



Engineering Solutions

The Next Level of Engineering Performance

The Globalization of Engineering

About the Company

Apex Engineering Solutions is a different kind of engineering organization. The difference is in our people-centric approach to building quality solutions for our customers. We recognize that providing great technology and service alone won't keep our customers coming back. It takes talented engineers with a deep commitment to quality and innovation. It takes project managers with a strong understanding of each customer's business, goals and challenges. And it takes communication with our clients at each step in the process to assure that the work is done on time, on budget and 100% on spec. We constantly challenge our engineering workforce to think of new ways to improve upon ideas, designs and processes. It's what keeps us challenged, and keeps Apex Engineering Solutions in demand. Our Engineering Solutions division helps companies in the construction, engineering, telecom and utility industries grow their businesses by providing unparalleled solutions in Mechanical, Electrical and Plumbing Engineering; Structural Engineering and Geospatial Data Engineering.

© 2007 Apex CoVantage. All rights reserved.

The information contained in this document represents the current view of Apex CoVantage on the issues discussed as of the date of publication. This white paper is for informational purposes only.

Table of Contents

Introduction	4
What is Globalization?	5
The Globalization of Engineering	6
Accepting and Managing Change	9
The Benefits of Globalization from a World Perspective	10
The Benefits of Globalization to Engineering Firms	11
Why Partner with Apex Engineering Solutions	12
The Benefits of Globalization to Engineers	13
Why India is the Number One Destination	14
The Future of Engineering	16
Conclusion	17

Introduction

The world of engineering work is changing. Just 20 years ago, it was practically unheard of to outsource engineering jobs to developing nations. First, engineers in developing countries were considered incapable of performing the work from a knowledge perspective. Second, they had limited access to computers and reliable telecommunications infrastructures; and, third, transporting blueprints and data was time consuming, risky, and expensive.

Things have certainly changed since the 1980's. For some businesses -- whether they wanted to or not -- the decision to compete globally was made for them by the very nature of changes taking place within their specific industries. In his latest book, *The World is Flat*, Thomas Friedman describes the unplanned cascade of technological and social shifts that effectively leveled the economic world, and "accidentally made Beijing, Bangalore and Bethesda next-door neighbors."

Friedman's list of "flatteners" includes the fall of the Berlin Wall, the spread of Windows PCs around the world, the rise of Netscape, the dotcom boom that led to a trillion dollar investment in fiber optic cable, and the emergence of common software platforms and open source coding enabling global collaboration. At the very time when these flatteners were coming together, three economies materialized -- India, China and the former Soviet Union, and "three billion people who were out of the game walked onto the playing field," writes Friedman.

"Globalization is not a phenomenon. It is not just some passing trend. Today it is an overarching international system shaping the domestic politics and foreign relations of virtually every country, and we need to understand it as such."

-- Thomas Friedman in his book "The Lexus and the Olive Tree"

In addition, the emergence of international trade agreements promoting the international free trade of professional services, such as engineering, had and will continue to have a dramatic effect on the globalization of these services.

Today, it's vital to a company's success to make a positive internal decision to compete globally and to integrate that decision in their business plan and strategy. As a result, it is the position of this Apex paper that the field of engineering, and how engineering work is done, has been forever altered because of globalization. Those organizations that embrace globalization, and all it has to offer in the way of innovation, efficiencies, scale and cost savings, will prosper in the next decade; and those organizations that don't will be faced with incredible challenges in trying to catch up. The good news is there is plenty of room on the new playing field; organizations just need to make up their minds to get in and play.

What is Globalization?

Globalization is a term that describes the increasing trend towards internationally integrated markets and global interconnectedness, making national boundaries less important in terms of political, cultural, technological, financial, environmental and national security issues.¹

According to Friedman, there have been three great eras of globalization. The first era occurred from 1492 to 1800 with the beginning of global arbitrage (Columbus discovers America) and the world shrunk from a size **large** to a size **medium**. The second era was from 1800 through the year 2000 and that era, spearheaded by companies globalizing for markets and for labor, shrunk the world from a size **medium** to a size **small**. Now, we've entered a whole new era of globalization and the world is shrinking from size **small** to size **tiny**.

