IT Leadership In A Global Environment: An Analysis Of Critical Success Factors And Software Engineering Best Practices In Context Of India

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ABSTRACT

Over the past few years, the IT landscape has changed dramatically to facilitate new entrants from emerging economies in the global market. Some nations such as India and China are poised to emerge as IT superpowers in the years to come. In this paper, we attempt analyze some of the critical success factors (CSF) that facilitate the development of IT leaders. Taking India as an example, we explore CSFs like educational system, governmental policies, infrastructure and entrepreneurial activities that are necessary for creating and fostering IT leaders. We conclude by describing the best practices for implementing software engineering projects in an offshore environment.

INTRODUCTION

India is currently the preferred destination for software outsourcing as compared with other countries around the world. According to Verma (2004), India has currently conducts most of the ongoing offshore projects. Software engineers in the US today feel that in less than five years, much of the software programming that is taking place within the country might very well go over to other countries where the cost of production is lower, and the quality of work is at an acceptable level. Countries like India, China and other Asian and South American countries are now emerging as global leaders in the IT industry (Herera, 2003). In many ways, India can be equated with Silicon Valley in terms of providing the necessary factors for the growth of the technology industry. Some of them are:

- Advancement in telecommunication that allows seamless integration among global offices and companies;
- Standardization of the software development and implementation processes;
- Globalization of the IT educational curriculum, giving rise to software engineers who are comfortable working for any company in any part of the world;
- Increasing pressure to lower the cost of production;
- Lower resistance to adopting stricter organizational changes to increase the quality of software dependent work;
- Establishment of IT dependent business functions in India by transnational corporations; and,
- Governmental policies that encourage the establishment and growth of IT related companies in India.

The result is that on a global basis, the vast majority of the CMM Level 5 organizations are located in India, where most of them are subsidiaries of US and European organizations. (Perkins, 2003) The cost savings by outsourcing to a country like India under some circumstances may be about 50 percent. This has resulted in a $20 billion IT industry that is expected to grow to $50 billion by 2010. The trend is not limited to India and it is estimated that by year 2025, countries such as Brazil, Russia, India and China could account for over half the size of the G6 (Wilson & Purushottaman, 2003).

In the following sections of the paper, we examine the rise of India in the IT industry. We look at acceptance of the global business environment, rise of geopolitical trading blocs, governmental policies, educational system, and the IT infrastructure, We also take the opportunity to examine the characteristics of Indian IT vendors and employees, Based on personal experiences and existing literature, we also prescribe best practices for successful software engineering projects. We conclude by examining some of the pitfalls and repercussions arising from off shoring of white-collar jobs and changes required in countries like US to maintain their competitive advantages.

Many developing countries and their nascent IT companies want to replicate the Indian success story. Our intent is that the analysis of the CSFs will provide them with a blue print of what investment and policy changes are required. At the same time, multinational organizations have become comfortable using the global IT model. This paper then will provide them with the best practices required for successful implementation of their projects.

CRITICAL SUCCESS FACTORS FOR THE GROWTH OF THE IT INDUSTRY IN INDIA

India is one of the oldest and populous civilizations in the world. However, the birth of India as a modern nation is relatively new, having gained its independence in 1947. The founding fathers of this nation on purpose adopted a nationalistic economic policy for approximately the first 40 years. However, the country has gone through a very rapid transformation in the last 20 years, where many factors have converged to give rise to an IT superpower. The following sections examine some of the relevant factors.

Acceptance Of The Global Business Environment

Business is becoming increasingly global in nature, as countries and regions recognize the advantages in forming regional alliances like NAFTA (North America), EU (Europe), ASEAN (Asia), or Mercosur (South America). These alliances are generally created to facilitate free movement of goods, capital, and labor, which is greatly enabled by standardization of accounting practices, tax laws, labor policies, educational systems, and cooperative governmental agencies. The alliances hope to create a powerful market for internal goods and services, and at the same time develop economies of scale to lower the acquisition cost of imported goods and services (Kirton, 2004).

The emergence of these trading blocs reduces the cost of doing business. For example, instead of having to comply with myriad laws, companies can now adhere to a single set of EU rules that apply to all the countries in which it aspires to conduct business. Such standardization, along with the establishment of a global telecommunication infrastructure, acceptance of English as the predominant business language, similarities of information based needs of consumers, and the acceptance of buying imported goods and services, has created the perfect breeding ground of global start-ups. Companies like eBay, Yahoo, Amazon, and Google have become worldwide phenomenon, where none of these companies exited 10 years ago.

