



Infosys: Maintaining an Edge

In Mysore, India, on one of the world's largest corporate campuses, 3,000 employees of Infosys Technologies, Limited watched, waited, and cheered. Chairman N.R. Narayana Murthy had just pressed an orange button on his podium. On cue, half a world away, trading commenced on the NASDAQ.

July 31, 2006, marked both the company's 25th anniversary and the first time a company rang the NASDAQ's opening bell from Asia. It was symbolic of a world economy transformed. Addressing the throng of Indian engineers, whose presence set an attendance record, NASDAQ President and CEO Bob Greifeld declared, "The real story of Infosys is not in numbers but in how it has changed the world. Infosys has defined what it means to be in the 'flat world.'"

Standing next to Mr. Murthy on the podium was Kris Gopalakrishnan, COO of Infosys and one of its founders. Basking in the festivity and jubilation of the moment, he recalled other major milestones in the company's history. In particular, Infosys had pioneered the concept of developing custom software for corporate clients from remote locations, where talented engineers earned substantially lower wages.

Infosys's meteoric rise was legendary in India. Mr. Gopalakrishnan was well aware, however, that Infosys could not rest. The success of the model drew imitators. In addition to Indian competitors Wipro and Tata Consultancy Services, big American firms such as IBM and Accenture were working day and night to match Infosys's strengths. Given the speed at which knowledge diffused in an interconnected world, Mr. Gopalakrishnan wondered what innovation initiatives should top the company's agenda. How could Infosys maintain its edge?

As Mr. Murthy's retirement was only weeks away, it would be up to CEO Nandan Nilekani, Mr. Gopalakrishnan, and four other founders to write Infosys's next chapter.

A Brief History of Business Computing

Companies began using computers in the 1950s. The first computers, mainframes, were bulky and expensive but were able to store and process large quantities of data. At first, only departments with heavy data-processing needs, particularly accounting departments, could justify the cost. Companies bought some standardized software for their mainframes, but most also developed proprietary software to tailor their information

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systems to their specific business needs. A commercial bank's software, for example, needed to be radically different from that of a hospital.

By the 1980s, computers were getting much cheaper and smaller. Personal computers were less versatile than mainframes but offered improved efficiency for a variety of everyday office tasks, such as word processing. As a consequence, the relatively "dumb" terminals that users operated to access mainframes were gradually replaced by personal computers.

Industry analysts began surmising the death of mainframes in the early 1990s as personal computers gained power. Mainframes did not disappear, however, because they were more reliable and secure than personal computers. Mainframes were designed for continuity; they could be maintained and repaired without interrupting normal operations.

Beyond getting smaller, cheaper, and more powerful, computers also became more interconnected. Computer networking promised tremendous productivity gains. Mainframes had automated the *storing*, *processing*, and *retrieving* of information generated by business processes, but not the *sharing* of information. Consequently, as work wound through the value chain, workers faced the onerous task of manually transferring information from one system to the next, often by printing and retyping.

As the costs of networking equipment and global telecommunications links plummeted, companies invested tremendous sums in integrating their mainframes, servers, and personal computers to work seamlessly as a single system. Global corporations aspired to construct single global networks, with customers and employees connecting via the Internet from most anywhere.

The Rise of the Information Technology Services Industry

The complexity of developing, maintaining, and upgrading these seamless global information systems propelled explosive growth in the information technology (IT) services industry. Companies maintained full-time computer engineering teams but often looked for additional help. The case for hiring outside IT services firms was particularly strong for large one-time projects that exceeded the in-house team's capacity. IT services firms were practiced in the management of complex projects—it was their bread and butter—while in-house teams focused more on day-to-day responsibilities. In addition, IT services firms offered up-to-date knowledge that was attractive to companies that found it difficult to recruit and retain the most talented experts in cutting-edge technologies.

The IT services industry provided a wide range of offerings, among them custom software development, advice on hardware purchases, installation of new systems, and business process redesign. Companies generally engaged IT services firms through multiyear contracts to ensure continuity from one project to the next.

Because implementing an IT system affected many aspects of a business, IT services firms sent teams to work nearly full-time at the client site. Proximity to the client was particularly important in the design phase of a project because writing technical specifications required intensive client input. Proximity was also important during testing and installation because both required a great deal of interfacing with existing systems.

The Rise of Infosys: 1981–2001

In 1981, Mr. Murthy saw an opportunity to provide high-quality IT services at low cost by employing talented but lesser-paid engineers from India to serve clients in the developed world. He launched Infosys Technologies Limited with only 10,000 rupees (about US\$1,000 at that time), pooled from his family and six co-founders. The founding team had one aspiration: “to become the most respected company in the world.”

In the early years, Mr. Murthy faced tough hurdles. Infosys waited for a full year for government permission to purchase the company’s first computer, for example. In addition, Mr. Murthy and his colleagues traveled great distances to work side by side with their clients, who were mostly located in the United States.

Infosys maintained and updated its clients’ mainframe systems as their businesses and IT requirements evolved. The company competed directly with U.S.-based companies, but at a substantial discount. Sometimes, large clients contracted with a major U.S. IT-services firm and that firm subcontracted part of the work to Infosys. Infosys’s first customer was Data Basics Corporation in New York.

The concept of working with an IT services firm based in India was new to Infosys’s clients. Infosys had to establish credibility first by demonstrating its capabilities maintaining systems that were not mission critical. After Infosys had thus proved itself, clients began asking the company to handle more critical tasks and to take on the development of custom software applications from scratch. (See Exhibit 1 for a fuller description of Infosys’s services.) As Infosys took on more and more critical work, its profit margins rose.

To reduce the cost of travel and leverage a vast pool of talented, technologically savvy, English-speaking engineers in India, Infosys began to experiment with a radical notion. The company began moving some of the project work from the client site to distant India. Early attempts at what Infosys later called its global delivery model (GDM) achieved only limited success. Data links between the United States and India were essentially unavailable, so Infosys sent software code back and forth by courier and fax. Because clients demanded tight timelines, Infosys teams could not simply remain idle during communication delays. Programmers on site and in India worked on the same software application in parallel. Ensuring that the portions of code developed in each location were consistent and interoperable was difficult.

Shifting work offshore was nearly impossible during the testing phase of a software development project. Tests needed to be conducted on the client’s mainframes, and testing required multiple iterations. In some cases, Infosys tried to work around the problem by duplicating client systems in India, but this method presented its own complexities. The company was practiced in operating mainframe simulators on PCs (in its early years, the company could not afford a mainframe), but the simulations were never perfect.