In his book, Friedman cites the new ways of doing business in this third era of globalization and they include:

1. Outsourcing – The delegation of non-core operations or jobs from internal production within a business to an external entity that specializes in that operation. A prime example of outsourcing is the programming work sent to India by U.S. companies in preparation for the potential Y2K disaster.
2. Offshoring – The relocation of business processes to another country, especially a country overseas. After its accession to the WTO, China emerged as a prominent destination for production offshoring.
3. Open Sourcing – Self-organizing collaborative communities are evolving, e.g., Apache, Linux and Wikipedia, allowing people to expand and broaden knowledge free of barriers.
4. Supply Chaining – A coordinated system of entities, activities, information and resources involved in moving a product or service from supplier to customer. Wal-Mart has revolutionized the retail world through its development and implementation of a global supply chain.
5. In-sourcing – When companies set up their own "captive" process centers overseas, taking advantage of their cheaper surroundings while maintaining control of their back-office work and business processes. UPS has been very successful in their in-sourcing operations.
6. In-forming – The ability to build and deploy one's own personal supply chain — a supply chain of information, knowledge, and entertainment. Google provides this via the Internet, Tivo has made television an almost virtual medium.

Glob-al-i-za-tion: the development of an increasingly integrated global economy marked especially by free trade, free flow of capital, and the tapping of cheaper foreign labor markets.
-- Merriam Webster's
Dictionary

¹ E.L. Wust, *The Effects of Globalization on the Civil Engineering Profession*

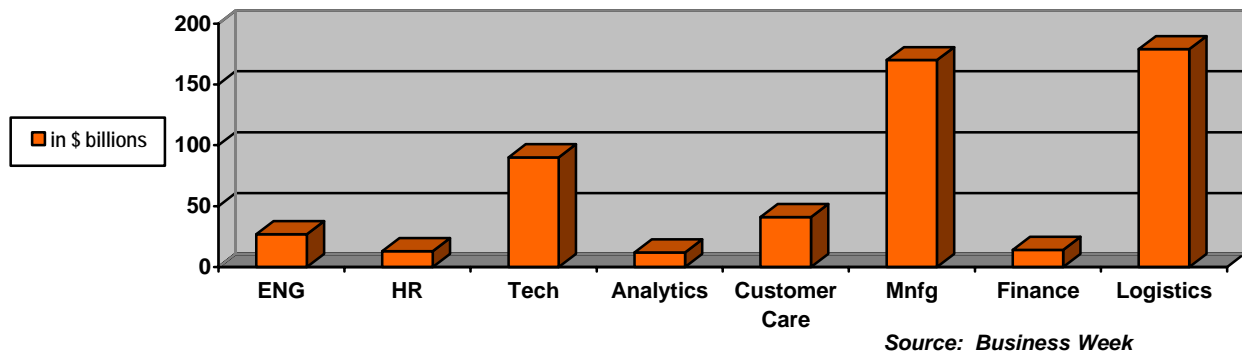
7. Steroids – The turbo-charging of the previous six forces, from new technologies like wireless access, voice over Internet protocol (VoIP), and file sharing. Now you can manage your in-sourcing, outsourcing, in-forming, etc., from anywhere, with any device.

The traditional view of these new ways of doing business is that they are part of the “big company” strategy, but that view is rapidly changing. True, corporations and multinationals have been outsourcing for decades, but creative new companies now have the opportunity to exploit the possibilities of globalization even faster than established players. A recent issue of *Business Week* noted that outsourcing to India allows even a small firm to compete on a very global basis with very low costs.²

Other manufacturers and tech companies are learning to capitalize on global talent pools. Just last year, IBM said it planned to triple its investment to \$6 billion in India over the next three years as part of its move to increase outsourcing services by taking advantage of the country's lower-cost labor and diverse engineering skills for technology services customers around the world. In the past three years, the company has invested more than \$2 billion in India and increased its staff from 9,000 to 43,000. Now IBM employs more people in India than any other foreign company. Multinational pharmaceutical companies are increasingly looking at offshoring research and development to India and China to help increase productivity and reduce costs.

