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AMERICA'S Agenda

SPRING 1994 SCHOOLS FOR THE 21ST CENTURY



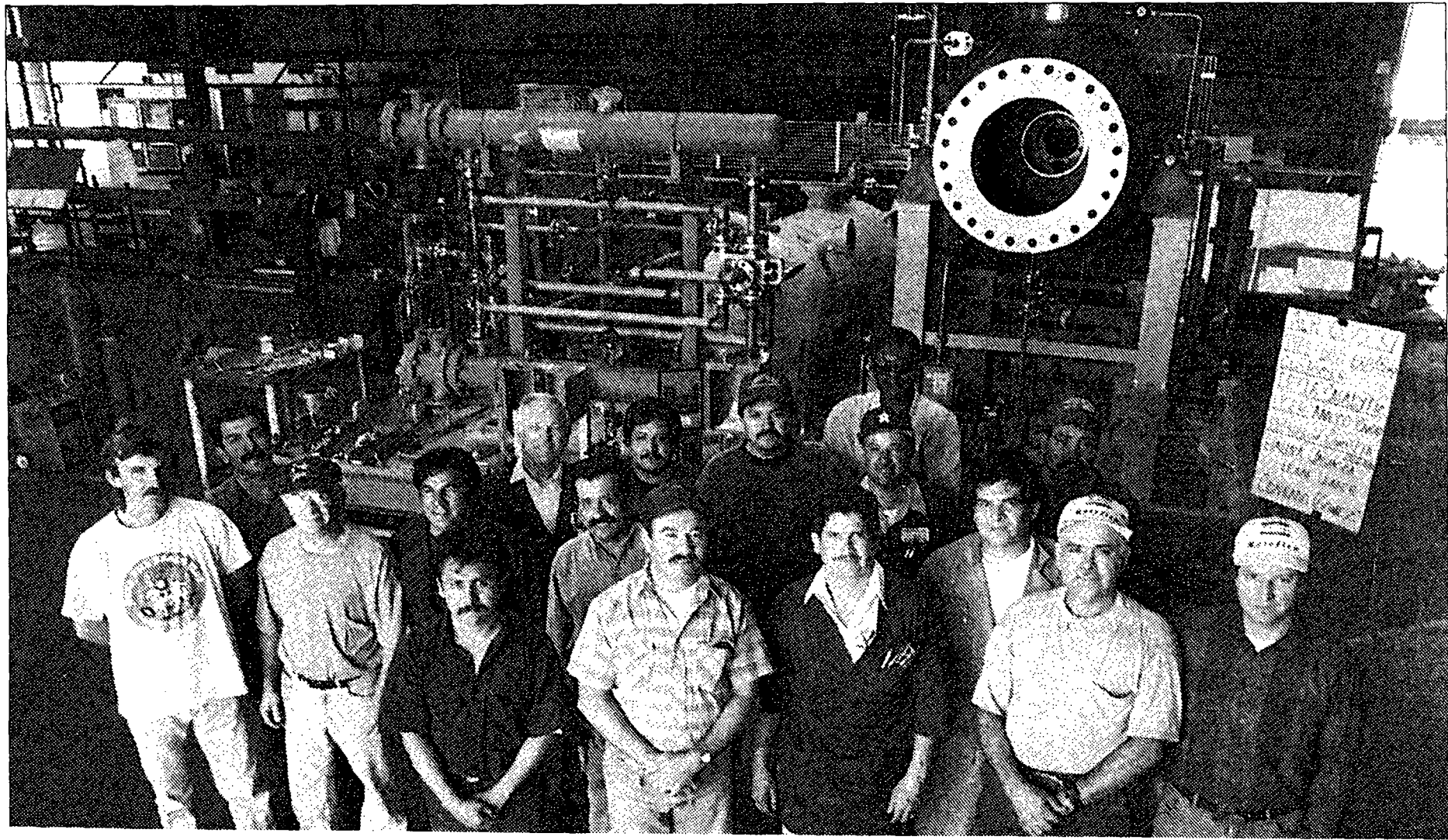
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SCHOLASTIC

The New Faces of U.S. Manufacturing





Scott Robinson for The New York Times

A team of workers at Rotoflow standing in front of one of its turbines. The company's 200-person work force includes 30 nationalities.

California's vision of the future: thriving, but with fewer high-wage jobs.

By LOUIS UCHITELLE

LOS ANGELES

IN his green surgical scrubs, Norman R. Jaffe entered the conference room as if he were a surgeon who had just implanted an artificial heart valve and had come to explain its features to the patient's relatives. A sample of the beige-colored valve, made from pig's tissue, was on the table in front of him. But there had been no operation. The conference room is in Mr. Jaffe's factory, not in a hospital. And Mr. Jaffe is not a doctor. Instead, he represents the best in American manufacturing: a scientist-entrepreneur restlessly trying to improve the heart valves that he manufactures.

"This second generation of heart valves

that we are making appears to last longer in patients without having to be replaced," said Mr. Jaffe, using a pencil as a pointer to explain how the valve works. "We are developing a third-generation valve that should extend durability even more."

Southern California is honeycombed with innovative, high-tech companies like Mr. Jaffe's, and with manufacturers that rely on new technology like AST Research Inc., a personal computer maker, and the Rotoflow Corporation, a producer of gas turbines. The region is also honeycombed with small, low-tech companies that employ thousands of immigrants at low wages in the manufacture of nothing more complicated than apparel and furniture. As these various smaller companies proliferate, giant military contractors, like Lockheed and Hughes — and big companies in general — shrink their payrolls and migrate.

These are the faces of manufacturing today. They share the stage not only in Southern California but elsewhere in the nation. Together they are holding down manufacturing wages for almost everyone, avoiding unions and pushing efficiency. They are also allowing the nation's millions of immigrants to go up the economic ladder a rung or two. And they are

constantly forming alliances to develop new products. The financing for Mr. Jaffe's latest heart valve, for example, comes partly from St. Jude Medical, a big Minnesota company on the hunt for fresh devices to market.

New Industrial Heartland

Nowhere is the new look of American manufacturing more evident than in the six counties of Southern California, a zone that stretches from just north of Los Angeles to just south of San Diego, and inland to the San Gabriel Mountains and the Mojave Desert. With 1.1 million people engaged in manufacturing, the six counties constitute the nation's largest manufacturing belt.