Infosys established its first direct communications link to the United States in 1989, which was timely. U.S. visas were becoming harder to acquire. Without a GDM, Infosys would not be able to grow. In the early 1990s, conditions changed dramatically in the company’s

favor. India's government began a fast-paced deregulation of its economy. The frequency of Mr. Murthy's trips to visit government offices in Delhi to acquire permits illustrated the dramatic nature of the change: he made over 200 visits in the 1980s; he made 1 the following decade.

After deregulation, telecommunications companies made massive investments in communications links from the rest of the world to India. Costs of using these links declined dramatically, and the economic potential of Infosys's GDM shone. Suddenly, it was possible to send software back and forth in the blink of an eye. Infosys could connect to mainframes in the United States from terminals in India, and this enabled a new range of services to be delivered remotely, including ongoing maintenance and user support.

Subu Goparaju, by 2006 the head of Infosys's R&D unit, was one of the first to experience the full potential of the GDM in the early 1990s. He recalled an early project:

We had won a breakthrough project with GE Appliances, one of the biggest projects we had ever worked on. It was one of the first corporate migrations from mainframes to client-server architectures based on Oracle databases. It was my first project in which most of the team—75 percent—was based in India. On the client site, we worked around the clock. Some of us slept during the day, some at night. Because email systems were still primitive, we were constantly on the phone to India, clarifying specifications and running tests. In the end, we hit some ambitious targets and a very tight timeline.

Mr. Murthy described the GDM basic philosophy:

The GDM is a model that splits a large task into multiple subtasks in two categories: activities that have frequent interaction with customers, and activities that have little. Activities that have frequent interaction are necessarily delivered on site, and activities that have little customer interaction are delivered from remote, scalable, process-driven, talent-rich, technology-based, cost-competitive development centers in countries like India.

Mr. Murthy and his colleagues dedicated themselves to achieving complete mastery of the GDM. In particular, they worked to embed knowledge about the GDM in the company's formal systems and processes. This was important to ensure the company maintained its low costs and high quality even as it grew rapidly.

Despite the GDM's ability to dramatically reduce costs, many clients were apprehensive. Part of their fear was rooted in the complications of dealing with a foreign, unfamiliar culture 12 time zones away. Additionally, the GDM upset the long-established—and comfortable—tradition of IT services professionals working on site.

Nonetheless, the GDM soon became a formidable competitive advantage. In fact, it even delivered an unanticipated benefit. Clients were more aware of the necessity to be precise about their requirements, and this improved a software development project's efficiency regardless of where the code was written. Infosys's growth continued through the 1990s, a decade in which the company passed a number of milestones—going public in 1993,

opening the first Europe-based sales, and winning contracts for developing mission-critical software for such high-profile companies as Nordstrom and Nortel. Infosys also began to tackle more complex projects than software development, helping clients manage their transitions from mainframe systems to modern new-technology platforms.

By the late 1990s, Infosys's credibility was firmly established, and the "Y2K" frenzy and the Internet boom drove a dramatic growth spurt. From 1998 to 2001, revenue grew at over 80 percent per year. In 1999, Infosys hired its 3,000th employee and became the first India-registered company to be listed in the NASDAQ. Its revenue that year reached \$100 million.

Infosys's strategy of competing on cost in the North American market was proving powerful indeed.

People and Values

Rapid growth demanded rapid hiring. Fortunately, Infosys was voted the best managed company by *Asiamoney* every year from 1996 to 2000. This and other accolades gave Infosys an unparalleled reputation as a premier employer in India. The company received so many job applications that it was able to hire only a small percentage of applicants, attracting India's top talent. Mr. Murthy reflected,

The biggest challenge for a knowledge company like Infosys is to recruit, enable, empower, and retain the best and the brightest talent. We realized long ago that we had to make a compelling value proposition to our employees, just as we did for our customers.

In addition to looking for strong technology skills, Infosys hired people that it believed had the capacity to continue learning. The founders had experienced the necessity of ongoing learning as their own roles morphed from software programmers to managers of a global service empire. The company recognized the related importance of humility. As one Infosys executive pointed out, "If you aren't humble, you aren't open to learning."

Mr. Murthy defined "learnability" as "the ability to extract generic inferences from specific instances and use them in new, unstructured situations." Infosys employees had to constantly learn new skills in order to adapt to the rapidly changing technology landscape. Furthermore, because the company was growing so rapidly, new hires could expect to take on managerial responsibilities quickly. Infosys invested heavily in initial training and education and required that each employee undergo a certain number of hours of training every year.

Mr. Murthy believed the company's values earned it admiration. "Powered by Intellect, Driven by Values" was the company's slogan. Mr. Murthy explained one core value that he believed helped keep the founding team together for so long:

We have always believed in putting the interest of the company higher than our personal interests because we have realized that doing so would indeed benefit us personally in the long term.

Working in India while serving clients in the United States revealed the importance of establishing a foundation of values that were universal across cultures. Mr. Murthy believed that for any company, there were five “context-invariant and time-invariant attributes” that lay the foundation for success:

The first is openness—openness to new ideas in an environment of pluralism, and subordinating individual egos to accept better ideas from others. The second is meritocracy—making sure that the best idea is selected in everything that we do; making sure that all discussions are based on data, facts, and logic, and not on emotions or past precedent. As I like to say, “In God we trust; everyone else must come with data.” Third is speed. We have to do things faster today than yesterday, last month, last quarter, and last year. Fourth is imagination. Are we bringing better ideas and more ideas to the table than yesterday? Fifth is excellence in execution. Ideas have no value unless they can actually be executed and implemented well and then improved so that we are constantly delivering at higher levels of customer satisfaction and employee satisfaction.

The leadership team adopted several strategies for perpetuating the company’s values. They talked about them constantly. But as the organization grew, the leaders adopted more powerful approaches. They shared case studies about the company at its best and ensured that the stories were told and retold by others. They also adopted symbols. For example, a statue of the Hindu god of learning graced the entrance to corporate headquarters. Most important, the leadership team recognized that values are sustained within a large organization only when the leaders model the values through their own actions and decisions.

Infosys was one of the most respected companies in India, and Mr. Murthy a business icon. Nonetheless, he remained modest and dedicated to lifelong learning, as reflected by his many speeches, including a 2007 graduation address at New York University (see Exhibit 2).