Such strategies offer just a small glimpse into the productive uses of globalization. The following chart illustrates the largest sectors in global spending in 2005.

Some of the Largest Sectors in Terms of Global Spending in 2005



The Globalization of Engineering

The globalization of engineering began at the bottom, starting with manufacturing and low value-added activities. As these activities became dispersed, engineering activities began to follow. Yet, engineering

² *Business Week*, *The Future of Outsourcing*, January 30, 2006

work in technology-based firms was always considered a core activity that had to remain tightly controlled within the home country. As a consequence, engineering departments developed dominant practices to keep all engineering activities within the firm. Ironically, some researchers in the late 1980s concluded that this unwillingness to share technological information undercut the competitiveness of the U.S. as many firms developed the “not invented here” syndrome.³

Now, with growing globalization, the spread of high-speed Internet connections, fiber optic cables that make it possible to send large data files around the world, and the ever-increasing demands for higher corporate profitability, a new employment dynamic has emerged and a growing number of firms are now outsourcing high-tech engineering design and development work to countries overseas. While multinationals have shuffled work among remote engineering centers for decades, small and medium-size companies are just starting to tap the foreign engineering talent.

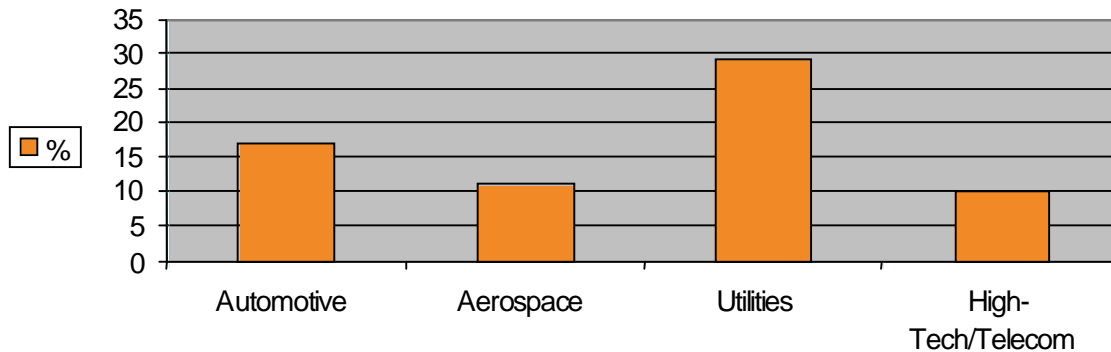
According to industry analysts, demand for engineering services will grow substantially across most sectors and geographies through 2010, with only about 10% of the world’s work being based in the U.S. versus about 40% back in the 1990’s. Even with these decreasing U.S. based work hours, many engineering organizations are already struggling to keep up with demand. In a recent survey, leading engineering firms, telecoms and utilities reported that finding qualified engineers was one of the top five challenges facing their businesses. These firms also reported that responding to increased competition was another top five challenge. For some firms and organizations, these twin challenges – scarcer talent and increased competition – have already meant higher operational costs, inability to meet demand, and lost customers, revenues and profits.

A recent study by Booz Allen Hamilton for India’s National Association of Software and Service Companies (NASSCOM), “Globalization of Engineering Services,” reports that global spending on engineering services is large and rising - constituting about 2% of global GDP, and companies are increasingly moving these high-value services to emerging markets as the next step in globalization. Spending on engineering services was about \$750 billion in 2004 and is projected to increase to \$1.1 trillion by 2020. Currently, the market is highly fragmented by industry, with automotive at 19%, aerospace at 8% and utilities at 3% in 2004. High-tech/ telecom is the dominant and fastest growing sector, with 30% of the market.

