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By Bruce G. Posner

TOYING WITH COMPUTERS

The inventors of the toy *Merlin* now are attempting to market a business terminal that even a grown-up can master

At the uppermost reaches of corporate America on a day late in April, an unusual gift is arriving by Federal Express messenger. One thousand chief executive officers of the nation's largest companies—among them Lee Iacocca, chairman of Chrysler, Walter Wriston, chairman of Citicorp, and Frank Borman, chairman of Eastern Airlines—are each receiving a small silver and blue computer terminal with a full keyboard and one-line display, no bigger

The terminal (above, actual size) is the brainchild of Bob and Holly Doyle.

than a paperback book. Unlike larger terminals, though, its native tongue is not computerese but ordinary, written English, punctuated with friendly audible beeps and boops. Switch it on and, with no special prompting, each industry titan is greeted by his own first name. The display line reads, "HI LEE."

IXO Inc., as the start-up company is called, is beginning a most unconventional product launch, further distinguished by three consecutive full pages of advertising appearing across the United States in *The Wall Street Journal* on that same day. The marketing tab for the day's blitz

will come to about \$375,000. Surprisingly, however, this little terminal—the IXO Telecomputing System—is not another technological tour de force from California's Silicon Valley or Boston's Route 128. Its genealogy is entirely different. Its older brother was a toy, its birthplace a three-decker house in an unassuming neighborhood in Cambridge, Mass., and its parents, a husband-and-wife team of astrophysicists.

An ordinary, full-size computer terminal in his third-floor Cambridge study reminds Bob Doyle of what drove him



Instead of teaching middle-aged Americans computerese in order to do such varied computer tasks as letting a salesman enter product orders from the field or letting a consumer pay bills from home, the Doyles plan to teach computers colloquial English. "We want our terminals to be usable by the totally untrained person," Holly says. "We don't think any training should be required." Her husband nods his head in agreement. But he adds, "If we're a success, we'll have displaced human beings as computer operators. The drudge work will be done by computers."

As ambitious as the goal may sound, thinking up creative solutions to problems has long been a way of life for the Doyles. "When Bob was a kid," Holly notes, "he always invented stuff." As an undergraduate at Brown University in the mid-1950s, for example, Bob wrote to CBS newsman Walter Cronkite suggesting a new device that could turn on

Johnson Space Center, supervising a staff of astronomers designing experiments for the National Aeronautics and Space Administration's Skylab space crews. By 1974, though, Skylab was grounded.

Deciding to stay in Boston, Holly continued her research at the observatory while Bob began to test commercial applications for some of his ideas. Around this time "Bob started to become interested in how people make money," Hol-



and his wife, Holly, to develop a tiny terminal for use even by technological illiterates. He is trying to use the conventional terminal to communicate with a remote airline-scheduling directory offered by The Source, a database subscription service. He flips through an instruction manual and types on a keyboard to enter four or five long series of numbers before the service is hooked up through the telephone line. At least two minutes have elapsed since he began. "I personally see this as a jungle," he says. "With our terminal, we've automated everything. We dial the number for you, too. And we don't have a manual."

The screen lists flights from Boston to Denver, but Bob Doyle, normally a very patient man, is getting fed up. He has typed his preferred flight time as 9 a.m. but the computer doesn't understand. It calls his entry an "illegal command." It wants the correct format: 0900. "Can you believe this?" he asks. "These programs are written by engineers. Nobody else can use them." Shaking his head in disbelief, he says, "That's what we'll be trying to overcome. The computer should be willing to guess, or at least ask you questions and give you a chance to say yes or no."

Building toylike terminals and teaching computers the language of human beings may not be the most likely work for two PhD astrophysicists. But since the mid-1970s, Bob and Holly Doyle, both 46, have spent very little time looking beyond the planet Earth. Instead, they have collaborated to put the much-touted powers of modern technology into the hands of ordinary, even frightened, grown-ups and their children.



With its amiable electronic sounds, Merlin became a toy industry winner. Derek Doyle (left) and his friends helped evaluate his parents' workshop products.

the radio automatically for important news developments. Only recently has such a product been introduced—by Dow Jones & Co. for alerting investors about stocks.

The Doyles' more studied approach in the early '70s to creative problem-solving, however, was motivated by the most practical of considerations: earning a living and supporting their two young boys. After completing their doctorates at Harvard University, where they met, they had temporary posts as research fellows there. But the chances of finding two suitable jobs for astrophysicists in the same city were next to nil. While Holly worked as a specialist in solar magnetic fields at Harvard's observatory, Bob spent part of the time away from his wife and family at Houston's Lyndon B.

ly recalls. His first venture involved a method he developed for synchronizing a tape-recorded sound track with super 8 home movies. Placing a small ad in a trade magazine, he began taking orders for \$250,000 worth of Japanese tape recorders he modified in his workshop.

