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Chapter 1: Offshoring: The Big Picture

"*Offshoring is nothing less than a revolution in the tradability of services.*" (World Investment Report 2004, p. 148)

1. 1 Introduction

In the United States today, there are two views about the offshoring of IT and IT-enabled services. Some people, such as the television business commentator Lou Dobbs, see a crisis in our midst. More than a million blue-collar manufacturing jobs in the United States were lost in the last ten years, mainly to low-wage Asian nations. The solace in all this for American policymakers had been that another kind of job – the high-paying, white-collar jobs in the computer and other knowledge industries that had long been dominated by the United States – seemed immune to competition from low-wage countries. But then the pattern of job loss began to be repeated in the white-collar labor force as the software and IT-enabled service sectors moved jobs to Malaysia, the Philippines, China, and especially India. Dobbs and others called for protectionist measures to stop the hemorrhaging of high-paying jobs from the US economy. They believed that offshoring was not only going to do short-term harm to those who lost their jobs, but also long-term damage to the individuals and communities losing these jobs.

Others disagreed, pointing out that when this work is sent offshore, although domestic labor may lose in the short term, there are many winners in the high-wage country: consumers through lower prices; companies through higher productivity, more competitive pricing, and shorter time to market; shareholders through higher corporate earnings; company executives through higher compensation packages; and perhaps a select group of other employees whose jobs change to include more interesting tasks associated with innovation and exclude much of the drudgery of mundane tasks. Many of the supporters of offshoring believe that the individuals who lose jobs will be able to find other good jobs, especially if they are given a safety net from the state consisting of temporary benefits and retraining, and that the total number of jobs may actually increase over time through higher productivity and greater competitiveness of the companies that send work to low-wage countries.

This difference of opinion in the public debates over offshoring is also found among professional economists. Economists are generally regarded as being in favor of free trade. For example, one economist who has looked closely at the issue of offshoring is Catherine Mann of the Institute for International Economics in Washington, DC. She argues that free trade will eventually lead to greater prosperity for the nation. She points to the case of computer hardware manufacturing where many manufacturing jobs shifted from the United States to East Asia in the 1990s as having been highly beneficial to the American economy. Western innovation, coupled with global sourcing, led to price reductions in products. This led in turn to more IT investment in the Western nations, higher Western productivity growth, and ultimately enhanced growth in gross domestic product. Mann believes the offshoring of computer hardware manufacturing was one of the reasons for the robust economy in the 1990s in the United States and argues that the long-term national economic benefits from outsourcing software and services are likely to be even greater than the benefits from outsourcing hardware manufacturing. On the other hand, both Paul Samuelson of MIT and Ralph Gomory of the Sloan Foundation, working with William Baumol

* W. Aspray and O. Berry took a leadership position in the writing of Chapter 1.

of Princeton University and NYU, have done analyses that show that high-wage countries can lose through trade under certain circumstances. (Mann's argument is discussed later in this chapter, Gomory and Baumol's in Chapter 2.)

Looking at this same issue from the perspective of a low-wage country such as India, you can also see two perspectives. Offshoring work is the top growth area in the Indian economy, and it is the driver of India's international trade. Hundreds of thousands of new jobs are being created, and even entry-level positions in this field pay much more than the average wage. IT is seen as the way for India to leap from being a third-world economy in the 20th century to a world leader in the 21st century. However, this IT workforce still represents only a tiny fraction of the Indian population, and there is a backlash to all of this change in a country with rich cultural traditions. The traditional family structure is threatened as young people move to the high tech centers for work, have large disposal incomes, and otherwise follow work practices that do not fit with traditional culture. This economic growth has brought congestion, unbridled growth, and severe wage differentials to cities such as Bangalore. The benefits of offshoring are unevenly distributed with little benefit for the majority of the people in China or India who are rural, poor, uneducated, and without English language skills. Some critics complain that government funds spent on attracting and building the infrastructure for IT companies could be better spent on helping poor and rural populations with clean drinking water, better primary education, and other basic infrastructure.