While today only \$10-\$15 billion of engineering services is offshored, the market is expected to grow to \$150-\$225 billion by 2020. India's current revenue base in the offshored engineering services market is about \$1.5 billion - relatively small as compared to its information technology and business process outsourcing sectors, yet India is well-positioned to increase its market share of engineering offshoring from 12% to 30% by 2020. The potential engineering market in India could exceed \$60 billion by 2020.

³ Leonard Lynn and Hal Salzman, *The New Globalization of Engineering*, June 2005

Market Fragments by Industry



Source: Booz Allen Hamilton

Offshoring of Engineering Services

While the offshore engineering services market has been growing over the years, the real hustle and bustle actually began a few years back. It was the automotive industry that was the first to realize the benefits of outsourcing engineering services to low-cost destinations like India. This is what saw the first wave of outsourcing to India through captives of major automobile companies such as General Motors, Nissan, Toyota, and Johnson Controls.

Today, a more enlightened, strategic view of global sourcing is starting to emerge as managers get a better fix on its potential. The new buzzword is "transformational outsourcing" because many executives are discovering offshoring is really about corporate growth, making better use of skilled U.S. staff, and even job creation in the U.S., not just cheap wages abroad. True, the labor savings from global sourcing can still be substantial. But it's peanuts compared to the enormous gains in efficiency, productivity, quality, and revenues that can be achieved by fully leveraging offshore talent.⁴

The factors that are driving the steady growth in the export opportunity in engineering services, especially in product development include:

1. As more manufacturers move to the next stage in their transformation journey and drive market differentiation and growth through innovation, there will be an increased focus on the design process.
2. While the focus on innovation will increase, the importance of innovation is moving beyond the confines of the internal R&D department in an organization.

⁴ Business Week, *The Future of Outsourcing*, January 30, 2006

Product companies are also increasingly leveraging extended engineering across all stages of product development lifecycle. Supply-demand economics of engineering talent is playing a vital role in influencing companies to leverage outsourcing for design and engineering. All these factors are working in favor of engineering services moving to remote destinations. Finally, it's the cost arbitrage that is the main driver of this huge boom in offshore engineering services.

Engineering cycle time can drop by 25%-30%, in addition to 30%-45% in cost; 20%-30% improvement in production efficiency, and 15%-20% reductions in maintenance cost. While these are the generic benefits of outsourcing engineering services, independent players promise better returns and margins.⁵

Savings Main Driver of Offshoring Engineering Boom*

- **Cycle time – 25%-30% decrease**
- **Overall costs – 30%-45% decrease**
- **Productivity efficiency – 20%-30% increase**
- **Maintenance costs – 15%-20% decrease**

** Within 2-3 years, as clients become accustomed to the cost savings, they begin to see other benefits such as service innovations.*

As stated recently in The McKinsey Quarterly, in the first few years of offshoring, clients tend to focus on cost benefits and on the provider's ability to maintain quality levels comparable to those at onshore sites. Given the availability of skilled talent and lower wage rates, most offshore partners can meet these initial expectations relatively easily and therefore generate high levels of client satisfaction. Within two to three years, however, as clients become accustomed to the cost savings, they begin to look for productivity benefits and service delivery innovations.⁶

The development of low-cost economies conveys advantages to engineers in other countries. Countries like China and India are rapidly developing markets with unique engineering situations. American engineers could benefit by becoming familiar with those environments so they can capture value from them, rather than assuming that all high value-added new ideas will necessarily emerge in developed countries.

Accepting and Managing Change

In order to survive, U.S. engineering companies must be willing to accept and manage change. While the United States is still the world leader in engineering education, many other nations can offer highly trained and competent engineers at a fraction of what U.S. engineers are paid. Electronic global communication, virtual plans, and free-trade initiatives will intensify the reach and scope of global competition.