Having already accepted manufacturing as a global practice, increasing consumption of information based services encouraged multinationals to seek out lower cost of production and support for IT related goods and services (Amoribieta et. al., 2001). This led to offshore engineering and business process outsourcing whereby companies can save up to 40-50% of their costs. As a result, India is sought after in areas such as software development, IT consulting, call centers, and high-end engineering for the design of semi-conductors. These companies began by providing support to existing legacy systems for the mainstream business segments of the industrialized world – manufacturing, banking, finance, insurance, healthcare, education and telecommunications. Over a period, the offshore companies moved vertically and horizontally across the value chain by providing services for high-end software engineering, R&D, back office operations like HR, and customer facing activities like the call centers. Quite often entire production and support of IT related functions have moved offshore, with front-end requirements engineering remaining in the host country (Kriplani & Engardio 2004). In the following sections, we look in detail at factors such as governmental policies and the educational system that have contributed to India's growth.

Geo-economic Factors

India is the world's largest democracy, having a population of over 1.2 billion people. It has a per capita income of about $460 (Kriplani $ Engardio, 2004). With a population four times that of the USA, the land mass (3.3 million sq. km) is about a fourth of the USA. This population pressure has always been a catalyst for individuals, family, and governmental agencies to seek non-agricultural based income sources. While the industrial output of the country is barely self-sufficient, the job market is simply not elastic and expansive enough to accommodate the growing ranks of recent graduates.

Most Indians grow up in a multicultural and multilingual society. There are almost a 1000 different dialects spoken in India, with 17 major languages. Thanks to the British rule, English is widely spoken and is the medium of instruction in most urban schools. There are also wide ranges of faiths that people in this country follow including Hinduism, Islam, Christianity and Buddhism. Due to this enormous diversity, Indians develop an inherent global outlook, which helps them in dealing with other countries.

In a sense, the existing geographic, economic, and historical conditions were ripe for India and Indians to take advantage of the opportunities accorded by the IT industry – limited domestic economic opportunities and highly trained engineers who are comfortable in dealing with the western companies and equally at home in different parts of the world. In addition to this, as shown below, governmental policies freeing up the economy helped India along the way.

Governmental Policies

India was under the British Rule until 1947 when it became an independent democratic nation. Since then, the Indian government mostly followed a protectionist policy that encouraged local companies to grow without competition from the multinationals. Partial liberalization of the economy started in the late 1980's and early 1990's, with most of the activities taking place in the last five years. The federal government has abandoned its efforts to micromanage the economy and has steadily lowered interest rates, eased up foreign exchange restrictions and freed banks from their obligation to lend to agriculture. This has made the rupee (local currency) virtually convertible, leaving Indian businesses free to invest where they choose. Credit has become very affordable resulting in a consumer boom. (Kriplani 2004) At the same time, government has encouraged the establishment of tax free zone for software related industries.

India still faces enormous bureaucracy, corruption and red tape. In contrast to the Chinese example of central planning for the emergence of a manufacturing super power, the IT boom and subsequent dominance in this industry cannot be completely attributed to the federal government policies. There has been tremendous investment in favorable policies and infrastructure by the state governments like Karnataka, Maharashtra, Andhra Pradesh, and Tamil Nadu, that has also contributed to the success. Some of the early success in the IT industry was due to the efforts of pioneering companies such as Tata Consultancy Services (TCS), IBM, Texas instruments, Unisys and GE.

Belatedly, the federal government has started addressing, in a cohesive fashion the need for more roads, airports, schools, powers, telecommunication and hospitals. Most of the state owned industries are being privatized, and restrictions on majority foreign ownership are being abandoned. As a result, direct foreign investment is increasing at a great pace, leading to the establishment of global companies that bring along with them much needed managerial talent and best practices (Hof & Kriplani, 2003). Education is one of the areas, which has benefited enormously from the governmental policies, contributing substantially to the establishment of the IT industry in India.

Education

With its vast population and enormous human resource, competition is fierce for jobs in India. Thus, many Indians view education as the primary avenue for economic advancement. The educated and urban populace places a lot of emphasis on higher studies. However, like other facets of life, educational quality and opportunities are not evenly divided.

Most of the secondary schools in India are private and faith based. Except for a few state sponsored institutions, the quality of government sponsored secondary education is dismal in nature. However, the founding fathers of modern India did make a concerted effort to create excellent post-secondary engineering and management institutions based on the role models of MIT and Harvard. The initiative took the form of Indian Institute of Technology (IIT) and Indian Institute of Management (IIM). These institutions are ably supported by second tier state run engineering and management institutions, which are affiliated with a powerful body (e.g., Mumbai University, Kolkata University, and Delhi University).

However, the reality is that these institutions simply do not have the capacity to serve millions of college bound Indians every year. As a result, numerous privately sponsored colleges and universities have sprung all over the country, serving the need for medical, engineering, and management training. The result is that India produces 3.1 million college graduates every year and that number is expected to double by 2010. The number of engineering colleges is expected to grow to over 1600. (Kriplani & Engardio, 2003). India churns out an estimated 200,000 engineering graduates every year, of which only 2500 are from the prestigious IITs. There is also a growing movement to raise the number of top-tier institutions and attract excellent faculty with concomitant salaries and resources, so that a larger number of students can be trained at these facilities.