Which of these pictures is correct? Is offshoring leading to long-term deterioration of Western living standards or is it the means to greater productivity and prosperity in the West? Is it the economic savior for low-wage countries such as India and China or is it the death knell for another traditional way of life? This chapter will introduce the subject of offshoring of software and services and provide a framework for understanding it and related issues from the perspective of both high-wage and low-wage nations. The following questions are addressed in this chapter; many of them will receive more detailed attention in later chapters.

- What do we mean by outsourcing, offshoring, and globalization of software?
- How did offshoring come about?
- How much work is offshored?
- Which countries send work offshore and which countries do most of this work?
- What types of work are sent off shore?
- Why are firms interested in sending work offshore?
- What are the technical, business, and other drivers and enablers of offshoring?
- Why might a firm, a profession, or a nation not want to offshore work?
- Is IT still a good career choice for people working in countries that ship IT jobs overseas?

1.2 What Do We Mean By Outsourcing, Offshoring, and Globalization of Software?

It is important to be careful about the terminology used in this study. Outsourcing means that a firm sends work to another organization to be done. Most outsourcing done by US firms, for example, is work sent out to other US firms. The client company might have parts made for them or have another company handle the cleaning of their office premises, for example. Offshore refers to where the work is done. It is a term that applies best to the

United States because, even though the United States does outsource work to Canada and Mexico, most of its work is sent over the seas, largely to India, but also to China, Malaysia, the Philippines, and many other places. Germany, for example, sends work across its borders, especially to Eastern Europe, but there is no water – no shore – to cross.

Some of the work that is offshored is sent to entrepreneurial firms established in low-wage countries. Thus a UK firm that sends work to an entrepreneurial firm in India, such as Infosys or Wipro, would be sending the work outside their own company.

At other times, multinationals headquartered in high-wage countries operate subsidiaries in the low-wage countries to work on products and services for their world market. The multinational might do this by contracting for all the services offered by an entrepreneurial firm located in the low-wage country, in which case the entrepreneurial firm is sometimes said to be a captive of the multinational, and the multinational holds great power over the entrepreneurial firm. The multinational might instead buy an entrepreneurial firm in a low-wage country outright, or it might create its own subsidiary there. These subsidiary firms, whatever their organization, represent an increasingly large share of the offshoring of software services.

Multinationals sometimes open facilities in low-wage countries in order to better serve the local market especially since the Indian and Chinese markets are expanding so rapidly, but that situation is not the primary interest of this study. We are more interested in multinationals that open operations in low-wage countries to serve the world market. Offshoring is part of a larger trend toward the globalization of software under which software products and software services are created throughout the world and sold throughout the world. The aspect of globalization that involves moving work from high-wage to low-wage countries is the most important aspect of globalization for this report but, over the coming years, other aspects of globalization are likely to become important to the professional, business, and policy communities.

More precisely, we should differentiate between captive offshoring and outsourced offshoring or offshore outsourcing as it is often called. For compactness of language, we will often use the term offshoring in this report without consideration for whether the work is done by a captive or entrepreneurial firm. Where it matters, we are careful about the distinction.

1.3 How Did Offshoring Come About?

In order to understand offshoring, it is worthwhile to place it in the historical context of globalization and multinational corporations. The import of raw goods and agricultural products from less developed nations and the export of manufactured goods by industrialized nations goes back centuries to a time when transportation across long distances became feasible. Over time, some countries placed tariffs and other protective barriers on international trade to protect their markets or industries. The first period of intensive globalization came in the nineteenth century when laissez faire economic theory drove nations to reduce or remove tariffs that limited the movement of goods. Globalization was also driven by the adoption of the gold standard by many countries in the second half of the nineteenth century. Gold stabilized the value of money and greatly enhanced trade across national borders. Globalization led to the concentration of industrialization in the industrialized countries at the expense of their agricultural bases, specialization in the manufactured products they exported, growth in population, and demand for greater import of agricultural products from agriculturally oriented countries. Globalization led to a substantial increase in wealth for the industrialized countries.