⁵ Bhaswati Chakravorty, *Engg Services & Design: Growing In a New Niche*, July 25, 2006

⁶ Noshir F. Kaka, Shailesh S. Kekre, and Saipriya Sarangan, *Benchmarking India's Business Process Outsourcers*, The McKinsey Quarterly, July 2006

The companies listed below are just some of the major engineering firms buying offshoring services today:

- The McKinsey Global Institute
- General Motors
- Bechtel Group
- Fluor Corporation
- Jacobs Engineering Group
- Washington Group International
- BE&K Engineering
- Harris and Sloan
- Mott McDonald

As a result of sophisticated telecommunications, including a global fiber optic infrastructure, and the digitization of engineering work processes, an increasing quantity of engineering work can be done anywhere in the world that has access to (1) global telecommunications networks and requisite software packages and (2) adequately trained personnel.

“Globalization is responsible for enriching the peoples of every country that participates in world trade. The critics of globalization say that world trade impoverished the peoples of the world. Nothing is further from the truth. Globalization is not a problem; it’s a solution.”

-- Marvin Zonis, international political economist

Many companies are transferring tasks and jobs that have traditionally been done by American engineers to lower cost countries. Company managers, making rational decisions, hope to save up to 70% in net costs by offshoring work. Although no government organization has reliable figures on exactly how many engineering tasks and jobs have been moved to low-cost countries in recent years, observable trends indicate that offshoring is accelerating in scale and scope. In fact, the National Academy of Engineering (NAE) goes so far as to suggest that “a typical start-up company today should begin planning for global growth from its inception.”

The Benefits of Globalization from a World Perspective

Because it expands economic freedom and spurs competition, globalization raises the productivity and living standards of people in countries that open themselves to the global marketplace. For less developed countries, globalization offers access to foreign capital, global export markets, and advanced technology, while breaking the monopoly of inefficient and protected domestic producers. Faster growth, in turn, promotes poverty reduction, democratization, and higher labor and environmental standards. By becoming an outsourcing Mecca for the Western World, India, China and other countries have been able to raise their standards of living.

While globalization may confront government officials with more difficult choices, the result for their citizens is greater individual freedom. In this sense, globalization acts as a check on governmental power that makes it more difficult for governments to abuse the freedom and property of their citizens. Microsoft does development work in India, thereby freeing up resources to work on new product developments, lower costs, and provide other types of jobs in the states that would not be available without the growth that outsourcing has afforded.

Today's businesses have a chance to turn around dying businesses, speed up their pace of innovation, or fund development projects that otherwise would have been unaffordable. More aggressive outsourcers are aiming to create radical business models that can give them an edge and change the game in their industries. Old-line multinationals see offshoring as a catalyst for a broader plan to overhaul outdated office operations and prepare for new competitive battles. And while some want to downsize, others are looking to liberate expensive analysts, engineers, and salesmen from routine tasks so they can spend more time innovating and dealing with customers.

The Benefits of Globalization to Engineering Firms

There are many benefits for U.S. engineering firms to embrace globalization, including cost reduction due to wage arbitrage and lower cost of living. Although the idea of lowering costs is the initial impetus for companies to outsource, most quickly realize that there are many other benefits equally as important. These include offshore and outsourcing as an attractive value-added option for high-cost, knowledge-intensive economies; while reduced costs in private sector means higher profits and larger market share.

One of the main advantages of outsourcing engineering services to India is that, although there is a substantial decrease in labor costs, quality is not compromised. Indian engineering service providers are technically proficient and have a zealous eye for detail, ensuring that service levels remain as good or even superior to those in countries like the U.S. And, there is ready access to a large intellectual pool with domain expertise in specialized areas, coupled with operative English language skills.

For engineering firms, outsourcing:

- Reduces costs associated with increased staffing resources, including hardware, training and benefits;

The issue of "offshoring" moved to the forefront of the national debate when President Bush's chief economic adviser Greg Mankiw said that "outsourcing...is something that we should realize is probably a plus for the economy in the long run."

- Increases the firm's efficiency, as less time is spent on production-related tasks and more time is spent on core development work;
- Improves the flexibility and capability of the organization to take on new assignments and expand offerings;
- Without the restrictions of hiring, training and managing internal staff resources, firms are more dexterous and can take on more strategic work, expand their offerings and complete projects faster.