That has not insulated the region from the decline in manufacturing employment endemic in America, nor the inroads of a recession that has endured in California for four years. But no other state in the Union has as many manufacturing jobs as Southern California — although the hills and open country here, and the graceful industrial parks, tend to hide the concentrated factory life.

"Southern California is in many ways a microcosm of the future of America, particularly for manufacturing," Labor Sec-

retary Robert B. Reich said. "Everything that is good about our future, as well as the things we worry about, seem to start in Southern California."

That ambivalence certainly applies to the thousands of small companies making the low-end products. They might never have been formed in the United States without Southern California's huge pool of immigrants to employ.

The apparel industry alone, having cut back elsewhere in the nation, employs 125,000 workers in Southern California, according to state government data. Most earn less than \$6.50 an hour.

"Unless wages rise in the third world, you are faced with two alternatives: pay low wages here or send the production abroad," said Richard Rothstein, a newspaper columnist in Los Angeles and a researcher for the Economic Policy Institute in Washington. "So if you were not making the goods here, you would be importing them. Is this a good thing? The alternative, creating the jobs here, helps the immigrants, who spend their wages and pay taxes."

And they move up the job ladder, reinforcing Southern California as a manufacturing center. Immigrants or their chil-

Continued on Page 6

The New Faces of U.S. Manufacturing

Continued from Page 1

dren, for example, occupy most of the 35 jobs at Mr. Jaffee's company, Hancock/Jaffe Laboratories, in nearby Irvine. They have become owners of growing companies like AST Research, which three young foreigners started on a shoestring. The partners employ 1,500 Californians today in the manufacture of personal computers.

Immigrants are truly represented at Rotoflow, which manufactures giant turbines used in the natural gas industry. Frank van Gogh, the president, counts 30 nationalities among his 200 employees, most of them Asians and Hispanics.

Mr. van Gogh is Australian. He represents Atlas Copco, a Swedish company that purchased Rotoflow in 1990, from its founder, Judson S. Swearingen, a Texan who relocated in Los Angeles and often hired immigrants and trained them.

"We are an international business, and the work force that we found here has become our great strength," Mr. van Gogh said. "We got an order out of Korea, and we think one reason is that we sent a Korean-American who speaks fluent Korean. They trusted him. We are getting orders out of China and Taiwan, and we sent our Chinese people to negotiate them."

But wages are another matter. They are continually under downward pressure. The bigger companies apply this pressure by shifting some production to lower-cost states.

Others like Rotoflow, unwilling to give up their experienced workers, nevertheless manage to shed some. Last month, five left, replaced by computerized machinery. While Mr. van Gogh's engineers and shop foremen earn \$40,000 and up, the automation has helped to keep the average blue-collar wage at \$13 an hour.

"We stick to the pay that prevails in the marketplace," Mr. van Gogh said.

So does Mr. Jaffee, and the dozen or more companies like his that cluster



Photographs by Scott Robinson for The New York Times

At Hancock/Jaffe Laboratories, a high-tech manufacturer, women assemble heart valves.



vival, Fairchild is a class operation.

Sales representatives, working on commission, market the sofas and easy chairs mostly in California, but also in other Western states, and even in Japan. Three-quarters of the workers have five years at the company, and they enjoy company-paid health insurance for themselves, but not their families.

Those who survive the first difficult weeks are encouraged to quickly take the first step up the ladder, from floor sweeper to the band saws to cut pieces for the furniture frames. "We make it clear when we hire, that we don't want anyone remaining as a

give up their experienced workers, nevertheless manage to shed some. Last month, five left, replaced by computerized machinery. While Mr. van Gogh's engineers and shop foremen earn \$40,000 and up, the automation has helped to keep the average blue-collar wage at \$13 an hour.

"We stick to the pay that prevails in the marketplace," Mr. van Gogh said.

So does Mr. Jaffe, and the dozen or more companies like his that cluster near each other in Irvine and engage, successfully, in the single task of developing artificial human parts from animal tissue.

Mr. Jaffe's production workers, many of them women who painstakingly assemble the heart valves by hand, spending a day on each one, average \$12 an hour, although a few who have been with Mr. Jaffe since he and a partner founded the company in 1987 earn up to \$20 an hour.

"The industry is trying to move away from so much pay," said Mr. Jaffe, a 51-year-old former professor of medicine, whose valves sell for \$3,000 apiece. "We recognize that manufacturing costs cannot be passed on to the end user forever, and we are trying to keep a cap on wages."

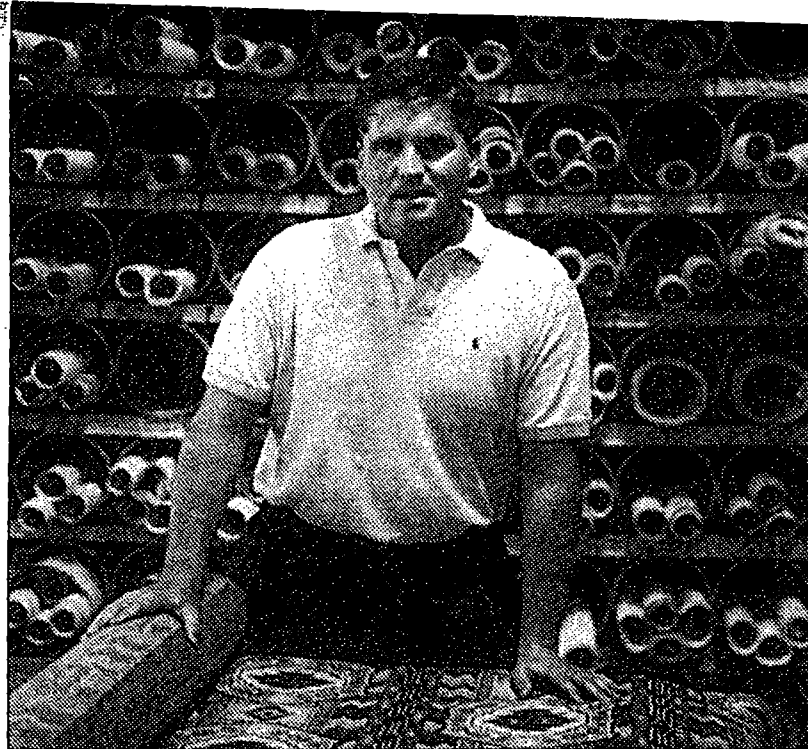
Need to Lower Costs

So is AST Research, but in a different fashion. "When you reach a certain size in a high-cost state like California, you have to look at other choices," said Safi U. Qureshey, a Pakistani, who as a young immigrant recently out of college, helped to found AST with two friends from Hong Kong and is now its chairman.