This period of globalization ended with the onset of the First World War, and then an era of protectionism ensued between the two world wars. The second wave of globalization, which continues today, began near the end of the Second World War with a meeting in Bretton Woods, New Hampshire in 1944 that led to the formation of The World Bank, The International Monetary Fund, and the reestablishment of the gold standard. The World Bank, whose original mission was the financial reconstruction of nations destroyed by the Second World War, broadened its mission to include reducing poverty through the funding of state governments to improve their educational, agricultural, and industrial systems. The International Monetary Fund was formed to oversee the global financial system. This it has achieved by making the international monetary system more stable and by helping out countries with monetary problems by supplying them with financial and technical assistance.

The period since the Second World War has been characterized by a series of international agreements to promote free trade. This period began with the General Agreement on Tariffs and Trade (GATT). Twenty-three countries participated in GATT's first round of talks in Geneva in 1948, but by the Uruguay Round of talks in 1993, the number of countries participating had increased to 123. The Uruguay Round of talks led to the formation of the World Trade Organization (WTO) as a successor to GATT. Under the WTO, there have been a number of different approaches to enhancing global free trade: reduction of tariffs, export subsidies, and other trade restrictions; formation of free-trade zones; reductions of restrictions on capital; and increased agreement among national intellectual property laws. Country membership has grown from 26 in 1993 to 148 today. The net effect of all this is to have many more countries participating in international trade and to provide conditions that enable this trade to occur more easily.

Multinational companies, which are simply companies operating in multiple countries, have played an important role in the globalization of trade. The first multinational was The Dutch East Indies Company, formed in 1602. The rise of big business in the second half of the nineteenth century, with its concomitant separation of ownership from management, created many new multinational companies. Some of these nineteenth-century multinationals were technology companies such as I.G. Farben, which started its chemical business in Germany, and General Electric, which started its electric power business in the United States. Within a few years of their founding, both of these companies were operating in many different countries around the world.

The computer industry attracted firms from the business machines, electronics, and defense industries but also included important entrepreneurial start-ups. A number of companies from the computer industries became important multinationals. These include General Electric (formed in 1895 and entered the computer industry in the 1950s), IBM (consolidated in the tabulating business in 1911), Hewlett Packard (formed in 1939 as an instrument maker and entered the computing industry in the 1960s), EDS (formed in 1962 to serve large users of computers), Microsoft (formed in 1975 to provide products in the microcomputer software industry), and Dell (formed in 1984 to provide microcomputer hardware). It is notable but not surprising that these companies all had their origins in the United States. The United States has dominated the computer industry throughout its history. In its hey-day, IBM alone held about 70% of the world market for mainframe computers, for example. The United States also had the market lead in the electronics industry (mainly because of its dominance of the radio and television industries and its later need for components for the computer industry) and the semiconductor industry, which grew as a spin-off from the invention of the transistor at the regulated US monopoly AT&T and was closely coupled in its history with the computer hardware industry.

US dominance in the computer, electronics, and semiconductor industries continued into the 1970s, but then some changes began to occur. Perhaps the most public story was the emergence of Asia as a leader in the manufacture of electronics and semiconductor devices.

In the 1970s and early 1980s, major US electronics products firms began to set up affiliates in Hong Kong, Singapore, and Scotland to use high-quality workers (with wages lower than US workers) to do labor-intensive assembly such as assembling circuit boards or assembling price-sensitive products such as computer peripherals or telephones. At first, the components were built in the United States and shipped to these assembly plants but over time the assemblers began purchasing components from local sources. Eventually, their skill levels increased and they began to provide turnkey services. One specific example is disk drive manufacture which began to migrate from the United States to Asia in the 1980s; today, very little of this manufacturing takes place in the United States.

A similar story occurred in the semiconductor industry. Beginning in the early 1970s, American (and later European) semiconductor companies such as IBM, Philips, AT&T, and Hewlett Packard began to move labor-intensive chip assembly to low-wage countries in East Asia, including Singapore, Hong Kong, Malaysia, and Thailand. These chips were then shipped back to the American or European electronics firms for assembly into final products. During the 1970s, the American semiconductor firms kept semiconductor wafer fabrication, circuit board assembly, and product-level assembly in the United States. But both computer and electronics firms opened or expanded plants in Scotland and Wales to do circuit board and product assembly for the European market in the 1980s. Scotland and Wales were selected for their educated workers, an English-speaking workforce, and government incentives to attract foreign direct investment. It also helped that wages were lower there than in the United States. More recently formed American companies such as Sun Microsystems, Silicon Graphics, and Cisco never vertically integrated their operations but instead always used contract manufacturers such as Solectron and Celestrica and chip fabricators such as Taiwan Semiconductor. These firms were located in the United States, East Asia, and Scotland.

