one level of computer to another. IBM, on the other hand, has several designs for mainframes, minicomputers, and PCs. Each design does a particular job best, the company argues, but the systems don't work together smoothly. And when customers need to move to a different level of computer, they usually must buy new software and rewrite old programs. The new plan, says SAA manager John T. Friedline, "will mask the differences between the unique architectures."

NO TIMETABLES. That won't happen anytime soon, though. For now, SAA is only a road map: IBM is telling its customers and competitors where it's headed and how it'll get there, but it's not setting any timetables. "The good news is that the three levels of IBM computers will start to look like one architecture," says Frank Gens, an International Data Corp. analyst. "The bad news is that it'll take three to five years."

Nonetheless, SAA is already having an effect. IBM has outlined a set of standards for the creation of SAA products. A software package, such as a spreadsheet or accounting program, should be SAA-compatible if it fulfills three conditions: It must be written in one of three programming languages (Cobol, Fortran, or C), must interact with a computer operator in a specified way, and must communicate with other machines in a prescribed way. Eventually, mm says, it will be possible to move an SAA-compatible package from one machine to another without major rewriting. IBM is already committed to delivering its own SAA-compatible software and is making sure its programmers stick to the rules.

IBM expects independent software companies to line up behind SAA, too. "It's a good business opportunity be-cause now an independent software vendor can greatly leverage his business," says mm's Friedline. Will they bite? Yes, say most analysts.

"Any-body who writes outside of the SAA languages has got to be crazy," concludes Arthur D. Little Inc. consultant Rudolf L. Strobl.

The race to produce SAA software will evolve into a contest between microcomputer and mainframe software companies, each trying to invade the other's turf, predicts IDC's Gens. For his money, the microcomputer camp will be the winner. "Over the past few years, there's been a huge flow of software talent into personal computers," says Gens. "Now that talent will be going after minicomputers and mainframes, too." And when that happens, IBM's gift to the software industry should start paying dividends—in increased sales for IBM hardware.

By Geoff Lewis in New York

SPECIAL REPORT

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