While AST's headquarters, design center and one factory — the factory where the newest products are first made — remain in Orange County, 5,000 of the company's 6,500 employees work at factories in Texas, Hong Kong, Ireland and Taiwan, churning out older-model computers.

"We are trying to keep all the high-end new stuff nearby, so there can be contact between manufacturing, marketing and design," Mr. Qureshey said.

Until recently, AST had been making desktop computers at the Orange County plant. They have been switched to Fort Worth, and 600 jobs switched with them. Notebook computers, still in the development stage, have taken up residence instead at



Scott Haigh, president of Fairchild of California, a furniture maker, where wages range from \$6 to \$15 an hour.

Then there is politics: California's congressional delegation has not been as energetic as politicians elsewhere in lobbying for military business, says Robert Paulson, a McKinsey director and head of its aerospace practice.

"You want to be in a state with a Congressman like Sam Nunn, who puts his emphasis on defense spending," Mr. Paulson said. Mr. Nunn, a Georgia Democrat, heads the Senate Armed Services Committee.

Despite such lures, considerable aerospace production remains in California. Both Hughes and Lockheed assemble satellites, for example, in Southern California, and they intend to continue doing so, according to their officials.

Mr. Paulson even suggests that the aerospace industry's migrations from Southern California may be ending.

"All the stuff that is easy to move probably has been moved," he said. "The high-volume, blue-collar work is largely gone. What is left is the research and low volume production, or the production that is too costly to

grow through cracks in the vast pavement, and 9,600 factory jobs are gone.

Seventy percent of these job losers have been re-employed in California, says Don J. Nakamoto, research director for the International Association of Machinists local that represented the Lockheed workers.

"People in the early layoffs managed for a while to find new jobs, often in aerospace, at just a little less than the \$15 to \$16 they had been earning at Lockheed," Mr. Nakamoto said. "But that has come down dramatically, and the average now in re-employment is \$10 an hour."

A Start for Immigrants

That is a hardship for aerospace workers, but very respectable pay at Fairchild of California, a family-owned company that manufactures inexpensive upholstered sofas and easy chairs. For many years, Walter Haigh ran the company, and now his son Scott, 33, is the president. The father, in his heyday, employed mostly Americans. Only two or three are left among the 100 employees. The rest are from Mexico, having started

also in other Western states, and even in Japan. Three-quarters of the workers have five years at the company, and they enjoy company-paid health insurance for themselves, but not their families.

Those who survive the first difficult weeks are encouraged to quickly take the first step up the ladder, from floor sweeper to the band saws to cut pieces for the furniture frames. "We make it clear when we hire, that we don't want anyone remaining as a janitor," Scott Haigh said. The next step is assembly of the frames and then on to upholstery, the most difficult task.

But going up the job ladder does not mean automatic raises. There are no raises. Instead, there are piece rates, which means extra pay for extra output. The best frame makers average \$9.50 an hour, Mr. Haigh said, and in upholstery they can go as high as \$15 an hour, when they work. A day off means a day without any pay.

Mr. Haigh has considered moving to Mexico, but uprooting a family business is a hardship that he rejects, and rebuilding an experienced labor force in Mexico might eat up all the savings from lower wages, he says.

What's more, Los Angeles keeps Mr. Haigh in the middle of his most important market. The apparel makers invoke a similar reason for being in Los Angeles, rather than Mexico.

"If you are making 200 or 300 shirts or dresses for fast delivery, then this is the place to be for these rush orders; there are a lot of mom and pop shops turning out small lots quickly," said Joseph Rodriguez, executive director of the Garment Contractors Association of Southern California.

Still, for Mr. Haigh, whose revenues reach \$10 million a year, profit margins are very slim because price increases for his furniture, which sells for between \$200 and \$400, are hard to get, given the competition.

"If you have a garage and you buy lumber and upholstery, you can make furniture," Mr. Haigh said. "A lot of Asians do this, using family members or friends to make furniture for a cousin or an uncle or a brother who has a retail store. This easy entry holds down prices. In most industries, it is the big players who set the price points, but here it is the small people."

Nonetheless, Mr. Haigh makes a living, and some of his workers improve their lot.

out older-model computers.

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The big military contractors — most of them aerospace companies making warplanes, missiles and satellites for the Government — practice a similar migration. These companies and their numerous suppliers still employ 25 percent of the manufacturing workers in Southern California, according to McKinsey & Company, a management consulting firm. But that number has been falling, to 235,000 from more than 350,000 in the 1980's.

Military contractors that once stayed put in communities like Palmdale, Irvine and Burbank still keep their front offices, research centers and design operations there. But the factories that were also present, providing blue-collar jobs at \$15 an hour or more, have been shifting to states offering lower costs.

The recession that began four years ago and is just beginning to lift in California undoubtedly exacerbated this process. But even before the recession, Lockheed began to move warplane manufacturing from Burbank to a plant in Marietta, Ga. And others have engaged in similar migrations.

McDonnell Douglas, for example, is shifting helicopter production to a plant in Mesa, Ariz., and the Hughes Missile Systems Company is closing three missile plants in Southern California and consolidating production in Tucson, Ariz. — eliminating 5,000 California jobs in the process.

"The strategy was to relocate to a modern facility in Tucson that was only 40 percent utilized," said Cal Kirby, a Hughes vice president. "And this was possible because we have good engineers in Arizona, as well as in California."

Wages in these states are often less than in California. So are taxes and the costs of workmen's compensation and of compliance with environmental rules.

Southern California, and they intend to continue doing so, according to their officials.

Mr. Paulson even suggests that the aerospace industry's migrations from Southern California may be ending.

"All the stuff that is easy to move probably has been moved," he said. "The high-volume, blue-collar work is largely gone. What is left is the research and low volume production, or the production that is too costly to move, like satellite assembly. You need enormous chambers to build them."