In the 1980s in East Asia, Singapore's labor rates became too high and its companies began to offshore the most labor-intensive work to Malaysia and Indonesia which had lower wage rates. A similar phenomenon occurred in Hong Kong which offshored its labor-intensive work to China. Singapore and Hong Kong retained the work on circuit board assembly that could be automated. They also began to add backward integration services such as component and circuit design, circuit board layout and reconfiguration for better manufacturing, and forward integration services such as testing, final product assembly, packaging, shipping, and repair. With a few exceptions, the East Asian companies providing these value-added services chose not to produce products that competed directly with their American and European customers. By the end of the 1980s, East Asia had the capacity to provide circuit boards and electronics products to the entire world. At the same time, the United States retained and grew its business for higher-value, lower-volume electronics products such as large computers and communications switching equipment. This work was often done under contract to specialized contract manufacturers, such as SCI and Solectron, that were housed in the United States rather than by the large brand-name electronics product companies themselves.

As more and more of this manufacturing work was done in other countries, middle-class jobs were lost in the United States. It is hard to count the exact number of manufacturing jobs created outside the United States to serve the US market or the needs of US-based multinationals, but the number is probably in the range of a million jobs over the past decade. The labor force in the US Midwestern industrial states was especially hard hit. While this caused a public outcry and led politicians to suggest protectionist actions as mentioned earlier, some economists see a silver lining in these developments. For example, Mann argues that a combination of technological innovation in the United States and the increase of global sourcing and markets for hardware (IT, semiconductors, and electronic components and products) led to price declines. These price declines led to greater

investment in IT in the United States. This, in turn, caused increasing transformation of the American workplace and an increase in the development of new products either incorporating IT or using IT in its development or manufacture. These developments, she calculates, caused half of the productivity growth in the United States during the 1990s and translated into increased wealth for the United States on the order of $250 billion in the period 1995 to 2000. Mann assumes that there can and will be a similar pattern of growth for the software industry but that the scale might be even greater for software than hardware.

While there has been angst in America over the number of good middle-class manufacturing jobs lost to Asia, there has also been a widespread belief that good jobs in the software industry would always remain in the United States. However, in the late 1990s and even more so in the past several years, there is a dawning recognition and fear that these high-paying software and service jobs will be moved out of the United States as well. Similar concerns are now beginning to be expressed in Western Europe.

A number of IT-enabled services are being offshored today. They range widely and include, for example, reading X-ray images of patients, identifying risk for insurance companies, and processing financial data, as well as testing, building, and maintaining software for customers. Software was the first service sector to be offshored to a significant degree. This is perhaps because it was easy to transport the work data and work products using simple communications equipment (a telephone and a modem) and because there was a significant wage difference for programmers between the United States (or Western Europe) and India (or China). During the late 1990s, software offshoring seems often to have been driven by labor shortages in the United States, especially associated with fixing the Y2K problem and creating new Internet products and services during the dot-com boom. When the dot-com bubble burst, offshoring continued – with cost as a major driver – and began to represent jobs transferred overseas rather than jobs supplementing an insufficient US labor market. The practice of offshoring became a political issue in the United States only after the recovery from the 2001 recession was historically weak in its creation of jobs. European concern about offshoring lagged behind US concern presumably because the United States began to offshore first and has always offshored to a greater extent than Europe.

