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DECEMBER 8, 2003

COVER STORY

## The Rise Of India

**Growth is only just starting, but the country's brainpower is already reshaping Corporate America**

As you pull into General Electric's (GE) John F. Welch Technology Center, a uniformed guard waves you through an iron gate. Once inside, you leave the dusty, traffic-clogged streets of Bangalore and enter a leafy campus of low buildings that gleam in the sun. Bright hallways lined with plants and abstract art -- "it encourages creativity," explains a manager -- lead through laboratories where physicists, chemists, metallurgists, and computer engineers huddle over gurgling beakers, electron microscopes, and spectrophotometers. Except for the female engineers wearing saris and the soothing Hindi pop music wafting through the open-air dining pavilion, this could be GE's giant research-and-development facility in the upstate New York town of Niskayuna.

It's more like Niskayuna than you might think. The center's 1,800 engineers -- a quarter of them have PhDs -- are engaged in fundamental research for most of GE's 13 divisions. In one lab, they tweak the aerodynamic designs of turbine-engine blades. In another, they're scrutinizing the molecular structure of materials to be used in DVDs for short-term use in which the movie is automatically erased after a few days. In another, technicians have rigged up a working model of a GE plastics plant in Spain and devised a way to boost output there by 20%. Patents? Engineers here have filed for 95 in the U.S. since the center opened in 2000.

Pretty impressive for a place that just four years ago was a fallow plot of land. Even more impressive, the Bangalore operation has become vital to the future of one of America's biggest, most profitable companies. "The game here really isn't about saving costs but to speed innovation and generate growth for the company," explains Bolivian-born Managing Director Guillermo Wille, one of the center's few non-Indians.

The Welch center is at the vanguard of one of the biggest mind-melds in history. Plenty of Americans know of India's inexpensive software writers and have figured out that the nice clerk who booked their air ticket is in Delhi. But these are just superficial signs of India's capabilities. Quietly but with breathtaking speed, India and its millions of world-class engineering, business, and medical graduates are becoming enmeshed in America's New Economy in ways most of us barely imagine. "India has always had brilliant, educated people," says tech-trend forecaster Paul Saffo of the Institute for the Future in Menlo Park, Calif. "Now Indians are taking the lead in colonizing cyberspace."

This techno take-off is wonderful for India -- but terrifying for many Americans. In fact, India's emergence is fast turning into the latest Rorschach test on globalization. Many see India's digital workers as bearers of new prosperity to a deserving nation and vital partners of Corporate America. Others see them as shock troops in the final assault on good-paying jobs. Howard Rubin, executive vice-president of Meta Group Inc., a Stamford (Conn.) information-technology consultant, notes that big U.S.

companies are shedding 500 to 2,000 IT staffers at a time. "These people won't get reabsorbed into the workforce until they get the right skills," he says. Even Indian execs see the problem. "What happened in manufacturing is happening in services," says Azim H. Premji, chairman of IT supplier Wipro Ltd. "That raises a lot of social issues for the U.S."

No wonder India is at the center of a brewing storm in America, where politicians are starting to view offshore outsourcing as the root of the jobless recovery in tech and services. An outcry in Indiana recently prompted the state to cancel a \$15 million IT contract with India's Tata Consulting. The telecom workers' union is up in arms, and Congress is probing whether the security of financial and medical records is at risk. As hiring explodes in India, the jobless rate among U.S. software engineers has more than doubled, to 4.6%, in three years. The rate is 6.7% for electrical engineers and 7.7% for network administrators. In all, the Bureau of Labor Statistics reports that 234,000 IT professionals are unemployed.

The biggest cause of job losses, of course, has been the U.S. economic downturn. Still, there's little denying that the offshore shift is a factor. By some estimates, there are more IT engineers in Bangalore (150,000) than in Silicon Valley (120,000). Meta figures at least one-third of new IT development work for big U.S. companies is done overseas, with India the biggest site. And India could start grabbing jobs from other sectors. A.T. Kearney Inc. predicts that 500,000 financial-services jobs will go offshore by 2008. Indiana notwithstanding, U.S. governments are increasingly using India to manage everything from accounting to their food-stamp programs. Even the U.S. Postal Service is taking work there. Auto engineering and drug research could be next.

### More Science in Schools

Tech luminary Andrew S. Grove, CEO of Intel Corp. ([INTC](#)), warns that "it's a very valid question" to ask whether America could eventually lose its overwhelming dominance in IT, just as it did in electronics manufacturing. Plunging global telecom costs, lower engineering wages abroad, and new interactive-design software are driving revolutionary change, Grove said at a software conference in October. "From a technical and productivity standpoint, the engineer sitting 6,000 miles away might as well be in the next cubicle and on the local area network." To maintain America's edge, he said, Washington and U.S. industry must double software productivity through more R&D investment and science education.