Super 8 sound movies were overtaken by home video developments. But other ideas were germinating. Waving his arm at the walls of books and trade magazines lining his study, Bob says, "Whenever we read, we try to find good ideas to work on. We try to figure out if there's anything out there in the future we can help bring about."

In the early 1970s, Bob began to envision new consumer products based on the tiny semiconductor chips already widely used in calculators. Although



Conventional computer terminals, like the one Bob Doyle uses in his study, aren't portable and require a training manual. Bob and Holly's answer: the telecomputer.



microchips were costly at more than \$20 each in 1974, Bob, Holly, and Holly's brother, Wendt Thomis, were developing a number of games for children and adults using these computer "brains" in the role of opponent.

They programmed the circuitry for the game prototypes on readily available single-board computers and carried them in briefcases to any interested toy company. They knew that the contents of each briefcase could be easily shrunk

to a chip the size of a fingernail whenever the economics were right. Within a year, Bob recalls, "the cost curves were bombing down, and we knew it was just a matter of time before a single chip would sell for under \$5."

The Doyles began peddling their toy prototypes and their bullish predictions of a big new market in electronic toys. The first toy company to bite was Parker Bros. In 1977, a game called *Code Name: Sector*, licensed from the Doyles, became one of the earliest semiconductor-based toys on the market. As Bob had anticipated, microchip costs had indeed fallen. Parker Bros., he says, "got them for about \$3.50."

Code Name: Sector was a promising beginning, but it was only one of the ideas the Doyles had showed Parker Bros. In 1978 the game manufacturer, best known for such board games as *Monopoly*, introduced a second product, which looked like a space-age telephone receiver with 11 lighted buttons. As with the Doyles' previous game, it contained a microchip that gave it a brain. It could challenge the player at such familiar pastimes as tic-tac-toe, blackjack, or echo, a memory game. It could also learn musical tunes, which it could remember and play back. A press of its buttons evoked a beep or a boop. "There was nothing new in the games," Holly

candidly admits. "We just added an array of lights and sounds." The Doyles designed the early versions with constant feedback from their sons, Derek and Robert, and neighborhood youngsters. Some games were challenging even for an adult. But within its red plastic case, the Doyles had built a friendly demeanor. "Even two-year-olds could enjoy it for the sounds," says Holly. Parker Bros. called it *Merlin*.

Although it cost more than \$20—at least twice the price of the company's other products—*Merlin* was an instant hit. But unlike many big toy industry winners that peak fast then fizzle, *Merlin's* magic lingered. In 1980, it had sold about 1.6 million units and generated more in dollar revenues (estimated at \$40 million at retail) than any other single toy or game. Packaged in 12 languages, *Merlin* not only surpassed *Simon*, its arch-rival from Milton Bradley Co., but more than doubled the dollar sales of *Monopoly*. Lifetime sales are approaching the \$150 million mark, and the Doyles and Thomis have earned more than \$5 million from it so far.

But the Doyles didn't stop with *Merlin*. In the next two years they sold four other games to Parker Bros., including *Wildfire* and *Stop Thief*. While none was as successful as *Merlin*, in a market that was becoming deluged with other

electronic products, there were no flops, either. "The Doyles really saw this market coming," says William Dohrmann, vice-president of new product research at Parker Bros. "They introduced us to the microchip at a very critical time."

By Christmas 1981, the market was glutted with electronic toys, but the Doyles, who had seen the proliferation of electronic toys as the inevitable prelude to a dramatic shakeout in the industry, had moved on to their next project. They fled the toy industry so quickly, in fact, that they left a bunch of game prototypes—some of their best, they say—in a third-floor closet. In a world that was becoming increasingly computer-oriented, they were racing to build a small terminal that could talk to all those computers and was as easy to use as, well, a toy.

As the Doyles began designing the terminal in early 1979 some of their earliest insights came from, of all places, *Merlin*. The same musical tones that had been fundamental to *Merlin's* personality became their low-cost solution to making the component known as the modem, which any terminal requires for linking a telephone with a computer. The use of a microchip to create the tones accomplished internally what other terminal manufacturers were achieving only with another piece of peripheral hardware offered at \$200 or more. The telecomputer would thus be more portable than other terminals.

Another priority was to develop a keyboard that would be unintimidating enough for a computer neophyte to use, while permitting talk with computers using standard English dialogue. A book about the problems of man-computer communications, written by James Martin, a former IBM executive, led the Doyles to include four buttons on their keyboard labeled "yes," "no," "don't know," and "help." "We have a very low-brow approach, and we wanted to make things very simple," Bob comments. "We always like to think we're inventors and sometimes we invent. But mostly we studied Martin."