Firms have outsourced work for centuries, sometimes even to companies that are outside their national borders. The first offshoring in the software and IT services sector began in the early 1980s: US firms sent some credit card processing to the Caribbean and established call centers there. Software centers provided software services to the PC manufacturers in Malaysia at about the same time. However, there was no substantial software offshoring industry until the 1990s. India, Singapore, Ireland, Israel, and Hungary were all early entrants in the offshoring business. Despite some differences in focus from country to country, described in a later section of this chapter, all of these countries benefited from first-mover advantages. Every several years, as a new application area became hot, the offshoring firms in these countries would turn their attention to this application, moving from business downsizing/reengineering, to Enterprise Resource Planning, to Y2K, to Euro conversion, and so on. These offshoring firms coupled this strategy with an effort to move up the value chain through industry sector specialization in order to deepen their expertise and build trusted relations with clients who would eventually turn over progressively higher level and more profitable tasks for them to do.

The story of how offshoring began in the major vendor countries, such as India and China, is told in Chapter 3. These case studies indicate that offshoring has meant several different things. In India, for example, it began with body-shopping, the process of sending trained programmers to work for a few months in another country on the client firm's premises. This was followed by a blended strategy in which some of the work was done on

the client's site and some at the vendor's site in India. Then call centers opened. In the past five years, facilities began to be established to carry out IT-enabled business processes such as accounting. More recently, Indian firms have begun to move up the value chain to do IT-enabled knowledge processing such as reading X-rays, conducting patent analyses, and carrying out IT research and advanced development. The players in this story were at first Indian entrepreneurial firms. But later, multinational firms came to play an important role, sometimes through an Indian firm that did contract work for the multinational company, but also through a firm purchased outright or started up by the multinational company.

The globalization of the marketplace is helping to drive offshoring. The Indian and Chinese governments, for example, have taken many steps to ready themselves to participate in the international software market. Software is seen as attractive to low-wage countries as a way to bolster their economies more quickly than the boot-strapping strategies tried in the past by developing nations. In fact, about one-quarter of all offshored shared-service centers for European clients involve interactions with the development agencies of the vendor's country (World Investment Report 2004). These countries have used tax breaks, marketing subsidies, grants, loans, reduced bureaucracy, and other techniques to attract foreign business and foreign capital. China passed the United States in 2002 as the most preferred location for foreign direct investment. Trade policy has been liberalized in these countries, for example, by reducing or eliminating export taxes and licensing (see Chapter 8 for details). These governments have enacted policies to strengthen the public and private education and training sectors (see Chapter 7). Subsidies have been provided for research and development activities in their countries, especially for development work that is likely to have a near-to-midterm payoff in new products or services. Governments are trying harder to protect intellectual property which has been an especially serious concern to Western businesses about China (see Chapter 6). The Indian central and state governments have worked to improve basic infrastructures such as telecommunications, electric power, transportation (both roads and airports), buildings and technology parks, and other amenities such as international-class hotels, but the infrastructure started in a poor state and the government is not efficient in these efforts. Table 1 describes the state of infrastructure in Bangalore, India's leading offshoring location.

Table 1-1: Bangalore's Infrastructure for Conducting Offshoring Work

Electric power is unreliable, so most companies have backup generators.
Roads are congested and in ill repair (an hour to travel the 12 miles from center city to the outskirts where the outsourcing companies have their campuses in Electronics City and Whitefield).
Work has not yet begun on a new international airport.
There is a shortage of rooms in international quality hotels.
No mass transit exists (talking of elevated railway) so most companies hire their own buses to bring employees back and forth to work.
Telecommunications infrastructure is improving rapidly (cell phones, satellite transmission, transoceanic fiber optic cable).

Source: Fannin (2004)

1.4 How Much Work Is Offshored?

The answer to this question is that nobody has very good data on the amount of offshoring worldwide, whether one measures the number of jobs lost or created through offshoring, the number or percentage of companies offshoring work, the number of companies providing IT software services for export, or the monetary value of this work. Chapter 2 provides a detailed analysis of the problems with the data. It also provides a sample of the statistics about the extent and impact of offshoring in the United States, Europe (with separate breakouts for the United Kingdom and Germany), and India. Adding these numbers up gives some sense of the global situation. In Table 2, we provide a sample of the worldwide statistics as already totaled up by others. One can see from the McKinsey (2005) statistics that the actual number of jobs offshored is still a small fraction (less than 15%) of the number that could be offshored. Other statistics in the table make it clear that one type of offshoring –business process services – is growing very rapidly, and that there is room for considerable growth since only 30 percent of the largest 1000 corporations are currently offshoring any work of this type. It is also clear that India is the major provider of these services. We do not have good numbers for the amount of software service work (software maintenance, testing, programming) being done independent of work for call centers or business process outsourcing. Nor can we tell exactly how much of the offshoring work is being done by independent firms and how much by subsidiaries of multinationals, although it is clear that the latter are a large part of the total. The numbers do, however, give a general sense of the scale of offshoring activity worldwide. Additional information about the size of the Indian and Chinese shares of the world offshoring and software markets is given in Chapter 3.

