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The Growth and Evolution of India's Software Industry

THE DEVELOPMENT OF the Indian software industry is an archetype of how economic liberalization combined with an entrepreneurial spirit can build an industry that today contributes as much as 8% to the GDP of a fast-growing country like India. On the back of thousands of IT services companies that were built over the last three decades, the industry has generated US$177 billion in revenue and more than US$135 billion in exports in FY 2018–2019 alone. The IT industry has also created over four million direct jobs and 12 million indirect jobs in India. A testament to this growth is the fact that the largest Indian IT services company is currently valued at over US$100 billion and generates over US$20 billion in revenue.

Over the years, the Indian software industry has matured from providing cost-effective back office support to driving the digital transformation agenda ahead in global companies. Increasingly, leaders of more than a thousand global enterprises across the U.S., Europe, and other locations have realized India's potential and have set up their own IT or R&D centers to take advantage of the vibrant Indian software ecosystem.

The current wave of Indian software entrepreneurs is focusing on building platforms and products for Indian and global markets. This has led to the creation of more than 7,000 tech start-ups in India. India is already home to 18 unicorns (start-ups valued in excess of US$1 billion), and another 10 are expected to be added by the end of 2020.

The Indian software industry has accelerated the adoption of digital technologies in the country. The industry has played a crucial role in providing digital identities to over one billion people in the country, which is further enabling the provision of services across industries such as banking, healthcare, and education in an efficient manner. The next generation of Indian software companies is helping millions of small and medium businesses (SMBs) and individual workers such as cab drivers and delivery personnel move into the formal economy.

This article is not just a story of the Indian software industry but also of the entrepreneurial capability of India's vast talent pool.

Growth of the Software Industry in India

For the purpose of discussion, the growth and evolution of the industry can be viewed in three broad phases:

▸ **Pre-2000 era: The growth of software exporting firms.**

For the two decades in this period, the software sector was largely comprised of firms looking to provide software services to global clients. The focus was on exports, and most companies viewed themselves as software exporters. The companies started solving Y2K issues for their customers and further extended their offerings to

help companies manage their legacy portfolio of applications and infrastructure. The first wave of the global Internet and dot-com era created intercontinental Internet infrastructure. Indian companies were able to leverage this infrastructure to deliver software development-related services to global enterprises remotely.

Realizing the potential and the availability of talent, some multinational corporations established their own offshore development centers in India. Companies involved in the software aspects of hardware—for example, design of tools or VLSI (very large-scale integration)/system design—also took root, diversifying their services portfolio.

▸ **Circa 2000–2010: The rise of Indian software multinationals and R&D centers.**

With experience in dealing with complex IT systems and confidence in working with international customers, several companies became multinationals with offices and centers across countries. They offered a wider range of services like executing large and complex projects involving integration, complete end-to-end solutions including management of IT infrastructure, running the services, providing IT strategy, and other related services.

Global multinational companies also realized India's potential in software services and started increasing their direct presence in India by setting up IT, business process management (BPM), and R&D centers. To date, 1,250 companies from around the world have set up their own centers in India across almost all key industry verticals. Software/Internet, telecom, semiconductor, automotive, and industrial are the top industries present, with R&D being a strong focal

IMAGE FROM SHUTTERSTOCK.COM

Figure 1. Growth of IT services, GICs, and tech start-ups in India.

