

**IBM**

## **Big Blue Is Turning Geeks Into Gold**

Can consultants and scientists mix? CEO Sam Palmisano has discovered the formula works.

FORTUNE

Tuesday, May 27, 2003

By Brent Schlender

Andrew Tomkins, a British computer scientist, is pretty much your typical ivory-tower egghead. He's spent his entire adult life either in academia--he earned advanced degrees from MIT and Carnegie-Mellon--or at IBM's Almaden Research Center, an Elysian think tank that crowns a bucolic hilltop south of San Jose. There Tomkins, 34, has quietly built a reputation as one of the world's leading experts on what he and his peers call text analytics and data heuristics. To grossly oversimplify, that means he teaches computers to read for comprehension and to recognize patterns of meaning that show up in the text of documents.

Three years ago his research grew into a project he called the Web Graph Structure, in which he programmed a supercomputer not merely to search but to continually "read" everything on the World Wide Web--literally billions of pages. Tomkins soon found he could spot trends in public opinion and popular culture as they emerged and watch them migrate around the world like wildfire. He realized that if you asked the Web Graph Structure the right kinds of questions, you could conduct virtual market research almost instantaneously. You could, for example, track the buzz following the release of a new Harry Potter movie the day after it opened by comparing the opinions of movie reviewers, reading news reports on box-office sales, and monitoring online chatrooms and gossip columnists. So impressed was Tomkins's boss, Almaden labs director Robert Morris, that he ponied up more funding and urged the young scientist to hook up with business consultants in IBM's Global Services group to explore turning his research into a service that the company could sell.

That's how, for the first time in his career, Andrew Tomkins, Ph.D., came face to face with the real world. One of his first orders of business was to do some market research of his own. Throughout 2000, Tomkins made visits to some of IBM's most sophisticated customers--the company won't reveal the names of those he called on--to ask how they might be able to use his technology, which he had rechristened Web Fountain. Since then he's worked closely with Bob Carlson, an IBM Global Services consultant who signed on as general manager of the Web Fountain "emerging-business opportunity"--or EBO in Big Blue-speak. Later this year Web Fountain will go live for a handful of pilot customers. The whole experience left an indelible impression on the bookish Tomkins. "For me it was a real eye-opener, coming from the lifestyle of writing academic papers to learning about markets and what business is all about," says the researcher, who now holds the additional title of chief science officer for Web Fountain. "It was like going to a foreign land--there were aha! moments in both directions."

Tomkins, Carlson, and the Web Fountain EBO are living proof of the big, new payoff IBM is getting from throwing open the doors of its vaunted research labs and turning its scientists loose in the marketplace. Another example is IBM Life Sciences, a three-year-old business division run by a former research chemist that will probably generate \$1 billion in new revenue in the next 12 months (more on that later). No longer content to sit in windowless labs and think deep thoughts, hundreds of IBM's brightest researchers are now making regular visits to customers--in some cases to roll up their sleeves to help solve a particular problem and in other instances simply to better understand how enterprises actually use the information technology IBM invents. And some, like Tomkins, are even taking a stab at being entrepreneurs.

It's all part of a new "customer facing" approach to R&D--an intriguing manifestation of Big Blue's big transformation into a business whose primary products are no longer computer hardware and software but IT services. That rather bland term covers everything from making house calls to repair balky mainframes, to designing and operating and outsourcing IT systems for corporate customers, to loaning out computer capacity and software "on demand," to reengineering the work flow and supply chains of entire corporations.

It's big business and increasingly high tech. With services now accounting for nearly 45% of IBM's \$81 billion in annual revenues, the company has had to rethink how the denizens of its ivory towers, many of whom have never even met an IBM customer other than maybe at a kid's soccer game, can remain relevant, much less central, to this new mission. CEO Sam Palmisano is betting that by turning IBM Research itself into a service business of sorts and getting his top thinkers out into the field, not only might they use their world-class smarts to help solve some knotty real-world problems and drum up new business, but they might also get a better sense of how to tailor their blue-sky research efforts to coincide with the future needs of the IT marketplace. Says Palmisano: "IBM Research has reinvented itself many times over the decades as technical challenges and customer problems have changed. A generation ago, most of our researchers grappled with challenges in physics, materials science, and magnetics because so much of our business depended on devices." But today, he notes, "many of the toughest, most fascinating problems are in services."