Table 1-2: The Extent of Offshoring Worldwide

Source	Data Reported	Statistic
McKinsey & Co. (2005)	Amount of onshore outsourcing worldwide as of 2001	$227 billion
	Amount of offshore outsourcing worldwide as of 2001	$10 billion
	Amount of captive offshoring worldwide as of 2001	$22 billion
	Number of IT services jobs globally that could be done anywhere in the world as of 2003	2.8 million
	Number of service jobs worldwide that could be done anywhere in the world	160 million
	Number of actual IT service jobs in offshore operations in low-wage countries as of 2003	371,000

Evalueserve (2004)	IT offshore revenue worldwide, April 2003-March 2004	$17 billion (almost half from India, almost one-quarter from Ireland; includes IT products shipped from Ireland)
UN Conference on Trade and Development (2004) (as quoted on TurkishPress.com)	Percentage of world's largest 1000 companies offshoring business process outsourcing	30
	Value growth in offshore business process outsourcing worldwide (projected)	$1.3 billion in 2002 to $24 billion in 2007
Scholl (2003) (as quoted in World Investment Report 2004)	Market value for offshoring of IT services (not including captive production for multinationals)	$1.3 billion
McKinsey & Co. (2003) (as quoted in World Investment Report 2004)	Market value for offshoring of IT services, including captive production for multinationals	$32 billion

1.5 Which Countries Send Work Offshore and Which Countries Do Most of This Work?

Countries that send software and IT-enabled service work offshore are primarily high-wage countries that have advanced service industries. These are also the countries that have the largest amount of IT work. According to Datamonitor (May 2005), the global data processing and outsourced market had a value of $246 billion in 2004 with North America accounting for 43.6%, Europe 29.4%, Asia-Pacific for 17.8%, and the rest of the world 9.1%. The country that started the offshoring trend and that sends the most work offshore is the United States. The United Kingdom, Germany, France, and other Western European countries come next. Although Japan has an advanced economy, it does not offshore as much work as the United States or the Western European countries. In an interesting turn of events, Indian offshore companies have begun to open facilities in China (where wage rates are lower than in India and a huge local market is opening) and Eastern Europe (to take advantage of proximity to the Western European market –nearsourcing). The extent of this phenomenon is limited and recent, and it is not clear whether it is a strategy for Indian firms based primarily on obtaining more contracts or on taking advantage of lower-wage labor.

Which countries do the offshoring work is a more interesting story. There are quite a few countries that have tried to develop this business, and these countries vary considerably in their skill sets, labor costs, cultural fit with the countries seeking to have work done, levels of technical and business expertise, and type of work that they offshore. The four countries that have the most established offshoring industries (accounting for 71% of the market in 2001) in order of market share are Ireland, India, Canada, and Israel (McKinsey & Co. 2003 as quoted in World Investment Report 2004). The public stories make one think that offshoring work is all done in low-wage countries such as India and China. In fact, the majority of offshoring services have historically been provided by developed nations, and Ireland still leads with a 25% share. However, as Arora and Gambardelli (2005) point out, the value added in Indian offshoring is higher than in Ireland because so much of the Irish

work involves localizing US software products for the European market. Moreover, the growth rate of the national software export industry is much higher in India than in Ireland so the relative position is changing rapidly. Canada and Ireland do have lower wages than the United States, perhaps 10 to 20 percent lower, but there are not the extreme wage differentials as there are between the United States and India or China. So this is not yet a north-south or developed/undeveloped nation issue although the trend is in that direction (World Investment Report 2004).