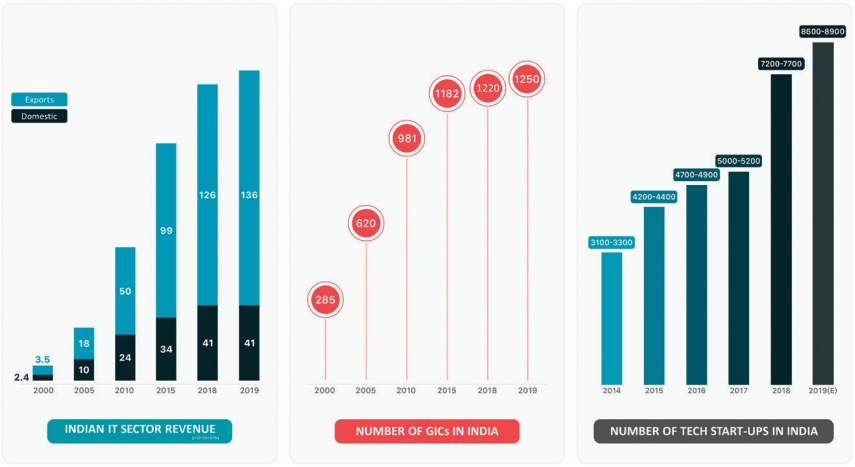


Figure 2. The rise of unicorns in India.

point. Enterprises across industries such as banking, retail, and healthcare also started driving digital engineering work from their India development centers.

Today, several centers have matured to deliver end-to-end products from India. These centers also act as the gateway to Asia, helping with product localization and creation of new products for these markets. Even next-generation companies have started setting up centers in India. Uber set up an engineering center in 2017, and OVH—a unicorn from France that provides cloud services—set up an R&D center in the country last year.

Over 400,000 engineers work in global R&D centers in India. Bangalore, Pune, Hyderabad, National Capital Region (Delhi, Noida, Gurgaon), and Chennai are key locations for such centers, amplifying the possibility of ecosystemwide learning, relearning, innovation, and partnership.

▸ **Circa 2011 to present: Vibrant and innovation-driven multi-dimensional sector.**

The Indian software ecosystem has now evolved into an extremely dynamic and varied sector that is building and managing the most complex IT systems for global enterprises. The combination of available talent, lower rates of brain drain to the U.S., the presence of large technology companies' R&D centers, and the presence of global venture capitalists has helped accelerate the growth of the start-up ecosystem. India, today, has over 7,000 start-ups (started less than five years ago), and over 1,200 technology start-ups were established in just the last year.

There are largely two types of technology start-ups. The first are consumer-led and largely focused on the India market. Initially these were replicas of U.S. companies, but soon morphed with unique innovations for the India market. For example, the cash on delivery model in e-commerce was pioneered in India and is now used globally. The second set of start-ups are focused on serving the U.S. and European markets.

In the last few years, 18 start-ups touched US$1 billion in market capitalization. Walmart bought India's largest e-commerce company, Flipkart, which is only about 11 years old, at a valuation of US$21 billion. OYO Rooms, a technology-enabled franchise model hotel chain, was started by a 20-year-old, and now has the largest number of rooms under management in India, overtaking both traditional Indian and global hotel chains.

Start-ups are driving innovation at an accelerated pace. To maintain the warp speed of innovation, large companies are building partnerships with the start-ups and are actively looking at acquisitions, both for talent and intellectual property.

Impact of IT Industry on India

The IT industry's impact on India is profound. It is a positive contributor to India's revenue growth, talent capability, diversity in workforce, and its digital infrastructure.

Growth in exports. In terms of revenue and foreign exchange, this sector has transformed India's finances, and is effectively financing a large share of imports. The sector is currently the largest forex earner from exports and accounts for over 25% of the country's total exports. The sector is already contributing over 7.9% to India's GDP.

Capability development and employment creation. No other industry segment has generated as many jobs for the middle class. The sector directly employs over four million people and indirectly supports an additional 12 million jobs. The industry was also a major trigger for the government to push for an increase in output of engineering colleges to over 700,000 graduates a year.

Companies have also set up processes to hire, train, and engage thousands of employees. In fact, Indian IT services companies spend over US$1.6 billion a year on employee training. Large technology companies have set up campuses exclusively focused on training their employees on skills relevant to their global customers. Over 500,000 engineers in India are already equipped with relevant digital skills to drive digital transformation. FutureSkills, an initiative of the National Association of Software and Services Companies (NASSCOM), has an ambitious goal of training another two million people in digital technologies over the next few years.