This large number of graduates with college degrees in engineering is made possible due to the heavy emphasis on science, mathematics and language in high school. Getting into a good engineering college is a primary concern for many high school students, since the quantity of applicants and quality of the entrance examination is extremely high. Engineering, medicine and the physical sciences are the primary career choices for most young Indians today aspiring to better their economic conditions. Rigorous foundational classes are often supplemented by taking classes in vocational institutions (almost always private) that teach the aspiring job applicants real life technical skills required to be immediately effective in the job market. This has given rise to companies like National Institute for Information Technology (NIIT), the largest IT training institution in the world.

On the other side equation, one of the effects of having such a large pool of talented people is that an equally large number of jobs need to be generated by the public and the private sector. When this does not happen, as in the case of India, people tend to immigrate to other nations where there are jobs available. Due to limited opportunities, many talented software engineers with good communication and process skills are migrating towards business process outsourcing related jobs like data entry and call centers. As a result, the education quality of employees on both end of the job spectrum is quite high.

For a long period, most of the engineering institutions and companies requiring those skill sets were located in close proximity (e.g., Bangalore). However, recent improvements in infrastructure are spreading the quality of education, the quality of the workforce, and job opportunities throughout the country (see Figure 1).

IT Infrastructure

After gaining independence, the socialist Indian government tried to build self-sufficiency in most of the basic industries like iron & steel, automotive, transportation, and telecommunication. The investments were made either by favored companies or by the government itself.

Starting in 1950s, the Indian government started investing quite heavily in building the foundation for precision equipments, electronic industry, and heavy machinery. Due to the climatic needs of such industry, the decision was made to develop a core group of companies around Bangalore in the state of Karnataka, located in the southern part of the country. This in turned fostered the birth and growth of other ancillary factors of production, most notably educational institutions required to supply a steady stream of engineers. Over time, this critical mass of basic industry, hospitable climate and an outstanding supply of educational institution attracted a large number of companies, domestic and international, to set up factories and offices in Bangalore. When software engineering opportunities arose in India, Bangalore was thus viewed as a natural choice. Eventually this critical mass spread to neighboring states of Tamil Nadu and Andhra Pradesh.

However, demand far outstripped supply. The basic infrastructure required for large-scale growth was simply not available, nor planned by the government entities. Electricity, telecommunication, housing, banking, transportation, land – all became scarce resources. Companies had no choice but to seek establishments elsewhere. Other cities where the software development started taking place were Mumbai, Kolkata, Pune, Hyderabad and Noida (see Figure 1). In all the cases, a judicious mix of existing colleges and aggressive local government efforts created the infrastructure leading to the development of these industries.

Overall, India has not made the necessary investment in the basic infrastructure to sustain the torrid pace of development. Industries and civic authorities are now working in tandem to plan for the long-term growth of IT and related services industries. Massive investments are being made in transportation, telecommunication, education, healthcare, and housing. In absence of the above, companies cannot grow any further. In contrast to places like Bangalore, Mumbai, and New Delhi, the rest of the country is not the recipient for similar investments. However, local authorities in many other states, wanting to emulate the "Bangalore Miracle" are taking matters in their own hands. They are attracting companies and vendors by creating software technology parks where land is cheap, power supply is uninterrupted, broad band connection is freely available, and companies enjoy tax incentives, all surrounded by large number of engineering and vocational institutions training young engineers specifically for the needs of the IT industry (Kriplani, 2003).

Figure 1: Major IT Services Centers In India

In the process, Indian software companies are amassing the skills needed to handle complex consulting projects and are rapidly opening offices in the west. To illustrate their success, in a span of three years, the number of Fortune 500 companies doing work with Indian companies has more than doubled from 125 to 285 (Kriplani, 2003). Indian vendors are obviously among the preferred ones in the global market. To understand the reasons, we look at some of the salient features of Indian vendors in the IT market today.

Entrepreneurs And Vendors

India has enjoyed a long history of trade and commerce with other parts of the world. Three thousand years ago, the country formed the troika of global trade with Egypt and Mesopotamia. Over the years, millions of Indians

have migrated across the globe, where they have flourished in all forms of professional endeavor, in particular commerce and trade. This same spirit is displayed in the country, albeit on a very limited basis, where the indigenous business community has been able to develop almost all basic aspect of an industrialized society without much international aid and cooperation. While the result has been self-sufficiency, the products were not always world class and global in nature. Discounting the fact that modern India is still an infant nation, stifling bureaucracy and protectionist policies did not help either in the development a critical mass of world-class companies (Herera, 2003).
As the country entered a period of political and economic stability, it was only a matter of time that the entrepreneurial spirit flourished in India. One can state that the conditions were perfect for Indian companies to become a critical source of knowledge workers for the IT industry. Some of the macro socio-economic factors, while not always efficient, that fostered the growth of world class Indian vendors are:

- Increasing use of computers in the industrialized world, in particular to automate and manage business function;
- Increasing use of supply chain in the manufacturing processes where suppliers are used globally to source and produce goods;
- Growing comfort in dealing with Asian cultures, in particular China, where multinationals have established the processes for partnering or establishing their operations;
- Continued pressure on US companies to lower their cost of production and seek cheaper sources of labor. Once these companies achieved success in the manufacturing process, it was only a matter of time before the same companies tried to lower the cost of service functions;
- The geographic location of the country, allowing for global companies to utilize the time-difference to provide round-the-clock services and support;
- A large Indian Diaspora that occupies prominent positions in the leading IT companies in the US like IBM, Microsoft, Oracle, HP, Sun, Intel, GE, and Texas Instrument. These expatiates were comfortable in establishing operations back in India;
- The availability of a modern democratic society, with an established legal and financial infrastructure;
- The advantages of having a critical mass of English speaking engineers who could be trained for software related work and who are available at a significantly lower cost; and,
- The nature of the Indian office worker that is used to change (in terms of cultural differences) and excels at listening and serving others in a structured environment.

The result was that thousands of companies sprung up to serve the needs of global companies seeking labor arbitrage. Initially the Indian companies were sending people on-site, at client location, while paying them a substantially lower salary. With the tightening of labor practices and visa restrictions, most of them started establishing modern facilities in India from where they were serving their global clients. (Kriplani et. al., 2003)
In true Darwinian fashion, the fittest and strongest have survived the past 15 years. Three different categories of firms have emerged during this period. They are services companies that are of Indian origin, non-Indian global vendor, and multinational corporations offering/using IT services as part of their business operations. The leading players among these categories are given in the following table.

Table 1: Examples Of Leading Vendors And Mncs With IT Operations

Indian IT Firms	International IT Firms	MNC's with IT Operations
Infosys	Accenture	Microsoft
Wipro	Cap Gemini Ernst & Young	SAP
Tata Consultancy Services (TCS)	Cognizant Technology Solutions	Oracle
Hindustan Computer Limited (HCL)	IBM	Intel
Satyam	EDS	HP

Table 1 does not even include vendors and companies specializing in providing back office operations for business processes. Quite often, the major players also have affiliates that specialize in just doing that. Two leading examples are Citibank and GE that have large captive units in India that specialize in providing back office services for their own subsidiaries and other paying clients.

Tier 1 vendors of Indian origin definitely have an advantage in terms of their understanding of the local market and the economy. However, instead of just resting on their laurels, they have invested heavily in creating a global delivery model, which has forced them to set up operations in places like US, Australia, Philippines, China, Mexico, and various European countries. They were required to do this to provide localized services to their global clients. In the process, they have become as good or better than their established counterparts in the US and Europe to provide IT services on a global scale. Table 2 illustrates this point by presenting the premium the capital market places on this competitive advantage.

Table 2: Based On Closing Prices On The NYSE And NASDAQ On January 20, 2005

	Infosys	Wipro	Accenture	Bearing Point
Revenue	$1.44 billion	$1.57 billion	$ 15.61 billion	$ 3.4 billion
Employees	35,220	32,000	100,000	15,000
Profit Margin	25.6%	18.22%	7.74%	-2.86%
Market Cap	$16.99 billion	$14.98 billion	$ 24.43 billion	$ 1.55 billion

The primary reason for the advantage has been the lower cost base of Indian firms and their understanding of the employees so crucial for maintaining a competitive edge. In the following section, we explore the characteristics of the employee base in India that is the foundation of a global IT services industry (Weiss, 2003).

Employee Characteristics

All causal analysis of India's predominance in the IT services industry begins with a discussion of its large base of English-speaking software engineer, capable of producing high quality work at a substantially lower cost (Kriplani & Engardio 2003). While the statement is true, not all the facts are consistent with the reality as it persists today. India does produce a large number of engineers and technically trained graduates every year. However, not all of them are ready for the software industry. Quite often, they supplement their college education with highly focused software related courses, which while giving them relevant skill sets, does not provide the technical foundation to be a high performing software engineer. An average Indian who gets the opportunity to go to an engineering college has a solid grasp of logical analysis (due to emphasis on mathematics) and abstract thinking (due to ability to speak multiple languages) abilities. This gives them the edge in becoming an above average software engineer. However, the general belief that every Indian software engineer is a brilliant graduate is a myth.