An assessment by the consulting firm A.T. Kearney of the most desirable future locations for offshore work placed India at the top of the list, followed by China, Malaysia, the Czech Republic, and Singapore (A.T. Kearney 2004 as quoted in the World Investment Report 2004). The expected rapid growth in offshoring activity occurring in low-wage countries will make the public perception of who does offshore work progressively more accurate. The Kearney report listed Brazil as the leading offshore source in South America; South Africa in Africa; Hungary, Poland and Romania in Central and Eastern Europe; and Canada and New Zealand among developed nations. Ireland, Portugal, Spain, and the United Kingdom were listed as the preferred destinations for offshore work within Western Europe.

Countries doing offshore work fall into four categories as shown in Table 3. First are those countries that take advantage of their large capacity of highly trained/educated workers and low-cost wage scale. One example is China which has established businesses providing offshore work on embedded software and IT-enabled financial services. Another example is Malaysia which is building up business at the lower end of the offshoring market in call centers and IT-enabled back-office business processing services. The principal example is India which is the fastest growing destination for offshore work and is involved in almost every aspect of the industry from call centers to business process outsourcing, to software maintenance and testing, to software research.

The second category consists of countries that have competitive advantage through their language skills to serve a special part of the market. While it is useful in any kind of offshoring work for vendor and client to be able to speak the same language, it is essential that workers in call centers, for example, be able to speak fluently in the language of their customers. Thus China, which has relatively few people who speak English fluently, is unlikely to become a major provider of call centers to the United Kingdom or the United States. The Philippines, Mexico, Costa Rica, Chile, and Morocco have taken advantage of their bilingual skills in English and Spanish to open up call center businesses serving the United States. South Africa is the leading offshoring nation in Africa because of its English-language skills. Some countries from Francophone Africa (Mauritius, Morocco, Senegal, Tunisia, and Madagascar) have recently started to provide call center and telemarketing service to France. India, of course, has been able to build up its call center business in part because of its English-language skills.

The third category consists of countries that take advantage of their geographic proximity to a country that offshores work, so-called nearsourcing. The nearsourcing countries not only are located nearby, making it easier for executives from the client firms to visit the vendors, but there is often a shared language and culture as well. These countries generally do not have extremely low wages, but their wages are typically lower than in the country that is offshoring the work. Canada is a major nearsource destination for the United States, providing many high-end services. Poland, the Czech Republic, Hungary, and increasingly the Ukraine, Belarus, Romania, and Latvia are building nearsourcing businesses to serve Western Europe, especially Germany. In a poll of 500 top European companies in 2003, the German consulting firm Roland Berger found that 50% of European firms were planning to offshore to other parts of Europe and only 37% were planning to offshore to Asia (Gumbel 2004). China is trying to establish a nearsource business for Japan and Korea. (One could call the second category linguistic nearsourcing and this third

category geographical nearsourcing. Doing so suggests that there are other kinds of affinities between nations that might make them want to do business with one another such as a common heritage or legal system as exists between the United Kingdom and countries in its former empire.)

The fourth category consists of countries that have special high-end skills. Like the nearsourcing countries, the wage rates might not be as low as in India or China, but they are lower than those in the United States or Western Europe. Israel provides offshoring in the form of research and development for multinational corporations and niche software products and services, especially in the security and anti-virus software markets. Ireland's offshore business is mainly in the area of packaged software and product development; it hosts many multinationals who are building software products and providing IT services for the European market. It also has a number of small Irish-owned companies operating mainly in niche markets. China is beginning to develop high-end skills in the Linux operating system, bioinformatics, and anti-virus software. Australia exports high-end, IT-enabled financial services. India is beginning to develop research and development laboratories for various European and American-based multinational corporations. Also, one should not neglect the United States which exports the highest amount of IT products and services of any nation, mostly to Europe, and mostly in the form of packaged software and consulting services.