Engineering firms are also finding that they receive a better quality of back-office operation due to supplier specialization and competitive pressures in the outsourcing industry abroad. Financial, accounting and human resources services can be outsourced as well as engineering support. Such operations create job opportunities in Indian cities and help lower costs for the foreign companies.

Why Partner with Apex Engineering Solutions

For two decades, Apex CoVantage has provided outsourced engineering and technical services from India to leading American, European and Australasian companies. Our professional staff includes mechanical, electrical, plumbing, structural, and civil engineers, as well as experts in physics, mathematics, technical writing and the graphic presentation of engineering drawings. In many cases, these professionals have worked for more than a decade in their specialized fields.

When partnering with Apex Engineering, many of our U.S. and European clients choose to deploy our Indian engineering teams on an overnight basis, immediately creating a round-the-clock engineering capability that did not exist before. In some cases, this overnight capability alone cut overall engineering project times by a third.

Apex Engineering Solutions can help businesses in four important ways:

1. Our solutions can transfer the engineering burden from your staff to ours, freeing your engineers to focus on new markets, new services and new clients.
2. Our solutions can accelerate your engineering processes and improve the performance of your engineering organization, enabling you to provide more value to your customers.
3. Our solutions can generate savings that offset rising costs in other areas, particularly health care insurance and professional liability insurance.

4. Our experienced senior management team can, at your request, contribute its knowledge and perspective to your plan for growth. Our team has implemented nearly 60 highly-customized engineering and technical solutions for construction, engineering, manufacturing, telecom and utility companies.

For instance, one Apex client, a leading US full-service engineering firm, was looking to grow its share of the engineering services market in the Mid-Atlantic region but encountered a regional shortage of qualified MEP engineers -- which in turn limited their service capacity driving costs higher. Apex developed a dual-shore solution that precisely conformed to their processes and was quickly integrated within the company's workflows. Since implementing this creative onshore/offshore solution, the client substantially reduced the costs and improved the efficiency of its MEP engineering services and as a result, more customers are turning to this client for their services and their market share continues to grow.

The Benefits of Globalization to Engineers

In the last 20 years, there has been a structural shift in our society from a manufacturing-based economy to a service economy, and now, to a knowledge-based economy. The field of engineering has felt this shift dramatically. Engineers in the traditional manufacturing era focused on the design of individual components. Today, a greater emphasis is placed on the design of systems, which means that today's engineer has to know more about more facets of engineering. He/she has to actively use technology – in order to get the job done. It is of interest to note that, engineering, according to a traditional dictionary definition, is “a science by which the properties of matter and the sources of energy in nature are made useful to man.” While such a definition is not untrue, its essence clearly is less and less relevant in today's world of the Internet and virtual reality.

The shift to a knowledge-based “services” economy means the engineer is more prized for his or her innovation consulting ability rather than for repeatable task work. Increased pressure for profits has resulted in the U.S. industry engaging in outsourcing by offshoring significant numbers of technical jobs, while at the same time demanding increased innovation and creativity in engineering work and services at home. Work becomes less task-oriented and far more interesting. There is also a growing share of engineering employment in nontraditional, less-technical engineering work such as management, finance, marketing and policy. It's a fact that good engineering firms in the U.S. and the U.K. have more work than they can handle. Outsourcing task-based engineering work means that engineers don't have to work 60-hour work weeks and can practice their craft and improve their portfolios as work becomes more enjoyable with less stress.

There has been an increased opportunity for using technology in the education and work of the engineer. Technology has opened up new engineering opportunities through new developments in nanotechnology,

logistics, biotechnology, and high-performance computing. Technology not only allows fewer people to do the jobs of many, it also allows their skills to be taught to almost anyone, quickly, anywhere around the world. Cheap, instantaneous global communication has made international markets and an international workforce a functioning reality for engineering employees. Today, engineers can share a wealth of knowledge with other engineers half way around the world.