The extensive engineering education system and the deployed talent pool in the IT industry are also helping improve the digital capabilities of Indian enterprises. The technical and managerial talent from IT companies have moved to Indian enterprises to help them accelerate their digital transformation initiatives.

Female empowerment. The industry has been supportive of women in the workforce, an aspect where India has traditionally lagged. Some 30% of the IT sector workforce is comprised of women employees and this has been a trend since the early stages of its development. The sector has not only helped empower women but has also provided them with highly aspirational career options.

Start-up ecosystem. The start-up ecosystem in India attracted over US$10 billion in investments from venture capitalists from across the world between 2016 and 2018. US$6 billion has already been invested in Indian start-ups by SoftBank out of its US$100 billion Vision Fund.

Start-ups such as Flipkart, Ola, and Swiggy have helped create or digitally enable millions of jobs such as cab drivers and e-commerce/food delivery professionals. These companies are also empowering the country's 60 million small and medium businesses by digitally enabling their operations. Start-ups such as Power2SME and CapitalFloat are offering innovative financial services for SMBs, including "flow-based lending;" a lending model that provides credit to SMBs based on an analysis of their financial transactions, thereby improving SMBs' ability to invest and grow their businesses.

Digital infrastructure. Within a span of about a decade, Indian IT companies have taken several services being provided to citizens and corporations and moved them online. Most of these systems have been developed by indigenous IT companies, and many are also maintained and managed by them. Examples include the Ministry of Corporate Affairs system for corporate tax filing, the income tax management system, including e-filing of tax returns, the entire India Stack digital infrastructure, the Goods and Services Tax system, the passport system, the Indian rail reservation system (that books over 200 million tickets annually), the Aadhaar unique identification infrastructure—the largest in the world (whose chief conceptualizer and first CEO, Nandan Nilekani, is a product of the IT industry), and others.

India's global perception. Finally, it should be noted the software sector has perhaps played the most crucial role in changing the global perception of India. Until the 1980s, India was perceived as a poor country that needed support from more developed nations. Today, this view has changed, and India now has a seat at the global table. The world is aware of India's technology prowess and is actively looking to make investments, form partnerships, and tap India's bustling technology ecosystem. Frequent foreign travelers can attest to the fact that the quality of interaction with local people has evolved dramatically over the last quarter century due to the IT industry's widespread impact.

Figure 3. Local impact of Indian software sector.

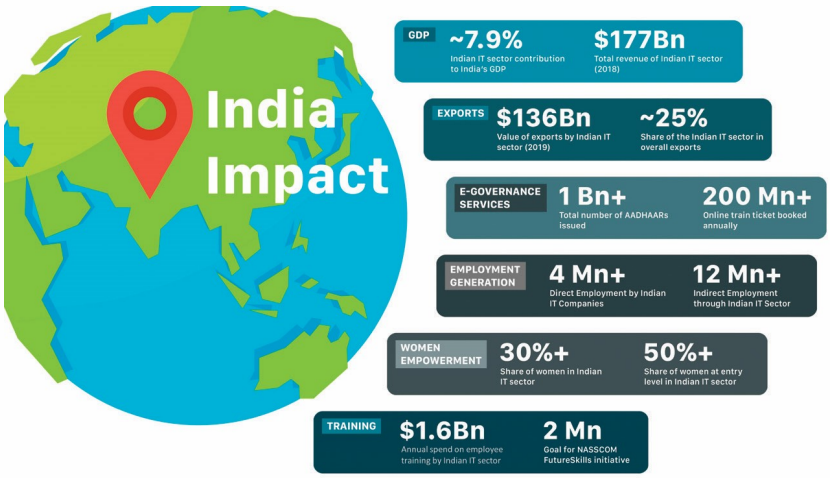
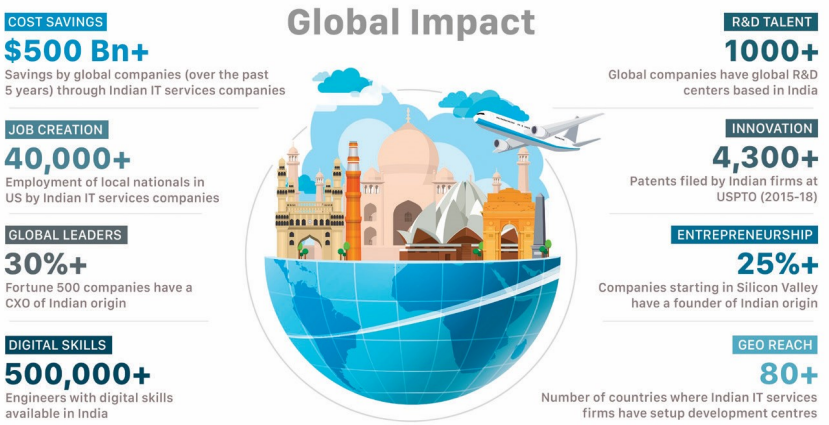