Motivation

Having penetrated an extremely selective hiring process and landed a job with one of the most prestigious firms in India, Infosys employees carried plenty of intrinsic motivation. Nonetheless, in addition to salary, each employee who delivered projects to clients was offered a bonus that was based on project performance assessed by time, cost, and quality factors. Company performance also figured into the bonus formula, though Infosys suspended new grants of employee stock options in 2004 when U.S. accounting regulations required that stock options be expensed when granted.

Additionally, the company offered formal “excellence awards” for outstanding projects. Mr. Murthy also believed that Infosys’s organizational structure, which featured a large number of small business units, kept people feeling empowered.

One senior executive, however, emphasized external motivators. Infosys employees took on extremely difficult schedules, often working through the night because of the GDM. The motivation to take on such a difficult schedule was an unprecedented opportunity for

impact. India was a poor country, and the preceding generations did not have as great an opportunity to make a mark on the country's development.

Organizational Structure

Infosys's origin was in software applications development and maintenance. Three-fourths of revenues were still derived from this kind of work by the end of the 1990s even though the company had added new capabilities.

Software programmers who wrote custom applications for corporations were able to leverage past experience most effectively if they concentrated on one industry. To achieve these economies of experience, the primary organizational construct within Infosys was the industry business unit (IBU). In the early years, an IBU might serve only one customer.

The company assigned new employees to an IBU and they tended to stay there for several years. Through several promotions, an employee could reach the position of account manager, earning responsibility for maintaining relationships with clients, ensuring client satisfaction, and selling additional work. Projects sold most readily through long-term trust-based relationships, so lengthy tenure within a single IBU was sensible for sales, just as it was for delivery.

An account manager partnered with a delivery manager in managing a client relationship. The delivery manager focused on day-to-day client interactions and also managed one or several project managers, each responsible for defining, planning, and executing specific projects (see Exhibit 3).

Infosys briefly experimented with organizing by geography in 1999 but by 2001 had returned to a structure in which the IBU was the primary organizational unit. (A small number of IBUs remained geographic units, such as the Asia Pacific IBU. There was not enough business in this region for division along industry lines.)

Beyond 2001—Further Ambitions

By 2001, Infosys's GDM had come a long way. To stay in constant communication with all of its clients, Infosys had built its own redundant hub-and-spoke network, with numerous dedicated lines between India and the United States. Telecommunications had become so cheap that it was no longer a significant part of the company's cost equation. The Internet, despite security concerns, was bringing costs down even further.

Instantaneous connections enabled expansion of services. For example, Infosys offered software maintenance service (frequent small-scale software upgrades) with little face-to-face interaction. Maintenance agreements mandated rapid response times for urgent needs. With its advanced network infrastructure, Infosys could respond to critical maintenance needs immediately anywhere in the world.

At \$414 million in revenues (fiscal year ending March 2001), Infosys was still a mere flea gnawing at the tails of big dogs like Accenture and IBM. The company was also still challenged by a perception that the quality of its services was lower than that of its U.S.-

based rivals. Infosys executives pointed out that an impartial industry association, the Software Engineering Institute, had examined their firm's processes and accorded Infosys the highest possible capability maturity rating. Some also felt that part of the perception was driven by unfamiliarity and discomfort with working with a company based so far away, adding that "those who have actually worked with Infosys perceived the gap to be much lower."

Even at only \$414 million, Infosys had established sufficient market presence to talk credibly about becoming one of a handful of dominant IT services firms in the world. One Infosys executive believed that in the "endgame" for the IT services industry, there would only be six or seven global players. Infosys expected to be one of them.

The management team believed that each of these six or seven players would offer a full spectrum of IT services across every industry in the economy. Aditya Nath Jha, the head of corporate marketing, put Infosys's competitors in three categories: those that had their roots in infrastructure outsourcing, like IBM and Electronic Data Systems; those that had their roots in process design and consulting, like Accenture and Deloitte Consulting; and Indian rivals with roots in applications development delivered through a GDM, such as Tata Consultancy Services and Wipro. Although there were overlaps in these categories, companies in one category traditionally had competed mainly with those in their own space. However, things were changing rapidly as each sought to expand its capabilities. Mr. Jha believed all of them probably would compete head-to-head eventually.

Infosys's big advantage was cost, but that advantage would erode in time under pressure from two trends. The first was rising wages in India. Infosys could not count on the seemingly inexhaustible supply of labor to last forever. Eventually, the demands of the burgeoning IT industry in India would outstrip the ability of India's universities to produce software engineers.

The second trend, which accelerated the first, was United States competitors building their own development centers in lower-cost countries, including India. This would take time. Companies such as IBM could not simply adopt the GDM overnight because they were accustomed to operating without much interaction across geographic offices. Mr. Jha elaborated:

There are complexities to operating not only across vast distances but across vastly different cultures. We've perfected the GDM through many years of experience. We know no other way of working. Beyond this, established players from the developed world face an even bigger barrier. Recent reports have shown that if they add 10,000 employees in India, they have to lay off 10,000 people in some other geography. That would be extremely traumatic. It would make it that much harder indeed for the people on both sides to work together.

These trends would play out slowly over a period of several years. Nonetheless, as Infosys plotted its path to becoming one of the dominant global IT-services providers, initiatives to improve productivity preoccupied the senior management team. Only with dramatic improvements in productivity could Infosys remain competitive.

The most frequently discussed measure of productivity at Infosys was not labor-hours per unit of work, but revenue per employee—a broader measure. The Infosys senior management team held a fundamental belief that for the company to be successful in the long run, it had to decouple growth in revenues from growth in head-count. In other words, revenue per employee had to go up dramatically. In 2001, Infosys generated \$43,000 per employee. At that level, Infosys would have to grow from 10,000 employees to 300,000 employees to match Accenture's 2001 revenues of \$13 billion. (Accenture employed 75,000 people that year.) Eventually, so great a head-count would become unmanageable.

Infosys's overarching strategic imperative was to raise revenue per employee, either by increasing productivity or by increasing price. A rise in productivity, either in selling or delivering services, would enable the company to sell and deliver more work without hiring more employees. In Infosys's competitive market, raising prices would be difficult without offering greater value. Infosys could either launch new, higher-value services that commanded a higher price or offer greater value through better integration of multiple services.

More effective integration of services was valuable because coordinating the efforts of multiple service providers proved a perpetual headache for corporate IT executives who purchased IT services. There were inevitable inefficiencies and misunderstandings at handoffs between consultants, applications developers, and hardware services providers. In addition, handoffs allowed each service provider to avoid accountability. Thus, the first competitor able to offer seamless, integrated, end-to-end services and take full accountability for delivering the promised results would be able to command a hefty price premium. In Mr. Murthy's words, such a company would "connect the boardroom to the boiler room." A single company that could do it all offered unprecedented value.