Cost used to be a major advantage at one time. However, India is no longer the cheapest place to do business. Quality of life has improved significantly, which has caused base salaries to increase substantially in places like Bangalore. This have has been exacerbated by MNCs coming to India, and recruiting the best and the brightest at a premium. As a result, turnover in all the major software centers in India is approaching 30%. The turnover in call centers is around 40% (Economist, 2004). In comparison to the cost of an average software engineer in the US with 2-5 years of experience, the cost of a comparable Indian programmer, even after discounting all the associated overhead of doing business remotely, is approximately 15-20 % cheaper.

There are two factors, however, in which the Indian employee base truly excels. They are availability and attitude towards work. Using an Indian offshore strategy, or for that matter any other non-local operation, is not worthwhile if a company is looking for short-term solution or a solution involving a small number of personnel. Once the proof of concept is completed, it makes no sense to pursue any software development project (or a series of projects) that needs less than 30 employees. Tier 1 Indian companies do not pursue opportunities that are less than 200 employees. Any operation less than 30 employees will not even cover the overhead burden for administrative purposes. According to Thum (2004), it is more effective to assign bigger and long-term projects for offshore, rather

than tasks requiring continual interaction with U.S. counterparts. When size does matter, India has no competition anywhere else in the world. The availability of software engineers, of reasonable quality, on such large scale has forced every Fortune 500 companies to include offshore in their strategic planning. In the era of quarterly profit and daily attention to the stock market, the large scale availability of highly trained engineers to do the high end work as well as the less glamorous tasks of documentation, data entry, validation and review, that reduces the cost of operation by 10-15%, makes the offshore strategy a no-brainer.

The second area in which the Indian employees excel is their attitude towards work. This is influenced partly by culture and partly by economic factors. Culturally, educated Indians are subservient in nature, who likes problem solving. This has been the main reason why U.S. based companies started investing so heavily from the very beginning in advanced operations in India. The result is that most CMM Level 5 companies are in India – because culturally it would be next to impossible to impose the same discipline and adherence to process in existing operations in the U.S. This same attitude towards work has also allowed Indians educated in the U.S. to make a very large impact on the IT industry locally. Companies like Microsoft, Oracle, and Intel all boast over 30% of their engineering staff who are of Indian origin, not to mention a number of key executives. This is true at a number of other companies.

From an economic viewpoint, most Indians are happy and thankful that they have a white-collar job that pays them more than what their parents could dream about in their lifetime. India is still a less developed country where poverty is rampant and economic liberation is for a less than 30% of the population. Thus, the fact that an average Indian now has the opportunity to make a decent living that allows him a chance to own housing, afford basic amenities of life, and travel with family, is a dream come true. Indians always valued education above all other endeavors. However, until about 20 years ago, vast majority of them never could get jobs that was commiserate with their education or even utilized what they had studied in colleges and universities. Thus, most college bound Indians dreamt of leaving the country and pursuing career opportunities in the western world. India still sends more students to the US than any other country. However, a large number of colleges educated Indians are staying back in India or are returning to India (Pink, 2004).

Having analyzed why India and Indians have come to occupy such a vital and leading role in the IT industry, let us turn our attention to understanding the best practices in making this long distance working environment a success.

BEST PRACTICES FOR OFFSHORE SOFTWARE DEVELOPMENT

There are many reasons why companies choose to use offshore business model. In this half of the paper, we analyze some of the best practices in the software development process in which an onshore company chooses to collaborate with an offshore vendor to perform some of the tasks in the project lifecycle. The highlights are based on the personal experiences of the authors and best practices highlighted in the journals.

Business Justification

The company choosing to use offshore resources should clearly state the business reasons for adopting the practices. Quite often, cost is presented as the main reason (Perkins, 2003). That is acceptable, as long as appropriate due diligence has been conducted to justify the business case. As presented through out the first half of the paper, companies choose the offshore model to acquire hard to find skill sets, scalability, flexibility in resource allocation, serve local clients, and increase quality of mundane tasks. Whatever the reason, a well-defined business case, clearly sets the metrics by which the project can be measured. Using an offshore model should be not be considered just because others in the industry are doing it. This business case should also clearly state whether the organization is ready for the offshore business model, the resulting implications, and risk mitigation strategies should the exercise fail to yield acceptable results.

Business Partner

Vast majority of the companies use local or multinational vendors, even when they have their own captive unit like GE. This choice becomes critical for companies that do not have past international experience. Due to the unknown factors, companies often insist on conducting business with only the biggest and the most established vendors (see Table 1) or companies who have achieved CMM Level 5 certification. This strategy generally backfires when there is a mismatch of expectations and capabilities among the parties. The large vendors are not interested in project-based relationships. They are mostly interested in outsourcing the entire business functions and are not very flexible in accommodating needs for projects that are not of significant size and duration. Many clients realize that these vendors have very stringent requirements (so that they can maintain their level of quality and mitigate risks) and are not willing to bend to the demands of the client during the negotiation process. Companies looking to outsource their problems will find the relationship to be a failure. Thus, it is important to find a vendor, who can collaborate and partner with the company based on the following criteria:

- Size (resources, financial strength)
- Domain expertise
- Process maturity
- Resource availability
- Willingness to invest in the relationship
- Willingness to educate client and provide knowledge transfer

Quite often, a small to medium size vendor will be a better choice, as long they have demonstrated a level of process maturity and posses sufficient experience in dealing with international clients.