The labs have gotten religion. Paul Horn, a ponytailed physicist who is director of IBM Research, puts it this way: "The goal of this research organization is to create the future of the IBM company, and if the company isn't growing, well, we're failing. But if we get our shit together in this space, to be honest with you, no one can touch us."

Palmisano needs that "if" to be "when." Sales have been hard to come by for IBM of late, as they have for the entire, recession-racked IT industry. The company's annual revenues have declined for two years running, from \$85.1 billion in 2000 to \$81.2 billion last year, and profits have slid much more, from \$8 billion to \$3.6 billion. IBM's hardware business, a victim of the relentless march of commoditization, was hit hardest, shrinking by 10% a year since the turn of the century, while software sales have remained flat.

IBM is counting on its Global Services business to mushroom to offset those declines. So far the company has redoubled its efforts in business consulting, the domain of McKinsey, Bain, and others, by acquiring PricewaterhouseCoopers Consulting last October for \$3.5 billion. But IBM can't buy growth forever. About the only way for a consulting business to grow internally is by increasing billing hours, that is, adding bodies--very scarce and expensive bodies. It's not a recipe for the kind of growth IT companies are accustomed to.

Palmisano thinks there's a lot more to the service business than hourly consulting fees. IBM's consultants and other service professionals often sell customers not only their expertise but also lots of other technology in the form of hardware, software, and systems and software integration. "A lot of people don't understand that IBM's services business is focused on high-end, high-value business problem solving," he says. "Today's grand challenges are in business design transformation and process integration. They're in advanced supply-chain management, risk analysis, optimization strategies, and text analytics for knowledge discovery. And one of the most important areas of research is in automating the infrastructure. In other words, people should not think of 'services' as only a labor-intensive business."

The trick is for IBM to provide its service professionals and consultants with unique technology and ideas. That's where the researchers come in. It's an intriguing plan, but not everyone is buying it. Wall Street analysts have yet to find a way to value the new combination, and IBM's chief rival--Microsoft--is moving in the opposite direction. Says Bill Gates, chairman and chief software architect: "If you rely on business controls to tie research to products, you run the risk of 'overmanaging' research and cutting off potential discovery," he says. "IBM Research has done great work over the years.... At Microsoft Research, we use a 'university' model rather than a 'corporate' model. We felt that the best way to expand the state of the art was to hire great researchers and give them the freedom to innovate with a minimum of bureaucracy."

Palmisano is confident that the eggheads at IBM Research, with a little guidance from the right people in Global Services and some face time with smart customers, can turn out more than good science-journal articles. And, he says, IBM's scientists are on the same page. "They understand that the business problems we are trying to solve for customers is not elementary stuff--it's hard, hard, hard!" he says. "Technical leaders want to make an impact, which means seeing their work make a difference in the real world. Sure, they thrive on publishing and going to conferences. But they understand that there's no better way to do that than by working with real, live customers."

To get a sense of what a radical change it is for researchers to start thinking as much about customers and services as they do about science, it helps to visit Yorktown Heights, N.Y. Nestled into a hillside outside this small town is the computer giant's flagship sandbox for resident geniuses, the Thomas J. Watson Research Center. Former CEO Louis Gerstner, in his recent memoir, called the work that goes on in the austere, curvilinear building the "soul of IBM."