But what did "doing it all" entail? The hypothetical company that could provide end-to-end services would start with a management consulting team that could reassess strategy, redesign a client's operations for executing the strategy, and write the specifications for the IT systems that would make the newly redesigned operations as efficient as possible. The same company would continue by developing, testing, and installing the necessary new software applications and helping the clients make the right enhancements to their IT infrastructures. Then, the same company would maintain the software and hardware systems as the client company evolved or even accept a contract for executing certain ongoing processes, such as transaction processing or call-center operations.

As of 2001, Infosys's senior management team did not believe there was a single company that could do it all. Infosys intended to be the first. It was a whale of an ambition. High-quality end-to-end services delivered with a GDM was the holy grail of the IT services industry. To get there, Infosys would have to dramatically expand the range of services it offered and smoothly integrate them all.

Thus, Infosys's innovation agenda boiled down to two core activities: improving productivity, and launching new well-integrated services.

As Infosys's ambitions cemented, the IT industry faced an unprecedented downturn. The explosive rise of technology stock prices that drove the first major wave of investment in the Internet abruptly halted and reversed in 2001. Companies stopped asking IT departments to launch new growth initiatives and asked them instead to cut costs.

Although every other corner of the IT industry suffered, this sudden change played right into the strengths of Infosys and its Indian rivals. Infosys's rapid growth continued for several more years. While contending with the challenges of rapid growth, Infosys launched or redoubled its investment in several initiatives to strengthen the organization and deliver on its innovation agenda.

Technical Backbone of the Innovation Engine—R&D

In 1999, at a time when Infosys's revenues were just over \$100 million, the company established an R&D group known as the Software Engineering and Technologies Laboratories (SETLabs). One of the group's core objectives from launch was to leverage technology advances to generate significant gains in Infosys's productivity in delivering projects. For example, SETLabs created a software toolkit, known as InFlux, that facilitated the process of partnering with clients to understand and improve business processes.

As Infosys's growth ambitions expanded, so did SETLabs' mission. The group soon adopted a goal of providing thought leadership on advancements in technology that could guide clients in their technology investment decisions. SETLabs published a quarterly journal, and members of the group presented and published at industry conferences. In addition, SETLabs began investigating possibilities for creating technology platforms to launch new services.

Infosys judged SETLabs' effectiveness based on long-term metrics tied to each of its three goals. It monitored SETLabs' contribution to productivity, its influence on revenue growth, and the number of patents and publications generated.

SETLabs grew to 300 employees and 1 percent of Infosys's budget by 2006. Most employees had both industry experience and a PhD and were interested in building careers in applied research. Deependra Moitra, a senior leader in the group, described SETLabs as a "business-relevant R&D organization," one that was closely connected to IBUs and customers, and one that only took interest in projects that were IT services related.

SETLabs established priorities by considering major trends in the evolution of the IT services industry, with input from their own industry intelligence; conducting dialogues with partners, such as Microsoft and Oracle, and conversations with industry analysts; and gathering feedback from an internal technology council composed of 35 technology leaders from each of Infosys's business units. Based on these inputs, SETLabs allocated funds to each of several major research themes. The central theme in SETLabs' work was making business processes and IT infrastructures more agile so they could be more readily modified as business conditions changed. SETLabs categorized projects in five related sub-themes, such as "dynamic processes" and "malleable architecture."

SETLabs maintained client connections through several mechanisms, such as joining with IBU leaders to sponsor customer visits to Infosys's campuses. And senior SETLabs leaders traveled extensively to meet directly with clients. Mr. Moitra visited 16 clients on a six-week tour in 2006, for example. In addition, Mr. Goparaju, head of SETLabs, reported to S.D. Shibulal, head of worldwide sales and delivery and one of the founders of the company. Furthermore, the unit established advisory boards made up of client-facing leaders for specific research efforts.

SETLabs funded individual projects based on detailed business cases. Because each IBU had its own small unit that worked on productivity tools, SETLabs funded more cross-industry projects than industry-specific ones. To help each IBU with its own projects, SETLabs assigned "IBU champions" who constantly fielded questions.

SETLabs did not fund projects of greater than 18 months' duration. "That would defeat the purpose of business-relevant R&D," explained Mr. Moitra. Mr. Goparaju elaborated:

We are primarily in the business of finding innovative applications of existing technologies, rather than creating new technologies.

The SETLabs management team reviewed projects monthly and conducted formal assessments twice per year, during which each project could be sustained, redirected, or discontinued based on previously agreed-upon goals and milestones. An average project involved 15 people, a large one as many as 60.

When SETLabs developed new tools that significantly increased Infosys's productivity in delivering services, it also took responsibility for catalyzing the adoption of these tools within each business unit. SETLabs built an internal marketing, training, and consulting team, composed primarily of top MBA-school graduates, for this purpose at a cost of 20 percent of SETLabs' budget. The teams worked with IBUs in their early attempts to use new tools, often working side by side with delivery teams on client projects. In this manner, SETLabs gathered feedback and developed ideas for improvements. When the tools had matured, SETLabs partnered with Infosys's quality department and training groups to embed the new tools in the company's core processes.

Managerial Backbone of the Innovation Engine—The Planning Process

As the Infosys organization became more complex, its management processes evolved, with a focus on both operational excellence and innovation. By 2006, Infosys managed its business through concurrent, integrated plans with three different time horizons—one year, three years, and five years—developed both within business units and at the corporate level. Online-planning tools integrated the planning processes, ensuring internal consistency across units and time horizons.

At the beginning of the annual planning cycle, the senior executive team developed a five-year plan that established a long-term vision and growth aspiration for the company. The plan was based on a specified set of assumptions about fundamental forces of change—changes in technology, client behavior patterns, and the global economy. Sanjay Purohit, the director of strategic planning, elaborated:

We work very hard to make the five-year aspiration achievable. We always are revisiting assumptions and recognize that linear extrapolation is invariably a bad assumption.

The company reviewed the assumptions each year. Mr. Nilekani believed that one common reason companies stumbled was they held onto a fixed set of assumptions for too long.

In addition to examining a wide range of market data, the senior management team asked for input from multiple parties, including a client advisory council of 12 handpicked chief information officers from a core group of Infosys's clients. One Infosys executive described the group as "people who are friends of Infosys, people who believe in us, and people who do not mince words." Each year, Infosys also named a group of nine high performers under the age of 30 to participate in eight senior-management meetings throughout the year. This Voices of Youth program was intended to improve the opportunity for great ideas from anywhere in the company to get visibility from top levels.