But there's also a far more positive view -- that harnessing Indian brainpower will greatly boost American tech and services leadership by filling a big projected shortfall in skilled labor as baby boomers retire. That's especially possible with smarter U.S. policy. Companies from GE Medical Systems ([GE](#)) to Cummins ([CUM](#)) to Microsoft ([MSFT](#)) to enterprise-software firm PeopleSoft ([PSFT](#)) that are hiring in India say they aren't laying off any U.S. engineers. Instead, by augmenting their U.S. R&D teams with the 260,000 engineers pumped out by Indian schools each year, they can afford to throw many more brains at a task and speed up product launches, develop more prototypes, and upgrade quality. A top electrical or chemical engineering grad from Indian Institutes of Technology (IITS) earns about \$10,000 a year -- roughly one-eighth of U.S. starting pay. Says Rajat Gupta, an IIT-Delhi grad and senior partner at consulting firm McKinsey & Co.: "Offshoring work will spur innovation, job creation, and dramatic increases in productivity that will be passed on to the consumer."

Whether you regard the trend as disruptive or beneficial, one thing is clear. Corporate America no longer feels it can afford to ignore India. "There's just no place left to squeeze" costs in the U.S., says Chris Disher, a Booz Allen Hamilton Inc. outsourcing specialist. "That's why every CEO is looking at India, and every board is asking about it." neoIT, a consultant advising U.S. clients on how to set up shop in India, says it has been deluged by big companies that have been slow to move offshore. "It is getting to a

state where companies are literally desperate," says Bangalore-based neoIT managing partner Avinash Vashistha.

As a result of this shift, few aspects of U.S. business remain untouched. The hidden hands of skilled Indians are present in the interactive Web sites of companies such as Lehman Brothers ([LEH](#)) and Boeing ([BA](#)), display ads in your Yellow Pages, and the electronic circuitry powering your Apple Computer ([AAPL](#)) iPod. While Wall Street sleeps, Indian analysts digest the latest financial disclosures of U.S. companies and file reports in time for the next trading day. Indian staff troll the private medical and financial records of U.S. consumers to help determine if they are good risks for insurance policies, mortgages, or credit cards from American Express Co. ([AXP](#)) and J.P. Morgan Chase & Co. ([JPM](#)).

By 2008, forecasts McKinsey, IT services and back-office work in India will swell fivefold, to a \$57 billion annual export industry employing 4 million people and accounting for 7% of India's gross domestic product. That growth is inspiring more of the best and brightest to stay home rather than migrate. "We work in world-class companies, we're growing, and it's exciting," says Anandraj Sengupta, 24, an IIT grad and young star at GE's Welch Centre, where he has filed for two patents. "The opportunities exist here in India."

If India can turn into a fast-growth economy, it will be the first developing nation that used its brainpower, not natural resources or the raw muscle of factory labor, as the catalyst. And this huge country desperately needs China-style growth. For all its R&D labs, India remains visibly Third World. IT service exports employ less than 1% of the workforce. Per-capita income is just \$460, and 300 million Indians subsist on \$1 a day or less. Lethargic courts can take 20 years to resolve contract disputes. And what pass for highways in Bombay are choked, crumbling roads lined with slums, garbage heaps, and homeless migrants sleeping on bare pavement. More than a third of India's 1 billion citizens are illiterate, and just 60% of homes have electricity. Most bureaucracies are bloated, corrupt, and dysfunctional. The government's 10% budget deficit is alarming. Tensions between Hindus and Muslims always seem poised to explode, and the risk of war with nuclear-armed Pakistan is ever-present.

So it's little wonder that, compared to China with its modern infrastructure and disciplined workforce, India is far behind in exports and as a magnet for foreign investment. While China began reforming in 1979, India only started to emerge from self-imposed economic isolation after a harrowing financial crisis in 1991. China has seen annual growth often exceeding 10%, far better than India's decade-long average of 6%.

### **In the Valley's Marrow**

Still, this deep source of low-cost, high-IQ, English-speaking brainpower may soon have a more far-reaching impact on the U.S. than China. Manufacturing -- China's strength -- accounts for just 14% of U.S. output and 11% of jobs. India's forte is services -- which make up 60% of the U.S. economy and employ two-thirds of its workers. And Indian knowledge workers are making their way up the New Economy food chain, mastering tasks requiring analysis, marketing acumen, and creativity.