Defining The Business Problem

Software development is intangible in nature (Ahern et. al., 2004). Traditionally requirements engineering and managing the change process are two of the weakest links in the software development process. This often leads to the failure of a project in terms of solving business problems on time and within budget. This problem is specifically magnified in the offshore business model as teams are separated by distance, time, culture, and business practices. In many cases companies do not do adequately conduct requirements engineering to a level of specificity that is required. Quite often, the offshore model is adopted simply because the project is running behind schedule. It is imperative that companies recognize the critical importance of spending adequate time and effort upfront in defining the requirements of the project. Companies need to ensure that their internal practices for requirements gathering are adequate and compatible with the practices of the vendor partner. When dealing on a project level, whenever possible, requirements should be defined at a component level. This level of work breakdown allows for easier and measurable assignment of task that subsequently allows for better quality assurance and integration of the overall project deliverables.

Contractual Relationship

India has an adequate legal infrastructure. However, it is prudent that contracts are executed based on US laws and jurisdiction, which accords a much higher protection of intellectual property and a expeditious process for dispute resolution The contract should clearly indicate the terms, conditions, deliverables, timeline, and penalties. In general, services vendors are not litigious in nature and typically settle disputes out of court. For large, critical projects where the deliverables are complex and critical in nature, adequate protection needs to be put in place for financial relief. A good practice to follow is to enter into a contract where payments are made on the acceptance of deliverables. Many firms use the benefits of an escrow account for penalties and software protection. Most vendors will generally insist on an escalation clause, where various levels of management get involved in times of disagreement. Finally, one must keep in mind that in the Asian culture, personal relationships are as important as legal relationships. Hence, companies will be well served to invest in building executive level relationship with their vendors, which will serve them favorably in settling business disputes.

Project Management

Both the parties in an offshore relationship should have a strong and mature project management process. This necessitates that project managers are adequately trained, certified and have the requisite level of prior experience. Companies need to ensure projects managers from the vendors have experience in dealing with international clients and have prior experience in working for multinational corporations. On a similar note companies need to assign project management responsibilities to people who are comfortable dealing in a distributed and heterogeneous environment. Many companies generally choose one of their international employees for the assignment.

One of the most important project management activity is the assignment of responsibilities and deliverables, along with firm deadlines. This can be implemented only if the task has been defined at a component level. In the relationship-building phase, companies should resist the temptation of simply adding project personnel to the team without clear definition of responsibility and deliverables. Another critical project management component that needs to be refined in the offshore model is the timeline for deliveries. As a rule of thumb, one should follow miniature milestones, where the quality of the work can be judged early and often, allowing for faster feedback. This will require more upfront investment in project management resources. However, the payback in quality assurance and risk mitigation will more than justify the cost. Managing relationships between supplier and customer is crucial and effort has to be made to manage them effectively (Lacity, 2002).

One of the major differences in project management between teams in the US and offshore teams is in the way information is communicated to project members. In the latter case, detailed documentation has to be prepared. If software teams are not used to doing this as part of the company's methodology, migrating work to other countries will be a difficult task. Lack of adequate communication channels and unavailability of resources to discuss business requirements is one of the leading contributors to frustration among team members and schedule slippage.

Team Structure

Doing business in the offshore model adds to the overhead in terms of project management and coordination. Vast majority of the projects typically include the following roles

- Project Manager/Lead
- Business Analyst/Requirements Engineer
- Technical Manager/Architect/Lead
- Senior software engineers
- Senior QA engineers
- Software engineers
- QA engineers

The offshore company will typically employ the above roles from their end. Depending upon the division of task, the company outsourcing the work may have some or all the above roles on their team. However, in the in the offshore model, another layer is added in the form of an onsite coordinator. Typically, this individual comes from a technical and project management background, who is the single point of contact for all offshore related activities. This role becomes critical when the company is engaged in a series of project with the same or multiple vendors. The onsite coordinator reduces the amount of communication confusion and facilitates activities behind the scene, in keeping the projects moving forward. Their role is mostly liaison in nature, but of critical importance if the team structure calls for no onsite resource from the offshore vendor.