Heads of business units wrote three-year plans that specified the multiyear actions necessary to achieve the five-year aspiration. Three-year plans began with a market analysis. What were the major market forces? What were likely competitive actions? How strong was the existing account portfolio, and what could be done to expand it? Three-year plans laid out financial and nonfinancial goals and identified the investments and initiatives required to achieve these goals, including major marketing thrusts, pricing strategies, potential acquisitions, and recruiting plans. Finally, the plans included an analysis of risks to the business.

Three-year plans were consolidated at the corporate level. If there were inconsistencies between the aggregated three-year plans and the five-year plans, the corporate team either renegotiated the three-year targets with business unit heads or identified new growth opportunities outside the existing business units.

Each business unit also crafted one-year plans, consistent with its three-year plans. The one-year plans were tactical and included exact budgets and revenue targets. They were formally reviewed and revised quarterly and were rolling, so that the one-year plan always reflected expectations for the next four quarters. In addition, business unit heads met less formally by teleconference every two weeks to update plans and the latest estimates for the current quarter.

The company ensured there was a closed learning-loop associated with each plan. Post-action reviews were the forums for evaluating both managerial performance and business lessons learned. Prior to each operating review, Infosys's strategic planning team went to great lengths to provide thorough data on business results to each manager participating in the review. That way, the team used valuable meeting time only to discuss actions and outcomes, as opposed to speculating where data was missing.

Managers were expected to deliver results equal to projections in their plans. Every operation was expected to be "PSPD"—predictable, sustainable, profitable, and de-risked.

The company measured forecast accuracy and maintained tight standards. Mr. Purohit elaborated:

By the time we get down to quarter-to-quarter reviews, there really is no such thing as not making your number. The fundamental principle is predictability. There is more leeway in the annual numbers, provided you keep updating your targets.

The company relaxed its expectations of predictability for innovative new services. In addition, Infosys shifted the metrics it monitored. While established services would focus on such metrics as revenue predictability, quality, process stability, and profitability, new services would focus most on revenue productivity. The company had observed that new services that gained traction always demonstrated an upward trend in revenue productivity. Mr. Nilekani, CEO, added,

Over 40 percent of our revenue comes from services launched in the last few years. They lost money at first. There are always risks for new services, and yet we want to make sure that our best managers lead new service launches rather than caring only about revenues under management.

At the corporate level, Infosys monitored several metrics that were proxies for innovation, including fraction of revenues coming from new services and fraction of revenues coming from solutions.

The Productivity Engine

Infosys pursued multiple paths to higher productivity. For example, the company was organized with an eye towards productivity, keeping employees within the same IBU indefinitely so they could accumulate experience and become more efficient. In this manner, more senior employees could also leverage long-term client relationships in follow-on sales efforts.

Infosys also went to great lengths to document its processes for software development. The company measured and improved—and then measured and improved some more. Infosys became skilled at predicting how long each new project should take based on past experience, then routinely set expectations for project teams a bit higher to motivate each project manager to find innovative ways to get the job done more quickly. In addition, each project team challenged itself to increase the fraction of work that was performed offshore. Although this did not reduce labor-hours, it did reduce costs.

Putting pressure on programmers to write code quickly increased the incidence of errors. Finding ways to reduce re-work by catching errors, especially critical errors, sooner in the process also improved productivity. Sometimes, this could be achieved through clever scheduling—by assigning the best programmers to the most foundational elements of an application and testing those modules early in the process. Infosys also purchased testing tools from outside software companies to improve error correction, including one tool that generated test data that enabled performance of a newly developed application to be evaluated across a wide range of test cases.

Another powerful avenue for increasing productivity was increasing reuse of past work. Infosys invested heavily in its knowledge management system. Through it, the company's programmers could find similar problems that past project teams had tackled and occasionally borrow templates, frameworks, or even modules of code.

When opportunity for reuse was particularly high, Infosys went beyond documenting projects in its knowledge management system and developed "solutions": software tools or modules, along with documentation, that project teams could customize to specific client needs. Infosys established a solutions group within each of its business units. One such group employed 100 of an IBU's 5,300 employees, working on 11 simultaneous projects in 2006. The solutions groups functioned as incubation centers and took innovative ideas that had been used in specific projects and tried to generalize them to apply more broadly. IBU leads approved solutions projects based on a cost-benefit analysis. Typical projects involved 10 to 20 people for three to six months. IBU solutions boards expected results within one year.

Infosys assigned one senior executive the task of minimizing duplication of effort across IBUs and ensuring that IBU solutions teams followed similar methodologies. A corporate solutions board evaluated particularly large projects that were expected to take more than one year to complete and had cross-industry applicability. One such project examined possibilities for applying radio frequency identification (RFID) technologies for inventory and logistics automation, especially in retail and healthcare.

In addition to making it convenient to reuse past efforts, Infosys endeavored to automate the process of developing new software by creating software for its own software developers. For example, the InFlux tool, developed by SETLabs, improved speed and reduced error rates in the front end of the development process when Infosys needed to agree with a client on the specific and detailed requirements for a new custom software application. Historically and across the industry, misunderstandings in this early stage of client engagement were common. InFlux provided a common visual language to which programmers and businesspeople from both Infosys and the client company could easily relate. Additionally, Infosys developed a "rapid development toolkit," which could convert visual process diagrams into code in certain scenarios, and a rapid development framework for Java programming, known as Radian.

By 2006, Infosys had begun to explore the possibility of departing from the established model of one project team for one client and assigning single teams to serve multiple clients. This could be particularly powerful, for example, for a group of clients who all needed similar systems maintained. This "next level of optimization" suffered from confidentiality concerns, however.

For further information, see follow-on case study "Improving Productivity at Infosys."

The New Services Engine

In 2001, to energize service-line expansion, Infosys reorganized, adopting a matrix structure. IBUs continued to manage client relationships and deliver most projects, but the company added a second kind of business unit, known as an enterprise capability unit

(ECU). While IBUs housed expertise within a specific industry, ECUs built deep expertise in capabilities that had applicability across many industries. As one part of the reorganization, an existing competence area in implementing off-the-shelf software packages from companies such as Oracle and SAP was formalized as a new ECU, called enterprise solutions (ES). Infosys assigned employees to either an IBU or ECU for multiple years to deepen their expertise in either an industry or a cross-industry capability.