Inside, more than half of all of IBM's 3,000-plus research scientists tinker in solitude, pushing ever outward the boundaries of physics, materials science, computer design and software theory, nanotechnology, advanced mathematics, and many other rarefied disciplines. Their counterparts at seven other labs around the world include two Nobel Prize winners and a handful of others with a genuine shot at joining their ranks. (IBM can boast employing five to date.) Among the creations that have sprung from IBM Research since its founding in 1956 are the single transistor memory cell (a.k.a. the memory chip); the disk drive; the relational database; those intricately beguiling mathematical designs called fractals; and perhaps its most public success, Deep Blue, the supercomputer that in 1997 outplayed Garry Kasparov, the world champion chess master. One of the company's elite IBM Fellows--55 currently hold that distinction--recently even cobbled together a rudimentary computing circuit out of individual atoms.

Those innovations and inventions have long translated into cutting-edge software and hardware for IBM--and have largely saved the ivory tower from getting cut itself. In the 1990s, IBM nearly imploded after profoundly misjudging the full business ramifications of the PC revolution it had helped to foment. To fix the company, Gerstner administered strong medicine, including firing nearly a quarter of its employees worldwide. Yet IBM Research was virtually untouched--indeed, its ranks of scientists actually swelled by 30% over the past decade, although its budget was pared slightly. And during the period, IBM's researchers continued to rack up more U.S. patents each year than any other company in the world.

As a result, IBM can boast having the world's preeminent corporate research organization. But in an industry that some believe has, thanks to the commoditization of technology, matured into something more akin to the automobile industry, the question is, So what? Arranging atoms to spell the logo of IBM--a stunt its researchers pulled off in 1991--shows amazing scientific chops but does little to win new business for IBM Global Services. So lab directors Horn and Morris have worked hard to get the soul of the corporation acting much more like a heart: beating faster and pushing creations out where they're needed--such as at customer sites. "There are many forms of customer contact, from simply dropping by and giving a talk, to actually working on a customer problem, to starting up a new business," says Morris, the puckish Australian database expert who runs the Almaden lab. "When you don't know what to do next in science, you go out and observe. So it's quite a natural thing for a researcher to want to go out and see the problems that our customers are actually trying to solve."

And one thing IBM is finding: Customers enjoy rubbing shoulders with the company's best and brightest. "In the normal course of business now, we have IBM Fellows and others in our design and brainstorming meetings pretty regularly. We're on a first-name basis," says David Dibble, executive vice president in charge of IT infrastructure at Charles Schwab. "Last week we sat around and talked about advanced mathematical modeling and data heuristics."

It isn't just for kicks. Schwab collects loads of data on customers through its website, over the phone, and at its locations around the country. It offers literally thousands of financial products, and their performance is constantly measured and recorded. But figuring out what it all means, and what product is best for which person, is a monstrously difficult challenge--one that often can be better answered by IBM's mathematicians and data heuristics experts than by, say, a typical IT consultant. "The big question for us is, 'What can we do to turn masses of raw data about customers and financial products and market performance into useful information?' " Dibble says. "These guys get it."

Dibble receives so much personal attention because Schwab is a big customer that pushes the envelope with its IT systems. Schwab is also helping underwrite IBM's research into "autonomic," or self-managing, computer systems, as well as into a new kind of database engine. Its purpose will be to sift through and find correlations in "unstructured data" residing in a plethora of other, specialized databases--digital agglomerations of text, numerical data, photographs, video archives, imaging data, and the like--as if they were all part of a single data pool. Schwab figures that if those projects pay off, they will help it cut the cost of its IT upkeep and create a better online environment for customers and employees. Says Dibble: "We track these advanced-technology projects from cradle to grave. Sometimes they bloom and some-times they don't."

The Schwab work still has a long way to go. A more advanced--and already successful--attempt to push researchers closer to customers is IBM Life Sciences, a full-blown business unit run by a former chemist. In just three years Life Sciences has grown into a thriving entity employing 1,000 people. IBM Research has assigned 35 scientists to the unit; many of its products have already leaped from the lab to the market.