Still, Lockheed's Burbank complex is a sobering sight. The huge gray and sandstone-colored buildings, where generations of warplanes were made, are empty and sealed. Wild flowers

A Start for Immigrants

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Technology at Fairchild rises no higher than band saws. But in the world of small manufacturers dependent on immigrant labor for sur-

"If you have a garage and you buy lumber and upholstery, you can make furniture," Mr. Haigh said. "A lot of Asians do this, using family members or friends to make furniture for a cousin or an uncle or a brother who has a retail store. This easy entry holds down prices. In most industries, it is the big players who set the price points, but here it is the small people."

Nonetheless, Mr. Haigh makes a living, and some of his workers improve their lot.

Efren Tamayo, who is 51, has worked for the Haighs since 1977 and has run the frame department since 1980, now earning \$435 a week. His oldest daughter recently earned a bachelor's degree in history and Chicano studies from the University of California at Los Angeles, and two other children are in college.

Mr. Tamayo's salary, however, has been frozen for two years, and while the company buys him health insurance, he can't afford any for his family. "That is a risk," he said, "but I feel proud of what I have done in this country."

Pushing Down Wages

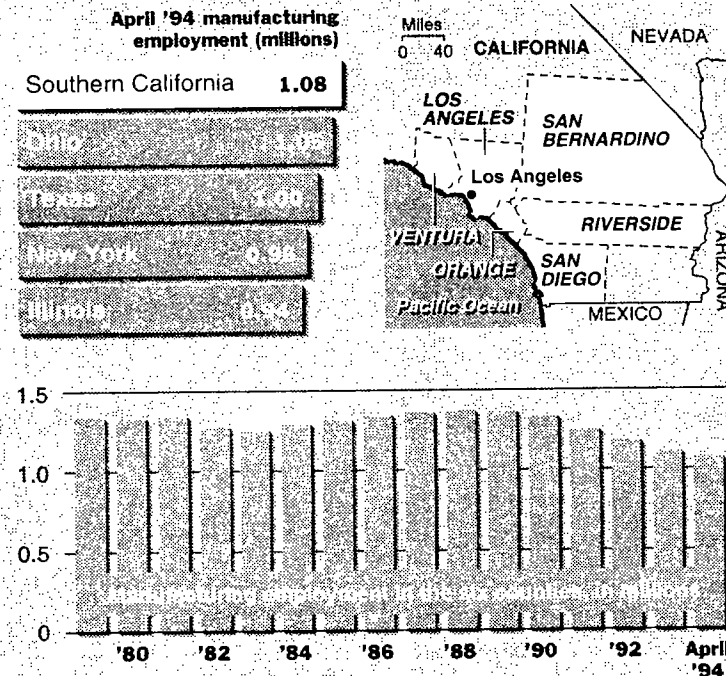
Mr. Tamayo's pride is hardly a feather in the cap of American manufacturing. Low wages and low technology are not a formula for raising the national standard of living. "There is an effort to meet the competition on cost by pushing down on wages and working conditions, which means competing more and more against the third world," said Allan J. Scott, an economist at the University of California at Los Angeles. "In the end, you can't win that game."

The military contractors might eventually move into new endeavors like electric cars, but so far their efforts in this direction have created very few jobs. The innovative, high-tech companies like Hancock/Jaffe or AST Research that proliferate in Southern California are an important solution. Everyone agrees on that point. But so far these companies have failed to generate the huge employment that came with the big investments and heavy Federal spending for weaponry — and they may never do so.

"Employment in the entire medical device industry is not equal to the job loss at Lockheed," Mr. Scott said.

Manufacturing in Southern California

Manufacturing employment statistics for the following counties in Southern California: Los Angeles, Ventura, San Bernardino, Riverside, Orange and San Diego.



Fleet-Footed Firms Reshape Economy

'Gazelles' Represent a Business Revolution

By Steven Pearlstein
Washington Post Staff Writer

The contours of the new American economy can be seen in Fall River, Mass., a down-at-the-heels city of triple-deckers, luncheonettes and once-proud textile mills that now serve as discount outlets for raincoats and sportswear made in Taiwan.

There, in an old granite factory with creaky wooden floors, a reborn Quaker Fabric Co., with nearly \$30 million in new state-of-the-art looms, has added 500 employees in the last five years, most of them from the city's large immigrant community.

Outcroppings also can be found in strip shopping centers across North America, where Discovery Zone opens another of its brightly colored child recreation centers every three days.

The public face of Discovery Zone is an army of 10,000 perky part-timers in shorts and Nikes, but behind the scenes is a sophisticated computer that can pinpoint the best new locations and a strategic tie-in with Blockbuster Video stores. Their challenge is to so thoroughly dominate this emerging industry that McDon-

business, too, decides to abandon the field and return to Big Macs and fries.

And the new economy is only a Metro stop away in Rockville, at Manugistics Corp., which transformed itself from a dying computer time-sharing service to the developer of a new software that helps manufacturers and distributors manage the supply of goods from raw materials to department store shelves. After 90 days of classroom training and a year-long apprenticeship, the best of the company's 150 recent hires—young graduates of schools such as Pennsylvania State University and Virginia Tech—are helping to streamline operations at giant companies such as Kmart Corp., Mars Inc., Pillsbury Co. and Procter & Gamble Co.

These companies are in the vanguard of a productivity revolution that is reshaping the American economy. With the aid of new technology and new forms of corporate organization, they are finding ways to do things faster, better and cheaper, revitalizing entire industries and redefining the terms of eco-

PHOTOCOPY
PRESERVATION

'Gazelles' Forge a New Economy in

GAZELLES, From A1

conomic competition at the same time.

Economist David Birch has a name for fleet-footed, fast-growing firms—gazelles.

Over the last five years, he said, nearly all of the country's economic growth has come from only 3 percent of all firms. These 250,000 gazelles can be found in every industry and region of the country. "Innovation is occurring everywhere in the U.S. economy," he said, "not just in certain hot sectors like biotech or software. The rest are finding better ways of doing things in ordinary, mundane enterprises, from fish wholesaling to discount brokerage."

Contrary to the popular perception that only small businesses are creating jobs, Birch found that gazelles come in all sizes. What distinguishes the smallest gazelles, he said, is that unlike the corner barbershop or florist, they do not stay small for very long. And while large companies as a group have been shedding employees over the past 20 years, the few that have bucked the trend accounted for more than 40 percent of all new jobs from 1989 through 1993.

The typical gazelle is probably "on the small side of big," Birch said.