This means India is penetrating America's economic core. The 900 engineers at Texas Instruments Inc.'s ([TXN](#)) Bangalore chip-design operation boast 225 patents. Intel Inc.'s ([INTC](#)) Bangalore campus is leading worldwide research for the company's 32-bit microprocessors for servers and wireless chips. "These are corporate crown jewels," says Intel India President Ketan Sampat. India is even getting hard-wired into Silicon Valley. Venture capitalists say anywhere from one-third to three-quarters of the software, chip, and e-commerce startups they now back have Indian R&D teams from the get-go. "We can barely imagine investing in a company without at least asking what their plans are for India," says

Sequoia Capital partner Michael Moritz, who nurtured Google, Flextronics ([FLEX](#)), and Agile Software ([AGIL](#)). "India has seeped into the marrow of the Valley."

It's seeping into the marrow of Main Street. This year, the tax returns of some 20,000 Americans were prepared by \$500-a-month CPAs such as Sandhya Iyer, 24, in the Bombay office of Bangalore's MphasiS. After reading scanned seed and fertilizer invoices, soybean sales receipts, W2 forms, and investment records from a farmer in Kansas, Iyer fills in the farmer's 82-page return. "He needs to amortize these," she types next to an entry for new machinery and a barn. A U.S. CPA reviews and signs the finished return. Next year, up to 200,000 U.S. returns will be done in India, says CCH Inc. in Riverwoods, Ill., a supplier of accounting software. And it's not only Big Four firms that are outsourcing. "We are seeing lots of firms with 30 to 200 CPAs -- even single practitioners," says CCH Sales Vice-President Mike Sabbatis.

The gains in efficiency could be tremendous. Indeed, India is accelerating a sweeping reengineering of Corporate America. Companies are shifting bill payment, human resources, and other functions to new, paperless centers in India. To be sure, many corporations have run into myriad headaches, ranging from poor communications to inconsistent quality. Dell Inc. recently said it is moving computer support for corporate clients back to the U.S. Still, a raft of studies by Deloitte Research, Gartner, Booz Allen, and other consultants find that companies shifting work to India have cut costs by 40% to 60%. Companies can offer customer support and use pricey computer gear 24/7. U.S. banks can process mortgage applications in three hours rather than three days. Predicts Nandan M. Nilekani, managing director of Bangalore-based Infosys Technologies Ltd. ([INFY](#)): "Just like China drove down costs in manufacturing and Wal-Mart ([WMT](#)) in retail," he says, "India will drive down costs in services."

But deflation will also mean plenty of short-term pain for U.S. companies and workers who never imagined they'd face foreign rivals. Consider America's \$240 billion IT-services industry. Indian players led by Infosys, Tata, and Wipro got their big breaks during the Y2K scare, when U.S. outfits needed all the software help they could get. Indians still have less than 3% of the market. But by undercutting giants such as Accenture, IBM, and Electronic Data Systems ([EDS](#)) by a third or more for software and consulting, they've altered the industry's pricing. "The Indian labor card is unbeatable," says Chief Technology Officer John Parkinson of consultant Cap Gemini Ernst & Young. "We don't know how to use technology to make up the difference."

### **Wrenching Change**

Many U.S. white-collar workers are also in for wrenching change. A study by McKinsey Global Institute, which believes offshore outsourcing is good, also notes that only 36% of Americans displaced in the previous two decades found jobs at the same or higher pay. The incomes of a quarter of them dropped 30% or more. Given the higher demands of employers, who want technicians adept at innovation and management, it could take years before today's IT workers land solidly on their feet.

India's IT workers, in contrast, sense an enormous opportunity. The country has long possessed some basics of a strong market-driven economy: private corporations, democratic government, Western accounting standards, an active stock market, widespread English use, and schools strong in computer science and math. But its bureaucracy suffocated industry with onerous controls and taxes, and the best scientific and business minds went to the U.S., where the 1.8 million Indian expatriates rank among the most successful immigrant groups.

Now, many talented Indians feel a sense of optimism India hasn't experienced in decades. "IT is driving India's boom, and we in the younger generation can really deliver the country from poverty," says Rhythm Tyagi, 22, a master's degree student at the new Indian Institute of Information Technology in

Bangalore. The campus is completely wired for Wi-Fi and boasts classrooms with videoconferencing to beam sessions to 300 other colleges.

That confidence is finally spurring the government to tackle many of the problems that have plagued India for so long. Since 2001, Delhi has been furiously building a network of high-ways. Modern airports are next. Deregulation of the power sector should lead to new capacity. Free education for girls to age 14 is a national priority. "One by one, the government is solving the bottlenecks," says Deepak Parekh, a financier who heads the quasi-governmental Infrastructure Development Finance Co.