Figure 4. Global impact of Indian software sector.



The Indian IT sector is in a unique position to lead global technology innovations over the next decade.

Global Impact

Rising from a position where it was almost impossible for a poor and impoverished country like India to create capabilities around software technology, India has emerged as a software powerhouse serving the world.

The IT sector has helped global corporations optimize their cost, improve quality, create jobs and capabilities worldwide, and drive global business models and technology innovations.

Cost optimization and quality. India's high quality and relatively lower cost engineering, IT, and BPM talent has helped corporations gain huge cost savings that have allowed them to increase their shareholder returns and invest in growth and transformational initiatives. Assuming a cost difference of over 50% between developed locations and India, the Indian IT industry has helped global enterprises save over US$500 billion in the last five years alone.

It was important for the Indian IT companies to ensure that they could deliver high quality software. In fact, they were among the first to adopt the software development process standard called Capability Maturity Model (CMM), launched by the Software Engineering Institute at Carnegie Mellon University in 1987. By 1998, half of all global companies assessed at CMM level 4 or 5 were from India. Companies from across the world, and even countries wanting to develop their own ITsectors, turned to India's experience of rigorous software development process and the use of quantitative techniques to manage them. Indian companies shared what they learned at software-related conferences, workshops, seminars, and so forth. Delegations from various countries visited India to learn from its experiences, and case studies were also developed. There were books like *CMM in Practice* (Addison-Wesley, 2000), and *Software Project Management in Practice*, (Addison-Wesley, 2002), which were translated into other languages including Chinese, Japanese, Korean, and French.

Global delivery model. Riding on its CMM capabilities, Indian IT companies have pioneered the global delivery model where distributed teams can seamlessly work together to deliver complex software projects.

The global delivery model innovation has quickly become an industry best practice among all global IT services companies as well as enterprises. Large enterprises have anchored on the global delivery model to set up their own IT and R&D centers in India to drive IT and product innovation. Today, over 500 global companies have their second largest development centers based in India. Not just American and European countries, but also companies from Asian locations including China, Indonesia, South Korea, and Japan have established a presence in India. Companies such as IBM and Accenture have increased their headcounts to around 100,000 in India, due to their ability to use a global delivery model to execute complex projects for customers.

Global innovation and digital transformation. Large global companies have realized the capability of Indian talent and started focusing on driving core innovation from the country. In fact, several companies have started filling global patents for ideas that were conceptualized and productized from their India centers. Between 2015 and 2018, more than 4,300 patents were filed by India-based companies/offices in the U.S. Patent and Trademark Office. Companies have also expanded the roles at their India centers to include product management, customer success, sales, and marketing. Some companies, including Cisco and Samsung, consider their India centers as second headquarters. Also, India is rapidly rising as a hub of global Centers of Excellence (COEs) for modern technologies such as artificial intelligence/machine learning, Internet of Things, robotic process automation, and others.

The Indian software industry was quick to realize the changing needs of customers and started supporting global digital transformation initiatives of several legacy companies in the retail, manufacturing, energy, and utilities industries.