Some of these companies are growing by stealing sales and profits from less efficient competitors—a big gain for them but only a modest gain for the economy as a whole. Others grow by offering technology or services that enable other firms to improve their efficiency—the economic equivalent of a turbocharging.

Both are part of the sometimes painful, sometimes halting, but always mysterious process by which gains in efficiency and productivity at individual firms eventually translate into more jobs or higher incomes for the economy as a whole.

Growth and Innovation

To chronicle this unfolding economic revolution, The Washington Post visited a dozen growing companies that offered stock to public shareholders for the first time in 1993. The companies were in the Washington, Chicago and Boston metropolitan areas.

What stands out after this three-city tour of factories and boardrooms is the breadth and intensity of the innovation—innovation that extends be-

views financing proposals from thousands of growing firms each year. "Now the healthy parts are being carved out and new management is being brought in, with almost immediate effects. If you bring good management into even a mundane business, you can get rather exciting results."

Applying Technology

It was in the 1970s that engineers hit upon the basic design for computer chips and biologists broke the code on genetic engineering, but it is only now that the results of those and other scientific breakthroughs are generating an economic payoff. Nearly every company in this sample is gaining a competitive advantage by applying 1980s technology to the way they do business in the 1990s.

At its research facility in Fall River, Mass., Molten Metal Technologies Inc. practices a kind of 21st century alchemy that not only can neutralize industrial wastes by putting them in vats of hot metal, but also turns the wastes into salable byproducts such as hydrogen gas, ceramic abrasives and nickel.

Chicago-based ABC Rail Products Inc. uses technology generally associated with a hospital—lasers, ultrasound and X-rays—to reduce tolerances on its metal train wheels by 90 percent, even as it lowered labor costs for each wheel by 12 percent.

And what makes it possible for Dulles-based Atlantic Coast Airlines Inc. to grab short-haul routes with airline industry giants are affordable versions of the cockpit controls and computerized reservation systems that were once so expensive only major airlines could afford them.

"With one PC, we can run 15 scientific experiments overnight that might have taken a technician a week to run without it," said Henry Linsert Jr., chairman of Martek, the Columbia biotech company.

A New Corporate Culture

The baby-boomer executives at the top of these growth companies learned their craft at big corporations, all the while keeping an eye open for an entrepreneurial venture they could call their own. The result often is a powerful combination of big-company sophistication and small-company leanness and flexibility.

"It used to be at these companies

A DOZEN FAST-GROWING F

Company	Headquarters	Business
ABC Rail Products	Chicago	Track, b
Atlantic Coast Airlines	Sterling, Va.	Regiona
Boston Chicken	Naperville, Ill.	Restaur.
CDW Computer Centers	Buffalo Grove, Ill.	Comput



Discovery Zone	Chicago	Indoor p
Manugistics	Rockville	Software
Martek Biosciences	Columbia	Biotechn
Molten Metal Technology	Waltham, Mass.	Industria



BY LARRY MORRIS—THE WASHINGTON POST

ATLANTIC COAST AIRLINES: Mechanics perform maintenance on the Dulles-based company's planes. Top executives of the

Economy in the Fires of Innovation

GAZELLE SAMPLER

A DOZEN FAST-GROWING FIRMS THAT ISSUED PUBLIC STOCK FOR THE FIRST TIME IN 1993

Firm	Headquarters	Business	1991 sales (IN MILLIONS)	1993 sales (IN MILLIONS)	1991 employment	Current employment
3M Products	Chicago	Track, brake manufacturer	\$145	\$159	1,225	1,250
Coast Airlines	Sterling, Va.	Regional airline	\$63	\$149	650	1,200
Chicken	Naperville, Ill.	Restaurant franchiser	\$21*	\$154	500*	16,500*
Computer Centers	Buffalo Grove, Ill.	Computer retailer	\$5	\$12	150	350



BY JAMES M. THRESHER—THE WASHINGTON POST

DISCOVERY ZONE: Youngsters at play in the company's Germantown recreation center. Most of the firm's 11,600 part-time employees earn minimum wages; most managers make less than \$25,000 a year.

Discovery Zone	Chicago	Indoor play centers	\$13*	\$80*	1,200*	11,650*
Stics	Rockville	Software developer	\$29	\$36	175	325
Biosciences	Columbia	Biotechnology	\$2	\$5	40	70
Metal Technology	Waltham, Mass.	Industrial waste reprocessing	\$2	\$5	3	170

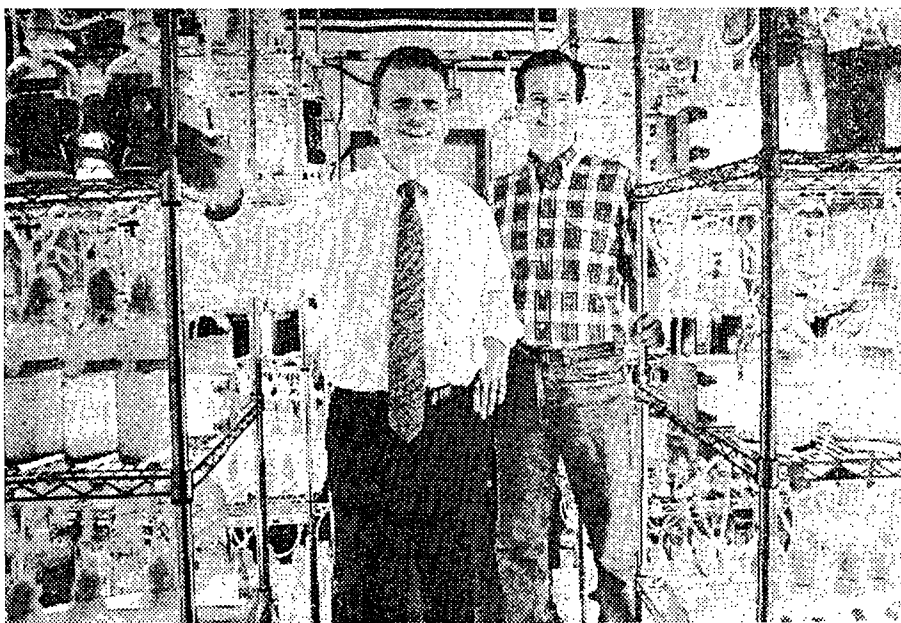


BY LARRY MORRIS—THE WASHINGTON POST

NTIC COAST AIRLINES: Mechanics in maintenance on the Dulles-based firm's planes. Top executives of the



PHOTOCOPY
PRESERVATION



BY MARY LOU FOY—THE WASHINGTON POST

MARTEK BIOSCIENCES: *Henry Linsert Jr., far left, chief executive, and Steve Dubin, chief financial officer, whose Columbia firm's major product is an additive for infant formula grown from algae.*

THE WASHINGTON POST

amounts to a huge still. But in-
of manufacturing the additive at
n facility, which might have cost
ds of \$20 million to build, Mar-
having it manufactured by Ar-
Daniels Midland Co. at a huge
nter the agribusiness giant had
ed to mothball.
ie availability of diffused, afford-
sophisticated technology has re-
ged the division of labor between
and small firms," said Zoltan
n economist at the University of
iore.