ECUs did not sell directly to clients. Instead, the ECUs maintained small sales teams that worked directly with Infosys's IBU-based account managers. When account managers spotted an opportunity to sell an ECU-based service to a client, they called on the support of the ECU sales group.

ECU sales teams could not initiate a sales call without following an approval process. Although this approach ensured uniformity of communication with the client's management, it also constrained the ability of an ECU to sell new services. One ECU senior manager remarked,

The IBU sales team may not be interested in new ideas that initially require a lot of sales effort. They are swamped by work. So you have to communicate the positive aspects of a new service to attract the IBU sales team and push them to get business.

The new structure also created some internal tensions as ECUs and IBUs competed to attract the best new employees. To ensure both types of business units worked towards common objectives, Infosys established interlocking ECU and IBU sales targets, broken out by account. ECU revenues were double-counted in internal reports, so that both the IBU and the ECU booked revenues for the same work. This eliminated squabbles over which unit deserved credit for selling ECU-driven work.

At the project level, ECUs and IBUs interacted on a daily basis under the leadership of the IBU delivery manager to ensure that the overall team met expectations for time, cost, and quality.

Infosys went out of its way to ensure consistent values and behavioral norms across ECUs, IBUs, and geographic locations. Leaders of Infosys's large corporate campuses in Bangalore, Pune, and elsewhere, each of which housed employees working for several ECUs and IBUs, launched periodic "One Infy"¹ initiatives.

Infosys added several new ECUs between 2001 and 2006, including the launch of a new infrastructure management service (IMS) in 2002. IMS maintained hardware in large corporate-data centers. The company created the unit because clear feedback from customers suggested a demand for the service. The market was growing, and it seemed particularly amenable to the GDM.

¹ "One Infy," literally "One Infosys," was company shorthand for the values and culture that distinguished Infosys.

Job number one in IMS's first year was hiring the best possible senior management team. Infosys hired experienced managers from the United States, each with deep expertise in infrastructure management. Getting the business off the ground also required substantial investments in sophisticated operating centers from which IMS could control clients' hardware. To gain the confidence of prospective clients, these centers had to be secure and impressive.

IMS proceeded to perfect its own GDM processes. These were quite different from the processes developed in the applications development business because most every action IMS conducted was an interaction with a live client computer and thus had possible consequences for a client's mission-critical processes. There needed to be greater focus on reliability and security than was customary at Infosys. The business unit developed and utilized sophisticated tools for operating client hardware remotely. Clients were used to the idea of outsourcing infrastructure management to remote locations, though not necessarily to a location halfway around the world.

IMS grew rapidly—to 2,000 employees by 2006—and it appeared to the ECU's leader that the speed at which the unit could hire and train new employees was the binding growth constraint.

Beyond ES and IMS, Infosys created four additional ECUs, following a similar approach to IMS. These ECUs were independent validation services (for more on this service, see follow-on case study "Infosys: New Service Launch"), systems integration, product engineering, and product life-cycle and engineering services.

Not every new service was launched as an ECU. Infosys launched Infosys Consulting in 2004, a unit that provided advisory services on strategy and implementation and thus took its place at the front end of Infosys's vision for end-to-end services. A typical Infosys Consulting project included a strategy assessment, a redesigned system of processes to deliver on that strategy, and the specifications for the IT systems to make those processes as efficient as possible. Infosys designed Infosys Consulting to be closely integrated with IBUs, ensuring the designs Infosys Consulting created were transitioned smoothly to another Infosys team that could actually build the new IT systems. (For additional information, see follow-on case study "Infosys Consulting.")

Infosys also launched Progeon in 2002, a majority-owned subsidiary that offered business process outsourcing services to clients. The range of processes that Progeon handled ranged widely, from call-center operations to transactions processing to order management. A client could now start with an Infosys Consulting project, continue with an Infosys Technologies Ltd. team, and then outsource ongoing operations of certain processes to Progeon, which was renamed Infosys Business Process Outsourcing in 2006.

Conclusion

By calendar year 2006, Infosys had exceeded \$2 billion in annual revenues and hired its 50,000th employee (Exhibit 4 provides fiscal-year results). Its recruiting pipeline was still strong, generating 1.4 million applications for 21,000 job offers (1.5 percent). Infosys opened a \$120 million state-of-the-art training center—one of the world's largest—in

Mysore, India. It could train 4,000 people concurrently. The company's hiring target was 18,500 for the 2006–07 fiscal year.

Despite sky-high growth rates through a period that was generally depressed for the IT industry, the senior management team remained concerned. Each of the global players was working to provide end-to-end solutions. IBM acquired PricewaterhouseCoopers's consultancy business in October 2002 and announced in June 2006 that it would invest \$6 billion in India. Accenture already had a staff of 19,000 in India in 2006, and it planned to hire 800 new employees a month. In part due to rising wages in India, Infosys's operating margin decreased from 30 percent in 2002 to 28 percent in 2006.

The senior management team knew Infosys would have to continue to innovate to stay ahead. Mr. Gopalakrishnan observed,

In today's world, where there is so much transparency and diffusion of knowledge, I believe our lead in practicing GDM is very small.... We have to constantly innovate, add new capabilities, and increase the effectiveness of the service we deliver.

That was a welcome challenge. As one Infosys executive put it, "How do you make life interesting? You do it by building new things. You do it by innovating."

Still, some senior managers worried that the company had not fully solved the riddle of how to balance long-term innovation goals with project-level imperatives for being process disciplined, on time, on budget, and high quality. Was the balance of incentives appropriate? What did Infosys's innovation agenda demand from every employee?

Exhibit 1: Description of Core Services

Software development. Infosys developed custom software applications pursuant to fixed-price, fixed-time-frame contracts. The projects varied in size and sometimes involved the development of new applications or new functions for existing software applications. Each development project typically involved all aspects of the software development process, including definition, prototyping, design, pilots, programming, testing, installation, and maintenance. In a development project's early stage, Infosys personnel often worked at a client's site to help determine project definition and to estimate the project's scope and cost. Infosys then performed design review, software programming, program testing, module testing, integration, and volume testing, primarily at its facilities in India.

Software maintenance. The company provided maintenance services for large legacy software systems, including modifications, enhancements, and production support. Such systems were either mainframe based or client-server and typically were essential to a client's business, though over time they became progressively more difficult and costly for the client's internal IT department to maintain. By outsourcing the maintenance responsibilities to Infosys, clients could control costs and free their IT departments for other work. Infosys took an engineering approach to software maintenance, focusing on the long-term functionality and stability, thus avoiding problems stemming from "quick-fix" solutions. The company performed most of the maintenance work at its own facilities, using satellite-based links to the client's system. In addition, the company maintained a small team at the client's facility to coordinate support functions. Infosys was a pioneer in managing time-zone differences between India and the United States to provide near 24-hour maintenance services. As an example, a leading provider of health and retirement benefit plans and financial services was facing difficulties balancing its needs to maintain existing systems while working on new Internet initiatives. Infosys assumed the maintenance responsibilities and saved the client money.