There is also a change in the engineering accreditation that will help engineering professionals to work globally. Accreditation in engineering education is a mechanism to certify degree programs as meeting a certain set of standards. Around the world, globalization of the engineering profession has led to increased interest in accreditation – as a way to improve program quality, and as the building block upon which mutual recognition educational agreements and cross-border practice treaties can be based.⁷

For the most highly educated, most brilliant Western engineers, offshoring is likely to have little, if any impact. There will always be positions for them, they will continue to be rewarded for the enormous value they create, and the nation where they are based will be rewarded in taxes and profits.

Why India is the Number One Destination

It was almost 10 years ago that global corporate superpowers such as General Electric, Citigroup and American Express first set up captive BPO (Business Process Outsourcing) operations in India, giving that country a head start in experience. Nortel Networks is the most striking example of a company that as early as 1989 set its sights on India in search for technical talent

What is it that makes India the number one destination for multinationals seeking to outsource any number of processes? A survey conducted in 2004 for a study on Global Services Sourcing found that multinational corporations initially went to India not merely to cut costs, but also to access good quality services and talent.

With the Indian way of education placing greater emphasis on higher education and specialization, there is a vast talent pool with specialized knowledge in just about any field. India's demographics, including the large number of software engineers that graduate each year, continue to give it an edge over other countries such as China. India has more than 250 universities and engineering colleges providing

Why India is the Number One Destination

- India's Higher Education System
- The English Language Advantage
- Data Privacy Efforts
- Information Security
- Strong Quality Control Measures

⁷ Russel C. Jones, Ph.D., *Global Accreditation Trends*, World Expertise LLC

computer education at the degree/diploma level. The formal education system is also augmented by thousands of private training institutions providing computer education.

Another reason India is preferred is that in all good Indian educational institutions, the preferred medium is English, resulting in a significantly large population of educated and qualified professionals being conversant, if not proficient, in the English language.

Finally, the Indian government has taken initiatives to ensure that India's data privacy legislation is aligned with those of the U.S. The government is also focused on the issues of information security and Intellectual Property Rights. Indian companies are also increasingly serious about protecting the information of their clients. Common security procedures include employees swiping identity cards through readers, having their devices such as cell phones, PDAs and notebooks deposited in lockers and shredding all notes of client conversations after a shift ends.

NASSCOM (India's National Association of Software and Services Companies) pinpoints these additional factors as major reasons behind India's success:

- Improving telecom and other infrastructures so they are on par with global standards;
- Strong quality orientation among players and their focus on measuring and monitoring quality targets;
- Fast turnaround times and the ability for U.S. firms to offer 24x7 services by leveraging India's time zone difference.

The fact that India has been able to provide good quality services has distinguished it vastly from others, such as the Philippines, China, Singapore and Mexico, the other major countries sought by multinationals for outsourcing.

With regard to the engineering field, India is capable of providing design, development, simulation, prototyping and testing services for aerospace structures just as the fuselage, wings, avionics, engines and landing gear, among others. All drawings like construction details from architectural plans, working drawings from raw data, technical drawings and comprehensive specification sheets can be drafted by Indian firms, at cheaper rates and with quality standards of detailing. Firms in India widely offer AutoCAD drawings from hand drawn sketches or blueprints. Complete construction drawings can be created from general layout sketches, with details like furniture plans, telephone and electrical plans, reflected ceiling plans, floor finish plans, partition and door hardware schedule plans. Elevations and perspectives are also offered. Drafting and design services like 3D structural modeling, structural drafting and analyses using software like STAAD-III and Star dyne are readily available in India, for both dynamic and non-linear analysis.

The scope for outsourcing within the field of engineering is vast in India and holds limitless possibilities for growth. It offers quality and precision at a fraction of the cost and is waiting to be exploited by companies smart enough to reap the rewards of outsourcing.