### **Future Vision**

India also is working to assure that it will be able to meet future demand for knowledge workers at home and abroad. India produces 3.1 million college graduates a year, but that's expected to double by 2010. The number of engineering colleges is slated to grow 50%, to nearly 1,600, in four years. Of course, not all are good enough to produce the world-class grads of elite schools like the IITs, which accepted just 3,500 of 178,000 applicants last year. So there's a growing movement to boost faculty salaries and reach more students nationwide through broadcasts. India's rich diaspora population is chipping in, too. Prominent Indian Americans helped found the new Indian School of Business, a tie-up with Wharton School and Northwestern University's Kellogg Graduate School of Management that lured most of its faculty from the U.S. Meanwhile, the six IIT campuses are tapping alumni for donations and research links with Stanford, Purdue, and other top science universities. "Our mission is to become one of the leading science institutions in the world," says director Ashok Mishra of IIT-Bombay, which has raised \$16 million from alumni in the past five years.

If India manages growth well, its huge population could prove an asset. By 2020, 47% of Indians will be between 15 and 59, compared with 35% now. The working-age populations of the U.S. and China are projected to shrink. So India is destined to have the world's largest population of workers and consumers. That's a big reason why Goldman, Sachs & Co. ([GS](#)) thinks India will be able to sustain 7.5% annual growth after 2005.

Skeptics fear U.S. companies are going too far, too fast in linking up with this giant. But having watched the success of the likes of GE Capital International Services ([GE](#)), many execs feel they have no choice. Inside GECIS' Bangalore center -- one of four in India -- Gauri Puri, a 28-year-old dentist, is studying an insurance claim for a root-canal operation to see if it's covered in a certain U.S. patient's dental plan. Two floors above, members of a 550-strong analytics team are immersed in spreadsheets filled with a boggling array of data as they devise statistical models to help GE sales staff understand the needs, strengths, and weaknesses of customers and rivals. Other staff prepare data for GE annual reports, write enterprise resource-planning software, and process \$35 billion worth of global invoices. Says GE Capital India President Pramod Bhasin: "We are mission-critical to GE." The 700 business processes done in India save the company \$340 million a year, he says.

Indian finance whizzes are a godsend to Wall Street, too, where brokerages are under pressure to produce more independent research. Many are turning to outfits such as OfficeTiger in the southern city of Madras. The company employs 1,200 people who write research reports and do financial analysis for eight Wall Street firms. Morgan Stanley ([MWD](#)), J.P. Morgan ([JPM](#)), Goldman Sachs ([GS](#)), and other big investment banks are hiring their own armies of analysts and back-office staff. Many are piling into Mindspace, a sparkling new 140-acre city-within-a-city abutting Bombay's urban squalor. Some 3 million square feet are already leased to Western finance firms. By yearend, Morgan Stanley will fill several floors of a new building.

For Silicon Valley startups, Indian engineers let them stretch R&D budgets. PortalPlayer Inc., a Santa

Clara (Calif.) maker of multimedia chips and embedded software for portable devices such as music players, has hired 100 engineers in India and the U.S. who update each other daily at 9 a.m. and 10 p.m. J.A. Chowdary, CEO of PortalPlayer's Hyderabad subsidiary Pinexe, says the company has shaved up to six months off the development cycle -- and cut R&D costs by 40%. Impressed, venture capitalists have pumped \$82 million into PortalPlayer.

### **More Bang for the Buck**

Old economy companies are benefiting, too. Engine maker Cummins plans to use its new R&D center in Pune to develop the sophisticated computer models needed to design upgrades and prototypes electronically. Says International Vice-President Steven M. Chapman: "We'll be able to introduce five or six new engines a year instead of two" on the same \$250 million R&D budget -- without a single U.S. layoff.

The nagging fear in the U.S., though, is that such assurances will ring hollow over time. In other industries, the shift of low-cost production work to East Asia was followed by engineering. Now, South Korea and Taiwan are global leaders in notebook PCs, wireless phones, memory chips, and digital displays. As companies rely more on IT engineers in India and elsewhere, the argument goes, the U.S. could cede control of other core technologies. "If we continue to offshore high-skilled professional jobs, the U.S. risks surrendering its leading role in innovation," warns John W. Steadman, incoming U.S. president of Institute of Electrical & Electronics Engineers Inc. That could also happen if many foreigners -- who account for 60% of U.S. science grads and who have been key to U.S. tech success -- no longer go to America to launch their best ideas.

Throughout U.S. history, workers have been pushed off farms, textile mills, and steel plants. In the end, the workforce has managed to move up to better-paying, higher-quality jobs. That could well happen again. There will still be a crying need for U.S. engineers, for example. But what's called for are engineers who can work closely with customers, manage research teams, and creatively improve business processes. Displaced technicians who lack such skills will need retraining; those entering school will need broader educations.

Adapting to the India effect will be traumatic, but there's no sign Corporate America is turning back. Yet the India challenge also presents an enormous opportunity for the U.S. If America can handle the transition right, the end result could be a brain gain that accelerates productivity and innovation. India and the U.S., nations that barely interacted 15 years ago, could turn out to be the ideal economic partners for the new century.

By Manjeet Kripalani and Pete Engardio  
With Steve Hamm in New York

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