Even Gains

cause the driving force behind
growth is greater productivity,
ing sales do not always trans-
directly into large numbers of
jobs for the economy.
terms of job creation, Inc. mag-
s list of fastest-growing public
anies probably has the propor-
about right: While the com-
sales of the 100 firms on the
creased 18-fold from 1988 to

1993, the number of employees in-
creased only six-fold.

As for pay, Birch's research puts
to rest the fear that United States
was slowly becoming a nation of
hamburger flippers. The jobs pro-
duced by growing firms pay slightly
higher than average wages, he
found. Unfortunately, at the same
time these firms were creating
above-average paying jobs, big cor-
porations were cutting large num-
bers of high-paying jobs, often in re-
sponse to competition from smaller,
lower-wage rivals.

When all of these job gains and
losses were added together, Birch
found that the U.S. economy lost 1
million high-paying jobs in the last
five years while adding 1 million
average-wage jobs plus a half-mil-
lion jobs paying below-average
wages.

This uneven pattern was evident
on The Post's three-city tour.

At Discovery Zone franchises, for
example, nearly 90 percent of its
11,650 employees are part-time
high school and college students

earning a few cents more than mini-
mum wage of \$4.25 an hour. Man-
agers generally make less than
\$25,000 a year.

One quarter of the work force at
Titan Wheel's Quincy plant are con-
tracted through a temporary help
service and have lower pay and ben-
efits than Titan's full-time employ-
ees.

And at Quaker Fabrics, the aver-
age annual production wage of
about \$21,000 a year has just about
kept pace with inflation, despite dra-
matic gains in labor productivity. So
far, the extra profits that came from
better productivity, said President
Larry Liebenow, have been invest-
ed in lower prices and new labor
saving machinery.

In other mature industries,
growth in sales may result in no job
growth at all.

Northwestern Steel, for example,
expects to ship at least 10 percent
more steel this fiscal year with 10
percent fewer workers, thanks to
new technology and a more flexible
labor contract. The story is much
the same at Chicago-based ABC
Rail Products Inc., which expects to
double its sales in the next few
years without hiring more workers.

Many look to high technology to
generate the good jobs of the future
but there, too, the record is spotty.

At biotech firms such as Martek,
lab technicians start at \$20,000 a
year while PhD's earn \$80,000. But
hiring tends to come in waves: It
takes a small but highly trained crew
of scientists to develop and test a new
product, but once production begins

the number of technicians needed to
produce it does not change much.
Sales and marketing are often han-
dled by major drug companies.

"I'm not sure biotech will be a huge
job generator," said John Kao, a
teacher at the Harvard Business
School and a co-founder of Biosurface
Technology in Cambridge, Mass.,
which grows replacement skin for
burn victims from small samples of
their own skin.

The newest high-tech jobs have an-
other drawback—they are often so
specialized that even people laid off
from other high-tech firms do not
easily qualify for them.

Along Route 128 in Massachu-
setts, for example, Powersoft has
hired almost 300 employees in the
past year in nearly every department,
from sales to service to marketing to
software development. But almost
none have come from troubled com-
puter manufacturers such as Wang
Laboratories, Prime Computer or
Digital Equipment Corp., which have
been laying off thousands of skilled
workers.

"Because we can hire from other
software firms that have cultures and
customers and cost structures that
are more like our own, we have the
luxury of not having to do the kind of
technical retraining and cultural con-
version that would be required to
bring those people in," Powersoft
founder Mitchell Kertzman said. "The
fact is that software companies can't
possibly grow fast enough to compen-
sate for the downsizing going on in
the hardware side of the computer in-
dustry."

GOOD JOBS OR BAD JOBS

NET JOB GAINS AND LOSSES, 1989-1993, IN THOUSANDS

	Small firms	Large firms	Total
Low wage	+906	-352	+554
Average wage	+1,479	-481	+998
High wage	+1,433	-2,520	-1,093
Total	+3,818	-3,359	+459

SOURCE: Cognetics Inc.

THE WASHINGTON POST

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eration.

Northwestern Steel and Rod Inc. of Sterling, Ill., was able to survive the recent recession largely because it negotiated changes in union work rules that make it possible to quickly and efficiently cut I-beams to customized lengths.

And Quaker Fabrics has gained a competitive advantage by operating its own specialty yarn shop that allows it to design more distinctive patterns into its upholstery fabric.

"Companies don't compete on the basis just of products any more, but on the basis of entire business models," said Alan Webber, founder of Fast Company, a new magazine about growing firms. "The aim of the game is to change the game—to redefine the terms of competition in such a way that it plays to your own company's particular strength."

New Wine in Old Bottles

Although some of the economy's growth comes from recent start-ups such as the Discovery Zone, it is just as likely to come from well-established firms: Birch estimates that about half the fast-growing firms have been around 15 years or more.

Some of these veterans are spinoffs from large corporations. Manugistics was cast off from Contel Corp., a phone company, that never really knew what to do with it. Martek Biosciences Corp. of Columbia, which turns algae into infant formula supplements and pharmaceuticals, was a backwater division of defense giant Martin Marietta Corp., which needed cash after a costly takeover battle in the 1980s.

Others are simply late bloomers. Computer Solutions Inc., founded in 1974, was going nowhere fast with its manufacturing software until it stumbled onto a software program for writing software. Now renamed Powersoft Inc., of Concord, Mass., it is one of the country's hottest technology firms.