The Future of Engineering

As the engineering industry continues to undergo profound structural change involving the adoption of new technologies and a significant increase in necessary skills, such changes will have major implications for future trends in engineering employment including:

- New working practices, such as cell working, team working and contract working, are changing the nature of 'jobs for life' and placing a greater responsibility on employees to market and develop their skills.
- Flatter organizational structures, introduced by companies attempting to increase efficiency, often leading to shorter career ladders.
- Outsourcing has pushed the responsibility for product or component development down the supply chain, and has given rise to new skill requirements in smaller and medium sized supplier companies.
- New technology constantly initiates changes in working practices.
- New competitors from emerging economies. In past waves of the globalization of business, new competitors challenged U.S. and European firms in the automotive, consumer electronics, semiconductor and other industries. Such firms as Toyota, Samsung, Sony, and less-known producers in Taiwan of lap-top computers, cell phones and electronic components seemed to come out of nowhere. This will be a growing occurrence in coming years with the difference that China and India combined have more than ten times the combined population of Japan, South Korea, Singapore and Taiwan.

In the future, engineers will have to become much more independent and entrepreneurial, and they'll need to keep track of what is happening in global markets so they can identify gaps in their knowledge, skills and attitudes. Such awareness will enable them to know where to focus their learning. Employers can no longer be expected to watch over engineers' careers and assure their futures. Tomorrow's engineers need to understand that their knowledge and skills have a commodity-like value, and with appropriate efforts, they can redefine, reshape, and re-engineer their careers.

Conclusion

The increasing expansion of engineering services into international markets presents real opportunities for the future of engineering. As a result, it is important for the engineering community to prepare to meet the challenges of a globalized world head on. Well-grounded conclusions are that the benefits resulting from globalization of the engineering profession will lead to greater access to world markets, competition and the freer flow of goods, services, capital and knowledge.

Perhaps, a less obvious benefit is that as companies disperse engineering work and more science and technology workers address the world's needs, these workers will take unique approaches to new problems and perhaps even solve old ones. As some Western companies have already learned, the sharing of ideas with new resources with a different point of reference vastly improves the collaborative process and makes things better – artistically, creatively and technologically.

“The demand for engineering services is growing and emerging countries such as India will play a vital role in expanding capacity,” said Kevin Dehoff of Booz Allen Hamilton. “This isn’t a case of substituting jobs in low cost countries for those in the developed world – these are core capabilities that provide a competitive advantage in the global marketplace.”

Let Apex Provide You with Qualified Engineers

Apex Engineering Solutions provides structural design services to consulting engineering companies in the USA, Europe and Pacific Rim for high-rise residential, corporate office, commercial, retail, education, institution and healthcare buildings, as well as automotive and industrial facilities. Apex also provides structural design services for reinforced, pre-stressed and pre cast concrete buildings, steel buildings, and steel structures including transmission and microwave towers. Apex has a complete knowledge of US and British Codes, Standards and practices.

Apex engineers and technicians are unmatched in the industry. We employ a large continuum of highly trained structural engineers and other professionals, each with their own specific areas of expertise. As a visible and respected employer in our operating countries worldwide, we know where and how to recruit highly educated, world-class professionals. Many of our engineering and technical professionals have been with us a decade or more.

Maximize Your Internal Engineering Resources

When you partner with Apex, there's no need to add overhead by hiring more engineers, especially for production work. You can better utilize your own engineering team by giving them more challenging and strategic projects.

Since 1990, businesses and institutions across various industries and sectors have partnered with Apex Engineering Solutions. Talk to us about how your business could benefit from our highly skilled engineers, effective project management and relentless pursuit of quality.

About Apex CoVantage

Apex CoVantage is a US provider of global Knowledge Process Outsourcing (KPO). We opened our first KPO service center in 1988 and subsequently pioneered the market for offshore services. Today, we provide contact center, engineering, publishing and research & content solutions, from a global network of service centers.

Our clients include many of the largest, fastest growing and most admired companies in the United States, Europe and the Pacific Rim. In every industry and every service area, these clients are reaching the next level of service performance in partnership with Apex CoVantage.



Apex CoVantage
198 Van Buren Street
Herndon, VA USA 20170-5338
+1.703.709.3000 T
+1.703.709.0333 F
info@apexcovantage.com
www.apexcovantage.com