Infrastructure

Companies typically expect offshore vendors to have the same level of infrastructure available. This is not always the case or even possible, unless dealing with the very large vendors. Upfront planning should go in place to ensure that the hardware, software, and communication infrastructure at the offshore company are adequate to support

the development activities in a transparent fashion. Hardware in general is not a problem. However, this can become an issue if a project is going to require extensive computational processing for development and testing. Software is an area of concern. Most offshore vendors invest in the baseline licenses for development. However, when the time comes for expensive, specialized software, companies need to either plan for additional license cost or negotiate that the offshore firm invest in the needed licenses. Companies also need to ensure that the development environments are compatible in terms of versions and service packs. Until recently communication infrastructure for voice and data was a major area of concern. While broadband connections are still limited and expensive, voice communication has become good and reasonably priced.

Knowledge Transfer and Communication Guidelines

An area often overlooked is the actual process of knowledge transfer of the existing needs and ongoing communication for adequately transferring the requirements from the client to the vendor. Needless to say, that thorough documentation is a good starting point. Time needs to be accounted for key individuals from the offshore team to spend with their counterpart onsite. Protocols should be developed for documentation style, email communication (including instant messaging), meeting summaries, status updates, voice conversations, scheduled meetings, demos, and feedback. Quite often major confusion can occur due the cultural differences and use of the English language. Due to the differences in time zones, vast majority of the offshore vendors have changed their work schedule to have at least a 4-hour overlap with the U.S. workday of 9 a.m. – 5 p.m. Processes should be established to account for the availability of key individuals during non-overlapped hours or holidays that do not match. Additionally, both the teams need to establish practice to account for the turnover of key individuals from the project team. Nothing can be more devastating than the knowledge to walk out with the individual.

Quality Assurance

The concept and practice of quality assurance (QA), strangely enough, is neither well understood nor well implemented (Burg & Singh, 2004). Offshore vendors with matured processes (CMM Level 3 and above) will generally have well-established policies for the typical QA practices like documentation, unit testing, code reviews, and load testing. Under no circumstance should the company outsourcing the project abandon their responsibility for the final QA and acceptance of the product. This typically entails establishment of stringent QA practices like requirements review, test plan review, white box testing (where the quality of the code is analyzed) database review, integration testing, security testing and stress testing. Quite often, many of these activities cannot be performed offshore because the activities need to be performed onsite, within the clients' existing environment. Another point of failure that needs to be planned for is keeping the test plan up to date with the changing requirements. This is a challenge when projects are conducted onsite – it becomes a greater challenge in the offshore model. One cannot put enough emphasis on the QA process. Final responsibility for the quality of the system simply cannot be outsourced and transferred to the vendor.

Cultural Training And HR Policies

Companies planning to adopt the offshore model on a significant scale should plan to invest in cross-cultural training of their employees as well as their vendor employees. People are resistant to change and nothing is more discomforting than working with colleagues with a different set of value system and beliefs. Training can be conducted formally and informally, where on-the job training is more beneficial than classroom training. Quite often, such training requires US based employees to be transferred to India and cross pollinating onsite project teams with key offshore vendor employees. HR policies also need to be examined to accommodate for relocations, visa restrictions, and tax implications.

Risk Mitigation

Established Indian vendors have adopted very strong personal and physical security measures to overcome the general concerns about privacy and information vulnerability. Companies however would be well served to set up their own audit process where onsite auditors are deployed for physical and process audits at the offshore vendor

facilities. Quite often companies are also insisting that vendors set up disaster recovery and business continuity facilities outside India (Ribeiro, 2004). Keeping up with the global business delivery model, many such vendors have opened offices and facilities in the US and European countries, which only bring peace of mind to the clients.

Pilot Project

Starting an offshore relationship is a complex, challenging, complicated and cumbersome process. There will be numerous business and technical hurdles to overcome, in addition to the difficulties of cultural assimilation. Hence, it is always advisable to conduct a pilot project as a proof of concept to establish trust and business processes. The pilot project should be similar to the actual first project. All the lessons learned should be well documented for knowledge transfer to other groups. This initial step also helps in building a feeling of ownership among the team members. Once the pilot is successful, initial projects should be small and of low risk (Karamouzis & Frances 2003). The quality of work should then determine the escalation of the project size and scope. Starting an offshore relationship with a critical and complex project should be avoided at all cost.

CONCLUSION

Any human endeavor that is dependent upon knowledge capital, telecommunication, and computers is a prime candidate for migration to an offshore location. Over the last 15 years, what began as low cost alternative for call centers (Ireland) and software maintenance of legacy systems (India) has turned into a full-scale industry. Today, in addition to software development and call centers, scores of jobs in engineering, accounting, human resources, healthcare, biotechnology, and other back office services have been transferred to countries like India, Ireland, Russia, Hungary, Philippines, Brazil, Mexico, and China. Services industry is following the pattern of the manufacturing sector. (Palvia, 2003; Herera 2003). Companies like Dell, HP and Motorola are outsourcing not only manufacturing of computers but also design and R&D. (Koch, 2005) In essence, the multinational companies are creating global electronic colonies and outposts.