Software reengineering. The company's reengineering services assisted clients in migrating to new technologies while extending the life cycle of existing systems. Projects included reengineering software to migrate applications from mainframe to client-server architectures, extending existing applications to the Internet, migrating from existing operating systems to UNIX or Windows NT, or updating from a non-relational to a relational database technology. For companies with extensive proprietary software applications, implementing such technologies could require rewriting and testing millions of lines of software code. As with its other services, the company developed proven methodologies that governed the planning, execution, and testing of the software reengineering process. For instance, Infosys reengineered the online analytical processing system of a leading computer manufacturing firm, managing a shift from legacy systems to new-generation systems. Infosys ensured that the client had more robust systems for better transaction processing and decision support.

Exhibit 2: Mr. Murthy's Graduation Address to New York University, May 9, 2007

Dean Cooley, faculty, staff, distinguished guests, and, most importantly, the graduating class of 2007, it is a great privilege to speak at your commencement ceremonies. I thank Dean Cooley and Professor Marti Subrahmanyam for their kind invitation. I am exhilarated to be part of such a joyous occasion. Congratulations to you, the class of 2007, on completing an important milestone in your life journey.

After some thought, I have decided to share with you some of my life lessons. I learned these lessons in the context of my early career struggles, a life lived under the influence of sometimes unplanned events which were the crucibles that tempered my character and reshaped my future. I would like first to share some of these key life events with you in the hope that these may help you understand my struggles and how chance events and unplanned encounters with influential persons shaped my life and career. Later, I will share the deeper life lessons that I have learned. My sincere hope is that this sharing will help you see your own trials and tribulations for the hidden blessings they can be.

The first event occurred when I was a graduate student in control theory at the Indian Institute of Technology in Kanpur in India. At breakfast on a bright Sunday morning in 1968, I had a chance encounter with a famous computer scientist on sabbatical from a well-known U.S. university. He was discussing exciting new developments in the field of computer science with a large group of students and how such developments would alter our future. He was articulate, passionate, and quite convincing. I was hooked. I went straight from breakfast to the library, read four or five papers he had suggested, and left the library determined to study computer science.

Friends, when I look back today at that pivotal meeting, I marvel at how one role model can alter for the better the future of a young student. This experience taught me that valuable advice can sometimes come from an unexpected source and chance events can sometimes open new doors.

The next event that left an indelible mark on me occurred in 1974. The location: Nis, a border town between former Yugoslavia, now Serbia, and Bulgaria. I was hitchhiking from Paris back to Mysore, India, my hometown.

By the time a kind driver dropped me at Nis railway station at 9 P.M. on a Saturday night, the restaurant was closed. So was the bank the next morning, and I could not eat because I had no local money. I slept on the railway platform until 8.30 P.M. in the night when the Sofia Express pulled in.

The only passengers in my compartment were a girl and a boy. I struck a conversation in French with the young girl. She talked about the travails of living in an iron curtain country, until we were roughly interrupted by some policemen, who, I later gathered, were summoned by the young man who thought we were criticizing the communist government of Bulgaria.

The girl was led away; my backpack and sleeping bag were confiscated. I was dragged along the platform into a small 8 x 8 foot room with a cold stone floor and a hole in one corner by way of toilet facilities. I was held in that bitterly cold room without food or water for over 72 hours.

I had lost all hope of ever seeing the outside world again, when the door opened. I was again dragged out unceremoniously, locked up in the guard's compartment on a departing freight train, and told that I would be released 20 hours later upon reaching Istanbul. The guard's final words still ring in my ears: "You are from a friendly country called India and that is why we are letting you go!"

The journey to Istanbul was lonely, and I was starving. This long, lonely, cold journey forced me to deeply rethink my convictions about communism. Early on a dark Thursday morning, after being hungry for 108 hours, I was purged of any last vestiges of affinity for the Left. I concluded that entrepreneurship, resulting in large-scale job creation, was the only viable mechanism for eradicating poverty in societies. Deep in my heart, I always thank the Bulgarian guards for transforming me from a confused leftist into a determined, compassionate capitalist! Inevitably, this sequence of events led to the eventual founding of Infosys in 1981.

While these first two events were rather fortuitous, the next two, both concerning the Infosys journey, were more planned and profoundly influenced my career trajectory.

On a chilly Saturday morning in winter 1990, five of the seven founders of Infosys met in our small office in a leafy Bangalore suburb. The decision at hand was the possible sale of Infosys for the enticing sum of \$1 million. After nine years of toil in the then business-unfriendly India, we were quite happy at the prospect of seeing at least some money.

I let my younger colleagues talk about their future plans. Discussions about the travails of our journey thus far and our future challenges went on for about four hours. I had not yet spoken a word. Finally, it was my turn. I spoke about our journey from a small Mumbai apartment in 1981 that had been beset with many challenges, but also of how I believed we were at the darkest hour before the dawn. I then took an audacious step. If they were all bent upon selling the company, I said, I would buy out all my colleagues, though I did not have a cent in my pocket.

There was a stunned silence in the room. My colleagues wondered aloud about my foolhardiness. But I remained silent. However, after an hour of my arguments, my colleagues changed their minds to my way of thinking. I urged them that if we wanted to create a great company, we should be optimistic and confident. They have more than lived up to their promise of that day.

In the 17 years since that day, Infosys has grown to revenues in excess of \$3 billion, a net income of more than \$800 million, and a market capitalization of more than \$28 billion—28,000 times richer than the offer of \$1 million on that day. In the process, Infosys has created more than 70,000 well-paying jobs, 2,000-plus dollar millionaires, and 20,000-plus rupee millionaires.

A final story: On a hot summer morning in 1995, a Fortune 10 corporation had sequestered all their Indian software vendors, including Infosys, in different rooms at the Taj Residency hotel in Bangalore so that the vendors could not communicate with one another. This customer's propensity for tough negotiations was well known. Our team was very nervous.