More than a few, such as Northwestern Steel and Rod, founded in 1879, once were industry leaders that went into decline because of poor management and heavy debt burdens taken on in a 1980s-style leveraged buyout. Now a new executive team backed by fresh investors and a work force with a sizable share of company stock have doubled the firm's share of the I-beam market.

"What we see these days are a lot of busted leveraged buyouts," said G. Cabell Williams, president of Allied Capital Corp. of Washington, who re-

Delta Air Lines Inc.; the new chairman of Northwestern Steel and Rod ran divisions at Bethlehem Steel Corp. and Rockwell International Corp. At Molten Metal Technologies in Fall River, the team standing behind 30-year-old Chairman William M. Haney includes several 20-year retirees from the Navy.

Actually, Molten Metal is Haney's third start-up—not an uncommon phenomenon in the world of growing companies. William Wetzel, who heads the entrepreneurship program at the University of New Hampshire, said these founders bring with them not only executive experience, but also the considerable profits they earned from earlier business success.

"Successful entrepreneurs recycling their winnings represents a pool of venture capital that is probably five times the size of the official venture funds," he said.

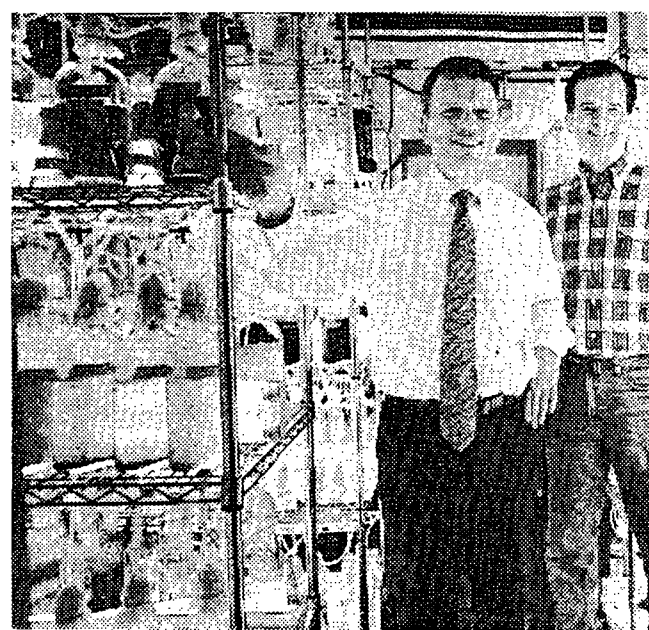
What they also bring from their old jobs is a determination to bust up traditional hierarchies. Corporate staffs are lean, the atmosphere informal and managers have plenty of autonomy. Bonuses, profit-sharing and financial incentives are used broadly throughout the company.

At Titan Wheel International Inc., for example, chief executive Maurice Taylor Jr., dressed in sneakers and overalls, rides around his industrial complex in Quincy, Ill., on a red motor scooter, hearing first-hand about operational glitches from metal workers who took home an average of \$1,700 in profit-sharing last year.

In the old economy, big corporations thought it was cheaper or more profitable to handle every facet of production in-house. But under competitive pressures, industries are breaking up into their component parts as specialized firms become more efficient at performing particular tasks.

A generation ago, for example, tire makers Firestone Inc. and Goodyear Tire & Rubber Co. and truck maker Fruehauf Corp. each had subsidiaries to make metal wheel rims for agricultural machinery and construction equipment. But as the vehicles got bigger and lasted longer, demand for new rims fell, making all of the divisions money losers. Now the remains of all three are combined under a single, independent Titan Wheel, which has virtually no domestic competition for most of its products.

In Columbia, Martek is the beneficiary of a different type of corporate recycling. The biotech company's major product is an milky-white additive for infant formula grown from algae in



what amounts to a huge still. But instead of manufacturing the additive at its own facility, which might have cost upwards of \$20 million to build, Martek is having it manufactured by Archer Daniels Midland Co. at a huge fermenter the agribusiness giant had planned to mothball.

"The availability of diffused, affordable, sophisticated technology has rearranged the division of labor between large and small firms," said Zoltan Acs, an economist at the University of Baltimore.

Uneven Gains

Because the driving force behind their growth is greater productivity, booming sales do not always translate directly into large numbers of good jobs for the economy.

In terms of job creation, Inc. magazine's list of fastest-growing public companies probably has the proportions about right: While the combined sales of the 100 firms on the list increased 18-fold from 1988 to

1993, the number of employees increased only six-fold.

As for pay, Birch's research to rest the fear that U.S. wages were slowly becoming hamburger flippers. The study found that wages in fast-growing firms were higher than average. Unfortunately, at the same time these firms were above-average paying jobs, other corporations were cutting wages. The result was a loss of high-paying jobs in response to competition from lower-wage rivals.

When all of these job losses were added together, the study found that the U.S. economy lost 1.5 million high-paying jobs in five years while adding 1.5 million average-wage jobs plus 1.5 million jobs paying below-average wages.

This uneven pattern is reflected in The Post's three-city study.

At Discovery Zone for example, nearly 90 percent of the 11,650 employees are high school and college graduates.

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BY GERALD MARTINEAU—THE WASHINGTON POST

BOSTON CHICKEN:

An employee at Boston Chicken waits on customers at the Reston Parkway store in Reston. Growth has been spectacular: With only 18 stores in 1991, it has grown to 330 as of this month, and is adding new stores at the rate of one every business day.

Boston Chicken: Hot Stuff

Company Serves Up a Market-Winning Recipe for Success

By Steven Pearlstein

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Washington Post Staff Writer

Perhaps no company better captures the spirit of the new economy than Boston Chicken Inc., the hottest of last year's hot stock offerings, which aims to do for the rotisserie what Col. Sanders did for the deep fryer.

Boston Chicken's recent growth is nothing short of spectacular. With only 18 stores in 1991, it has grown to 330 as of this month, and is adding new restaurant-cum-take-out locations at the rate of one every business day.

Sales of chicken and all the fix-in's grew to \$154 million last year from \$21 million in 1991, and there are 16,500 employees, the vast majority making slightly more than the \$4.25 minimum wage. The company's stock is selling at a spectacular 50 times its expected 1994 earnings.

There is nothing particularly new about rotisserie chicken—those birds have been turning succulently in delicatessen windows for generations.

But Boston Chicken is not really about poultry—it is about developing a market-winning formula for picking real estate, designing

stores, organizing a franchise operation and analyzing data.