India is a prime example of what can happen if proper conditions exist and government and industry nurture favorable policies. Starting from a negligible base 10 years ago and notwithstanding the continued backlash in Europe and US against offshore operations, the software exports exceeded USD 17 billion for the fiscal year ending in March 2005. For the same fiscal year, total exports including other IT services exceeded USD 22 billion. India currently employs over 1 million people in the software engineering sector alone (Anonymous, Yahoo.com, 2005).In the near future, just HR process outsourcing is expected to generate $40 - $60 billion per year (Aiyer, 2005).

Naturally, many emerging economies in the world want to emulate India's success. Service sector in the US and European countries will continue to face pressure from all parts of the world. While other countries do not have the scale or other advantages discussed in the preceding sections, one has to take the China factor seriously. The Chinese government is determined to emulate success in the services industry just as it did in the manufacturing sector. The government is actively promoting English only software engineering universities, setting up software parks, encouraging Indian companies to set up joint ventures in China, and actively promoting Chinese investment in the Indian IT sector. Adding to this momentum is the continued pressure on the Indian vendors from their international clients to open operations in China, so that they can be better served locally. It is expected that in the next 10 years, China is going to emerge as a major player in the IT sector (Herera, 2003).

The question that needs to be addressed by decision makers, both in private and public sector, is how does the local economy stay competitive against the dual threat of India and China? US has already turned into a service-based economy, where most of the well-paid jobs are analytical and customer facing. As these white collar activities are exported to different parts of the world, there is a tremendous backlash amongst employees, governmental regulators, and local communities impacted by the migration. Hoping that the problem will go away will not solve the problem. Rather a proactive approach has to be adopted and implemented by the educational institutions, industrial organizations and governmental agencies.

Change has to occur first in college curriculum in the colleges and universities. Two fundamental shortcomings need to be addressed. First, is that the curricula needs to be updated to reflect the needs of the business world. Students emerging from the computer science and engineering tracks hardly take classes in the business schools. Additionally, they are trained to be problem solvers, without acquiring the technical skill sets that are required to be immediately productive. On the other hand, business school IS students lack the technical foundation to be effective in highly complex field of IT. New employees have to be mentored for at least a year before they add value to an organization. Colleges and universities need to integrate practical work experience as part of the education, as is the norm in other professions like medicine, pharmacy, law, and engineering. Further, most colleges and universities have dropped mainframe related courses (e.g., COBOL) from their curriculum, which does not prepare their graduates for the still existing demands from industry for employees that can maintain and enhance legacy systems.

Second, the quantity of qualified IT graduates needs to be increased. Colleges and universities graduate approximately 30,000 IT students from computer science, engineering, and business schools when the average number of job openings per year is over 200,000 (Rubin - ITAA Taskforce Report). In the absence of a trained workforce, companies have no choice but to go to offshore locations to fulfill their needs.

Politicians and policy makers need to realize that rhetoric and myopic legislations are not going to prevent industries from taking jobs offshore. It did not work in the manufacturing sector and it will not work in the services industry. Despite all the discussions and legislation passed in state assemblies, many federal and state agencies are using offshore companies for IT services, often at a substantially reduced cost with guaranteed work performance. Rather decision makers need to realize the policies needed to be passed and incentives needed to be provided for industries, educational institutions, and individuals to invest in the next generation of knowledge based industries. Quite often, the new growth areas are in the emerging field of life sciences, nanotechnology based engineering, and information intensive business functions. Local, state, and federal agencies need to provide tax incentives and relief for companies investing in R&D and creating jobs in the high tech industry.

Finally, companies cannot abandon their responsibilities for the local economy just for the sake of profits. Companies can greatly influence the competitiveness of their community and lessen the impact from the export of white-collar jobs in three ways. First, organizations need to provide ongoing incentives and even require that employees keep their skill sets current through continuing education, certification programs, and cross-functional college degrees. The rate of skill set obsolescence is quite high in the IT industry. Due to the flexibility of lay off policies, employees who loose their jobs in the US and have not kept their skill sets current, find it very difficult to get comparable employment opportunities. Second, companies need to realize that there are many critical customer-facing jobs that should not be considered for offshore location (McLaughlin, 2003). For example, in software engineering, companies should retain requirements engineering, architectural design, and critical aspects of quality assurance onsite. Third, IT workers are a critical source of organizational knowledge. All attempt needs to be made to retrain and redeploy them in other areas of the organization where they can add value in solving customer needs.

The world has become increasingly global with the advent of advanced telecommunication and computational facilities. Governments and individuals need to realize that the theory of comparative advantage will continue to drive economic activities. Companies always find ways to circumvent protectionism. Countries where competition is restricted by tariffs and legislations will loose their predominance and will be replaced by countries like India that are able to harness their manpower for an information intensive world.

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