First of all, with revenues of only around \$5 million, we were minnows compared to the customer. Second, this customer contributed fully 25 percent of our revenues. The loss of this business would potentially devastate our recently listed company. Third, the customer's negotiation style was very aggressive. The customer team would go from room to room, get the best terms out of each vendor, and then pit one vendor against the other. This went on for several rounds. Our various arguments why a fair price—one that allowed us to invest in good people, R&D, infrastructure, technology, and training—was actually in their interest failed to cut any ice with the customer. By 5 P.M. on the last day, we had to make a decision right on the spot whether to accept the customer's terms or to walk out.

All eyes were on me as I mulled over the decision. I closed my eyes and reflected upon our journey until then. Through many a tough call, we had always thought about the long-term interests of Infosys. I communicated clearly to the customer team that we could not accept their terms since it could well lead us to letting them down later. But I promised a smooth, professional transition to a vendor of the customer's choice.

This was a turning point for Infosys.

Subsequently, we created a risk mitigation council, which ensured that we would never again depend too much on any one client, technology, country, application area, or key employee. The crisis was a blessing in disguise. Today, Infosys has a sound de-risking strategy that has stabilized its revenues and profits.

I want to share with you next the life lessons these events have taught me.

I will begin with the importance of learning from experience. It is less important, I believe, where you start. It is more important how and what you learn. If the quality of the learning is high, the development gradient is steep and, given time, you can find yourself in a previously unattainable place. I believe the Infosys story is living proof of this.

Learning from experience, however, can be complicated. It can be much more difficult to learn from success than from failure. If we fail, we think carefully about the precise cause. Success can indiscriminately reinforce all our prior actions.

A second theme concerns the power of chance events. As I think across a wide variety of settings in my life, I am struck by the incredible role played by the interplay of chance events with intentional choices. While the turning points themselves are indeed often fortuitous, how we respond to them is anything but so. It is this very quality of how we respond systematically to chance events that is crucial.

Of course, the mind-set one works with is also quite critical. As recent work by the psychologist Carol Dweck has shown, it matters greatly whether one believes in ability as inherent or that it can be developed. Put simply, the former view, a fixed mind-set, creates a tendency to avoid challenges and to ignore useful negative feedback. It leads people to plateau early and not achieve their full potential. The latter view, a growth mind-set, leads to a tendency to embrace challenges, to learn from criticism, and such people reach ever-higher levels of achievement.

The fourth theme is a cornerstone of the Indian spiritual tradition: self-knowledge. Indeed, the highest form of knowledge, it is said, is self-knowledge. I believe this greater awareness and knowledge of oneself is what ultimately helps develop a more grounded belief in oneself, courage, determination, and, above all, humility—all qualities which enable one to wear one's success with dignity and grace.

Based on my life experiences, I can assert that it is this belief in learning from experience, a growth mind-set, the power of chance events, and self-reflection that have helped me grow to the present. Back in the 1960s, the odds of my being in front of you today would have been 0. Yet here I stand before you! With every successive step, the odds kept changing in my favor, and it is these life lessons that made all the difference.

My young friends, I would like to end with some words of advice. Do you believe that your future is preordained and is already set? Or do you believe that your future is yet to be written and that it will depend upon the sometimes fortuitous events? Do you believe that these events can provide turning points to which you will respond with your energy and enthusiasm? Do you believe that you will learn from these events and that you will reflect on your setbacks? Do you believe that you will examine your successes with even greater care?

I hope you believe that the future will be shaped by several turning points with great learning opportunities. In fact, this is the path I have walked to much advantage.

A final word. When one day you have made your mark on the world, remember that in the ultimate analysis, we are all mere temporary custodians of the wealth we generate, whether it be financial, intellectual, or emotional. The best use of all your wealth is to share it with those less fortunate.

I believe that we have all at some time eaten the fruit from trees that we did not plant. In the fullness of time, when it is our turn to give, it behooves us, in turn, to plant gardens that we may never eat the fruit of, which will largely benefit generations to come. I believe this is our sacred responsibility, one that I hope you will shoulder in time.

Thank you for your patience. Go forth and embrace your future with open arms and pursue enthusiastically your own life journey of discovery!

Exhibit 3: Organizational Chart

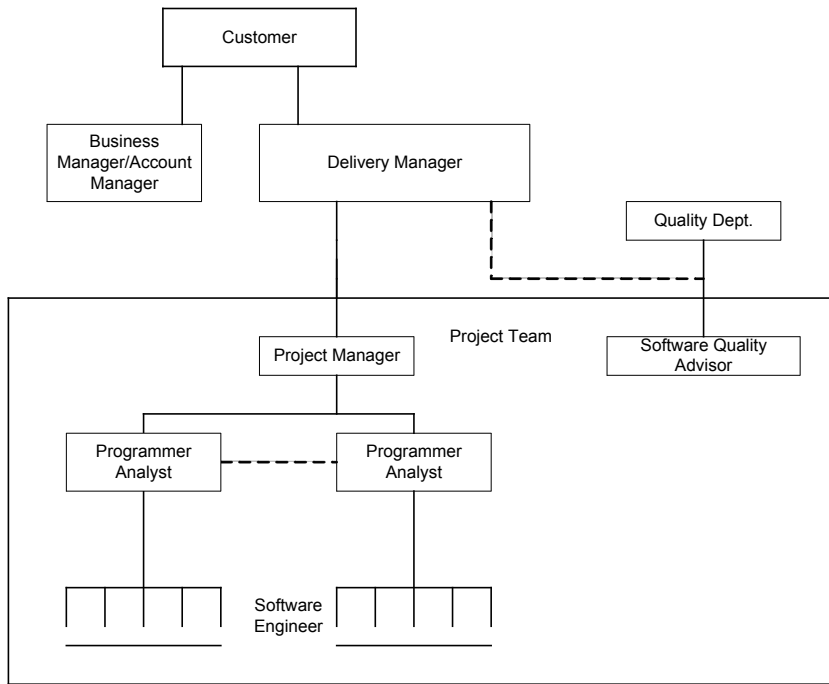


Exhibit 4: Company Metrics*Infosys's fiscal years end March 31.*

	Revenue \$M	Op Profit \$M	Employees	Revenue per Employee
FY 2006	2,151	712	44,656	48,168
FY 2005	1,592	540	32,178	49,475
FY 2004	1,063	354	23,377	45,472
FY 2003	754	265	15,356	49,101
FY 2002	545	217	10,738	50,754
FY 2001	421	174	9,831	42,785
FY 2000	211	87	5,390	39,215
FY 1999	122	46	3,770	32,361
FY 1998	70	24	2,605	26,871
FY 1997	41	14	1,705	24,047
FY 1996	28	6	1,172	23,891