In September 1980, Bob Doyle set up a meeting in New York with a man he knew only by reputation. Ben Rosen had become one of Wall Street's gurus in electronics at Morgan Stanley & Co., an investment firm. Now he had his own research firm. Entering Rosen's office, Bob Doyle was uncharacteristically nonchalant about his new product, the prototype for what became the gift to the 1,000 CEOs a year and a half later. "He just put it on my desk," Rosen recalls.

Rosen asked what he was supposed to do with it. "If I have to tell you how to use this thing," Doyle replied, "then we're in real trouble." After fiddling with the paperback-size microterminal



Jeff Rochlis made Mattel a leader in electronic games and went on to IXO.

for a moment, Rosen identified a telephone connection on the back and hooked it up using the phone connection on his desk. Says Rosen: "All of a sudden I was using it." With the small, typewriterlike keyboard, Rosen responded easily to the questions flashing across the display-line screen, in English.

When it informed him that the terminal could connect him to remote data bases, using phone numbers stored in its memory, Rosen—without any coaching from Bob Doyle—connected first with the Dow Jones News Retrieval Service in Princeton, N.J., and then to a simulated airline reservation service the Doyles had developed on a computer in their Cambridge basement.

The single-line display was confining, but Rosen could control how fast the words crossed the screen. The textual material paused at punctuation marks, which were underscored by beeps and hoops, a lot like *Merlin's*. Rosen was especially taken with the "yes," "no," "don't know," and "help" buttons, which he saw as a sort of olive branch to noncomputer people. "It had never been done before," comments Rosen.

But the mass-market potential for the microterminal wasn't clear to him until Doyle told him of cost projections for a retail price of no more than \$500 initially, with big discounts for volume purchases and declining prices down the road. At those prices, Rosen thought, the Doyles' microterminal had real potential. "What they were bringing to the party was something cheap and friendly," says Rosen, whose opinions tend to carry a lot of weight with investors. "I offered to help in any way I could."

At that point, the Doyles were in great need of help. They had set out the

previous January to license the production of their microcomputer to a large company, as they had with *Merlin* and the other toys. But the responses from Digital Equipment, IBM, ITT, GE, and GTE didn't lead to any concrete agreement.

The Doyles told anyone who would listen in those months that the microterminal's initial appeal would be for the nation's big corporations, which have vast amounts of internal data stored in large computers. This would be a portable, easy to use, and inexpensive record player for existing records. It would enable large numbers of employees to enter and retrieve information from company computers independent of specially trained and high-paid computer operators. A large national retail chain, for example, might provide its hundreds of store managers with microterminals to facilitate rapid reporting of overnight cash positions, price adjustments, and inventory records.

The Doyles were confident that there would be multiple applications for consumers, too. Just as calculators moved from the office to the home when people wanted to balance their checkbooks, the Doyles were sure that the microterminal would, too. And it would be only a matter of time, they thought, before the applications spread to entertainment, with such things as nationwide contests using financial or sports data.

During more than six months of dog-and-pony shows with their terminal, the Doyles heard a familiar refrain: "This isn't our business." Bob kept saying, "This isn't anybody's business, but it could be *your* business." The argument had little impact, though. "Within a lot of big companies," he comments, "new ideas are like viruses. They have their own immune system."

To become more persuasive, the Doyles recruited Jeff Rochlis, one of toyland's most successful marketers. As president of Mattel Inc.'s electronics division Rochlis had led it to the No. 1 spot in electronic handheld games and then into Intellivision. Rochlis, however, was having no better luck licensing the terminal he had labeled the "telecomputer." And he didn't foresee any major breakthrough. Nobody could succeed in marketing it, he believed, without first understanding its mass-market possibilities and what distinguished it from the array of other fancy new terminals and personal computers.

Almost everyone focused on what the Doyles and Rochlis actually saw as secondary. The appeal, Rochlis notes, "was in the human engineering features that made it easy to use." With that realization, they set out on an altogether different course. They decided to establish their own company.

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On May 6, 1982, at the Culver City, Calif., headquarters of IXO Inc., Jeff Rochlis made a major presentation to investors. Bob and Holly flew in from Cambridge. The company's venture-capital investors, now including Ben Rosen, had put in almost \$10 million and were getting a detailed look at IXO's progress.

Rochlis had a lot to tell them. IXO had assembled an impressive management team from such places as Dow Jones and had signed up Michael Suchoff, who had built the telecomputer prototype for the Doyles. There were several senior people from Mattel, including Jeff Bachman, who had been the \$1.13 billion toy company's top finance man, and Alan Secor, who had headed operations in the electronics division. By May the telecomputer was in production at a rate of 3,500 a month with a subcontractor in Costa Mesa, about 40 miles south. There are plans to shift manufacturing to Hong Kong and Taiwan this fall.