These are Boston Chicken's innovations—trade secrets that can be every bit as valuable as a new drug or computer chip design. With them, Boston Chicken has not only developed the secret for delivering generous quantities of home-cooking at affordable prices, but also transformed what had been a mom-and-pop business into a new national category—take-out home-cooked food—that potentially can draw business away from both supermarkets and restaurants.

At the company's unassuming headquarters in a one-story office park west of Chicago in suburban Naperville, there are all the signs of New Age management—young professionals in casual dress, bosses who go by first names, lots of e-mail communications and a new corporate structure that organizes employees by processes rather than departments.

But the game being played here is old-fashioned hardball.

Top executives at Boston Chicken include the former president of Kentucky Fried Chicken, former vice presidents of Bennigan's, Taco Bell, Red Lobster, Chili's and Baker's Square, and a chief financial of-

ficer who cut his teeth doing oil and gas deals in Texas.

Heading the team is 35-year-old Scott Beck, the son of one of the founders of Waste Management Inc. who, while in his 20s, became the first and largest franchisee of Blockbuster Video until he sold his stake back to the parent company in 1989 for a cool \$120 million.

Boston Chicken franchisees are also not your typical two-store entrepreneurs making their first venture into the food service business.

Instead, Beck and his crew have staked their growth on 23 regional franchisees—-independent businessmen with at least a decade of relevant management experience, a sizable cash investment and a mandate to open 50 to 100 stores over the next few years.

The strategy is to concentrate operations in the largest 60 metropolitan markets, including Washington, and to ensure that each franchisee has the efficiency, sophistication and marketing clout that comes with running a regional business with sales of more than \$100 million a year.

As chief financial officer Mark Stephens sees it, this unusual structure combines the entrepreneurial energy of a franchise operation with the control and economies of scale normally enjoyed only by company-owned operations.

The computer provides the key link between headquarters and the stores.

Software, developed by the company at a cost of \$8 million to \$10 million, already uses the information punched in at the checkout register to advise store managers when to put on another rack of chickens or heat up another tray of mashed potatoes. The software also makes appropriate adjustments for the day and season and the preferences of that particular store's customers.

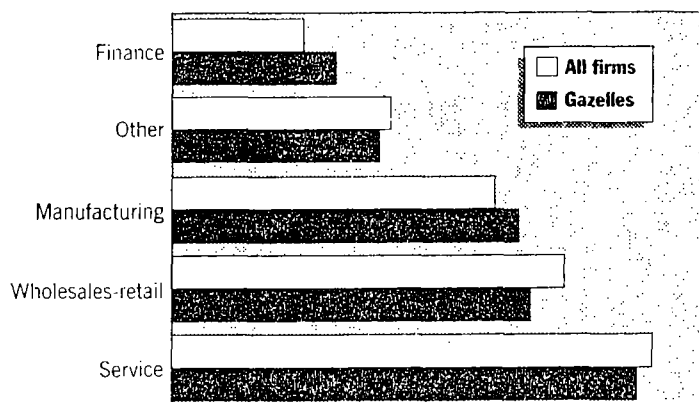
The same computer can draw up employee work schedules to match the peaks and valleys of customer flows, automatically reorder food supplies from approved vendors and update the store's financial performance on an hourly basis.

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WHO ARE THE 'GAZELLES'?

Gazelles are the 3 percent of all firms that created nearly all the new jobs in the United States from 1989 to 1993.

GAZELLES BY INDUSTRY
PERCENT OF TOTAL EMPLOYMENT



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But what most excites Blaine Hurst, the former Ernst & Young partner who now heads Boston Chicken's computer operations, is how technology can get the company closer to its customers.

By year's end, every Boston Chicken store is expected to have a touch-activated computer terminal that will allow customers to rate the quality of the food and service.

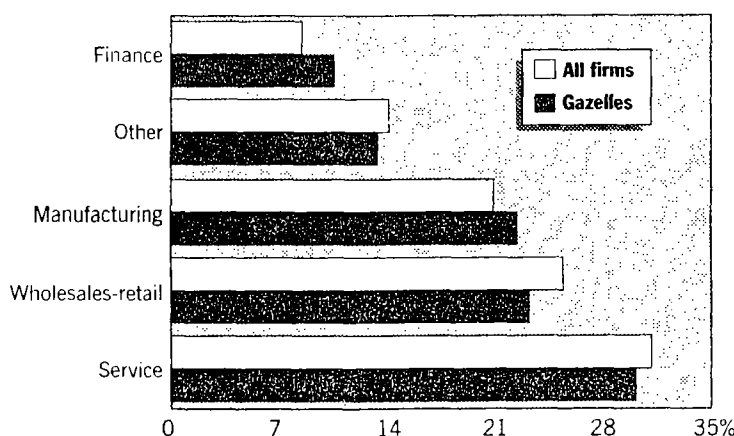
"If I can save half a percentage point on food costs, that's a lot of money," Hurst said in explaining the role of technology. "But if I can know almost instantaneously that customers don't like the drink selection and I can have that changed in 300 stores within a week—that's worth a whole lot more money."

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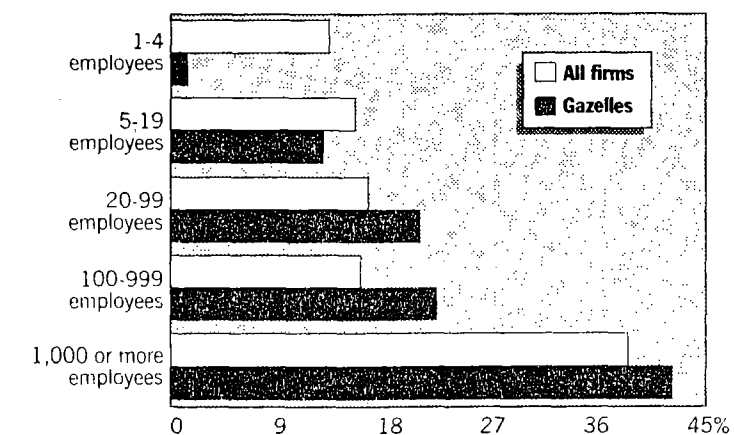
GAZELLES BY INDUSTRY

PERCENT OF TOTAL EMPLOYMENT



GAZELLES BY SIZE

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SOURCE: Cognetics Inc.

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