"Life Sciences was one of six industry areas that IBM had identified as being ripe for dramatic growth," explains Caroline Kovac, the chemist who is general manager of the unit. "The reason it was on the list was that some rowdy guys at IBM Research had become very vocal about the fact that computational biology was growing by leaps and bounds with the advent of the human genome project."

Not only does Life Sciences provide sophisticated tools for medical and genetics researchers, but it also makes IT systems to help pharmaceutical companies speed up and manage drug development and testing. The unit is working with Mayo Clinic to try to revolutionize how patient records are stored electronically. One of Life Sciences' biggest successes is a specialized database called Design Link that enables drug companies to manage a wide variety of experimental data that previously had to be stored on as many as 13 separate, incompatible systems. To date, four big pharmaceutical makers have adopted Design Link. "The most difficult problem pharmaceutical companies meet is integrating genomic, chemical, and biological information to reach a 'go or no-go' decision," says Dominique Herve, who is in charge of IT systems for the French drugmaker Aventis, which was the first company to deploy the product.

Design Link was the brainchild of Laura Haas, an IBM Distinguished Engineer from the Santa Teresa Development Laboratory just down the road from Almaden. Haas was looking for a way to build a single "front end" that could tap into a variety of databases holding different types of data. Initially she didn't have pharmaceutical companies in mind as customers. But Kovac spotted the technology and asked Haas to come aboard temporarily as the unit's chief technical officer. "Carol called me the mother of the group in the early days," Haas says. "We had a blast. It was just like working for a startup. In our case, there wasn't that much culture shock when we met with customers because pharmaceutical companies think about their problems in much the same way we do." Now Haas, who really prefers conducting research to managing the development of a full-blown product, is back at Santa Teresa working on another database project called Cleo, but she keeps close tabs on her old colleagues at Life Sciences.

The potential customer for nanotechnologist Don Eigler probably isn't even born yet. He revels in inviting visitors to come into his cramped lab at Almaden to "push atoms around" on his scanning tunneling electron microscope. Eigler, an IBM Fellow, is the one who made the famous Big Blue logo out of atoms, and more recently he constructed functioning logic circuits from groups of atoms. "The work in my lab has the furthest horizon of anything in the building, but we still feel it fits our business model," he says.

A self-proclaimed surfer dude (he has the ponytail and the tan to prove it) as well as a world-renowned physicist, Eigler is a big believer in meeting with customers even though his work "may not have an up-front connection. It's important to show customers that computing technology has a lot of life left; that we haven't even begun to reach the limits." More important, he also believes the new atmosphere is making everybody at IBM Research better scientists in the purest sense of the word. "It has many of us thinking, How do I teach myself new tricks? How do I broaden myself a little? Some would say that's ludicrous because we're already sitting on top of the future. But, hey, when you get down to it, learning new tricks is what doing research is all about."

There's a much grander ambition, too, behind IBM's strategy of linking research with its burgeoning service business. To hear the top executives talk, they think they're trying to uncover the Rosetta stone for the next round of growth in IT.

"We're discovering the 'physics' of business," says Irving Wladawsky-Berger, a 15-year veteran of IBM Research who runs the company's On Demand business, a new unit in the services group that will sell access to IT capacity when customers need it, much as an electric utility provides power. "It's sort of like trying to unravel the business genome. We're asking our researchers--mathematicians, computer scientists and systems experts, and even anthropologists and sociologists--to look at business processes and decision-making in a much more systematic and serious way. Classic computer scientists don't do this."

The ultimate goal is to give customers the IT tools to go beyond merely automating the processing of transactions and other rote operations in an enterprise, and to genuinely transform how they analyze the marketplace, deploy resources, and make strategic decisions. An example of that is Tomkins's Web Fountain. It soon may provide a much more accurate gauge of the mood and nuance of the marketplace than a typical focus group or market research study. That, in turn, will help customers' businesses run better, make IBM's numbers healthier, and provide its researchers with at least one thing to brag about that the rest of the world might understand.

*Feedback: [bschlender@fortunemail.com](mailto:bschlender@fortunemail.com)*