While it might be months or longer before Rochlis could meaningfully appraise the marketing blitz unleashed the previous week, venture capitalists were encouraged by the early accomplishments. Unlike other start-up company presidents, Rochlis issued monthly reports to investors. And he had brought the company into production five months ahead of schedule and nearly \$1 million under budget.

Pleased as the investors were with Rochlis's ability to get things done, they were really putting their money on the creative abilities of Bob and Holly. The Doyles could give IXO the edge it would need to become more than a maker of little terminals. Their concept of a company-run access center offering terminal users service applications and entertainment, for example, could lead IXO into a new industry tied to personalized software. Not coincidentally, that business would be far more insulated from ruthless price wars than is usual for makers of electronic hardware.

"We feel we've invested in a stream of ideas," says Karen Camp, a vice-president at Palmer Organization, a venture capital firm in Boston.

Also appealing to the investors was the Doyles' unusual—and perhaps inimitable—point of view. "As the Doyles thought about microcomputers in toys, they thought about how children play," says Howard Anderson, president of Yankee Group, a Boston electronics research firm. "To be accepted, those toys had to be touchy-feely and warmy-fuzzy with lots of audio feedback." Anderson bought a piece of IXO in the belief that "the Doyles understand software better than anyone else in the country."

With IXO off and running, the Doyles know competition will intensify. A company called Axlon Corp., of Sun-

nyvale, Calif., has entered the market already with a low-cost terminal designed to communicate in specialized computer dialogues. To think IXO can find any meaningful protection under patents on the design of the modem or the display, Bob Doyle notes, would also be naive. "We intend to be a moving target," he says. "By the time they've got the first thing copied, we'll be on to something better."

The Doyles want competitors to develop products like the telecomputer that can use the fee-based services of IXO, available—of course—in easy English.

IXO already has launched an aggressive cost-cutting program, and it is designing new telecomputer models to speed into production at the right time. IXO's roots in the fast-turnaround toy industry, says Alan Secor, "give us six months on most other companies." But in contrast to most high-tech companies that strive to be state-of-the-art, IXO is committed to waiting for cost-effective technologies before integrating new components into future products. "Our main aim is to be one inch behind technology," Michael Suchoff says. "Anything less would cost too much."

The Doyles aim to do almost all they can to encourage competitors entering the business to build products like the telecomputer. To speed the development of remote applications and services, they hope all terminal makers will adopt the IXO keyboard format, and to encourage this they intend to license features like the "yes," "no," and "help" keys for a token fee—perhaps as little as \$1 per year.

In a few years, in fact, they say IXO may abandon the terminal business altogether to concentrate on the English-language services the company intends to offer over the phone lines through its own access, or service, center in Culver City. "If all we had was a low-cost miniature terminal," says Bob Doyle, "we'd be in for a real dogfight. But, if everyone uses the same keyboard, the market for services will develop a lot faster."

In large companies, lots of potential applications for small terminals such as the telecomputer exist today. As part of its business development effort, IXO plans to help large commercial customers develop custom programs for their computers to facilitate intracompany

transactions, such as sales order entry and access, using standard English. The rationale is simple: Without new software programs to enable the computer to translate English into its own language, telecomputer users would have to learn the same idiosyncratic computer language commands used by computer operators at any other terminal—a direct affront to the Doyles' way of thinking.

The big companies may have their own specialized applications, but within the year IXO plans to start offering its own fee-based services through the access center. All of them will be in English, of course, and will be available to those with IXO telecomputers as well as to users of competitors' terminals. At one end of the spectrum, the access center is likely to offer personalized financial information. One of its services, for example, might give an investor up-to-the-minute performance reports on his or her own investment portfolios, comparing the value to, say, the major stock market averages or other financial yardsticks. Another might be a customized news-clipping service that would collect items on any subject named, perhaps sending everything to a personal electronic mailbox. Still another might tell the least costly way to fly between two points.

But the imprint of Bob and Holy Doyle is likely to be most obvious at the opposite end of the spectrum. While they don't openly discuss the details on specific products—few, in fact, have been worked out—the Doyles are confident that the IXO access center will become a kind of on-line funhouse for the electronic age, involving nationwide participation by television viewers of events ranging from football games to Academy Awards. IXO might also design games based on manipulation of data such as stock quotations. One possibility can only be thought of as an elaborate version of *Monopoly*—with the game lasting perhaps weeks or even months. At the beginning, players, operating out of homes and offices around the country, would be given a fund of play-money with which to "buy" stocks at their actual trading prices. They might match wits with Wall Street's best-known and highest-paid money managers. Whoever amasses the greatest fortune would be the winner, and IXO might give out fancy prizes.

Whatever games and services the Doyles end up offering through the IXO access center, they are certain to have one thing in common: They will all be conducted in everyday, conversational English—a language engineers and even computer operators should, with a bit of practice, be able to master. □

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