The large Indian IT companies are now multinationals in their own right—the top companies operate in over 50 countries, where they have substantial offices. Many have significant development centers in other

regions like the United States, Mexico, China, Europe, and Australia, employing thousands of software engineers and managers. The Indian IT services industry is estimated to employ a total of 40,000+ locals in the United States alone. Additionally, the industry is also exporting its massive talent training infrastructure to global locations. Tata Consultancy Services has set up a training hub in Cincinnati and is creating a pipeline of graduates coming out of U.S. universities.

The worldwide impact of the Indian software industry is widely evident:

- Code written by Indians is present in almost all systems with software, including cars, consumer electronics, enterprise software solutions, industrial products, banking systems, and more;
- Indian designers are involved in most chip and system designs by major multinationals;
- Indian IT firms have development centers in over 80 countries around the world; and
- Over 1,000 companies develop global products from their centers in India.

Key Lessons

Observing the growth and impact of the Indian IT industry provides a set of valuable lessons that can be replicated for the development of other industries in India and other countries.

Government involvement. Minimal government interference coupled with supportive incentive policies was a key success factor. The Indian government did not regulate the industry and created tax incentives for both importing technology and for revenue from exports.

Skilling and development. Focus on skills and talent development has been instrumental in the growth of the IT industry. Even in their early stages, IT companies spent significant time and money developing the skills of their employees ahead of time. This helped companies rapidly address the changing technology needs of their global customers.

Process orientation. The heightened focus on process orientation in the Indian software industry has undoubtedly contributed to its meteoric growth and has also enhanced the perception of the industry globally. A strong process and continuous improvement focus is a catalyst for both quality and productivity.

Industry collaboration. One key factor in the success of the Indian IT sector has been its ability to bring companies together to develop an industry. The sector has created a huge collaboration ecosystem in the form of an industry body—NASSCOM. The association has helped develop best practices that get disseminated to companies across the sector.

Scale and entrepreneurship. Widespread industry effort to promote, cultivate, and celebrate entrepreneurship has created an ecosystem for entrepreneurs to conceptualize, fund, and scale IT companies. The first generation of entrepreneurs focused on building and scaling IT services companies, while the second is focusing on building IT products and IP-led services companies.

The Way Forward

The Indian IT sector is in a unique position to lead global technology innovations over the next decade.

The Indian education infrastructure is being rapidly overhauled by dedicated government initiatives. The government has announced the creation of 17 new Indian Institutes of Technology (IIT) across India to further improve the quality of engineering education. IITs have some of the country's best engineering faculty and education infrastructure. The millions of engineers who will graduate in the next few years will be adept at machine learning, cloud computing, and other new-age digital technologies. As a result India will continue to be a source of skilled digital talent and intellectual property for more than 2,000 global enterprises.

India's per capita income is expected to cross US$3,500 by 2025 from the current US$2,000. This will increase discretionary spending by the population, creating a huge consumer market, potentially triggering the next wave of digital entrepreneurs building India-focused technology. Venture capital activities will increase due to massive domestic opportunities and the ability of Indian start-ups to build global products. The availability of capital will catalyze the creation of many companies with valuation in excess of US$1 billion across India.

The government is expected to accelerate the creation of public digital infrastructure to streamline existing citizen services and create new services. The India Stack model will be expanded to create industry-specific initiatives in areas such as healthcare, supply chain, and education. This will result in technology getting weaved into the fabric of the Indian workforce across agriculture, healthcare, education, and other industries. Millions of digitally enabled jobs and job categories will be created in the process.

Further, second- and third-tier locations will join India's software ecosystem due to the strong mobility network, education, and digital infrastructure built over the last decade. Global companies, Indian IT companies, and start-ups will leverage these cities to drive innovation.

Over the last three decades, India has risen as a technology and software trailblazer, and with concerted efforts by the entire ecosystem including Indian IT companies, multinationals, start-ups, and the government, India has the potential to further establish its standing as a world leader in the software sector.

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Suggested Reading

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