Table 1-3: Nations that Do Offshoring Work

Strategy	Principal Examples	Others
Cost and Capacity	China India	Malaysia
Language Skills	Philippines Mexico Costa Rica India	South Africa Tunisia Morocco Senegal Madagascar Mauritius
Nearsourcing	Canada Poland Czech Republic Hungary Slovakia	Ukraine Belarus Romania Latvia China
Special High-End Skills	Israel Ireland Australia United States	China India Russia

1.6 What Types of Work Are Sent Offshore?

Various kinds of work involving the use of information technology are being offshored. Types that are of primary interest in this study include:

- programming, software testing, and software maintenance,
- IT research and development, and

- high-end jobs such as software architect, product designer, project manager, IT consultant, and business strategist (the extent to which these jobs have been offshored is an open question).

Because the focus of this study is on offshoring of software and services, we are not primarily interested in the following kinds of IT-related work, even though they are frequently offshored:

- physical product manufacturing – semiconductors, computer components, computers,
- business process outsourcing/IT enabled services/knowledge process outsourcing (e.g. insurance claims, medical billing, accounting, bookkeeping, medical transcription, digitization of engineering drawings, desktop publishing, and high-end IT enabled services such as financial analysis for Wall Street and reading of X-rays), and
- call centers and telemarketing.

A detailed list of the various kinds of IT and IT-enabled services that are being offshored can be found in the World Investment Report 2004 (p. 150). These include various types of audiovisual and cultural services, business services, computer-related services, higher education and training services, financial services, health services, Internet-related services, professional services, and animation. Many of these fall outside the principal focus of this study. In Table 4, we identify skill levels required for various kinds of IT and IT-enabled services also taken from the World Investment Report 2004.

Table 1-4: Skills Categorization of Traded IT and IT-Enabled Services

Skill Level	Definition	Examples	Requires	Comments
low	Low entry barriers in terms of skills, scale, technology	Data entry Call centers	general formal education working knowledge of relevant language basic computer skills	few economies of scale little agglomeration
medium	Complex services that require more advanced skills	financial and accounting services standardized programming work routine data analysis back-office services such as ticketing	specialized training required (perhaps in training schools)	may offer economies of scale may have agglomeration effects

high	Most creative and skill-intensive work	R&D Design services Architectural drawings software design Animation Medical testing Technology systems design	Advanced skills at high levels of specialization, often with strong educational institutions	stringent entry requirements involve agglomerated economies with different skills, enterprises, and institutions interacting with each other to share work, stimulate knowledge flows and allow specialized skills to be fully utilized

Based on Box IV.2 in World Investment Report 2004

Jobs that are at the greatest risk of being offshored are also often those most at risk of being automated, in which case labor would be replaced by technology instead of by foreign labor. For example, although it has not happened to an extensive degree yet, software automation tools might help to automate low-end software development.

The situation is far from static. We described earlier how India first offered body-shopping, then software services, only later IT-enabled services, and most recently research and development. There has been a similar change in the pattern of offshoring by firms in high-wage countries. In the 1980s and 1990s, the typical pattern was for an IT manager to hire an outsourcing firm to carry out some task that was not critical to the mission of the client firm. It tended to be an application development that was highly structured, required relatively little interaction and project management from the client, had clear deliverables, well understood bidding procedures, and transparent risk to both the client and vendor. Often the vendor was located near the client. More recently, the pattern has changed. The outsource firm is hired not by the IT manager but by a higher-level executive such as the CFO, CIO, or perhaps even the CEO. The task is more likely to be mission-critical to the client. The applications are wide ranging, but they often include tasks that are less well structured than in previous times; ones that require greater amounts of client contact and project management and where deliverables, costs, and risk are less clear. The vendor is as likely to be located in another country as nearby.

But what are the characteristics of work favorable to performance offshore? John Sargent and Carol Ann Meares of the US Department of Commerce have provided an excellent and detailed answer to this question that is adapted slightly in Table 5.

1.7 Why Are Firms Interested In Sending Work Offshore?

The public perception is that companies in the United States, Western Europe, and Japan send work to India, China, and other low-wage countries principally because of the lower labor cost. There is some truth to this perception. Companies want to maximize their profits, and, in many cases, the lower cost of qualified labor in these countries is the principal reason for making the offshoring decision. Sometimes companies begin offshoring for cost reasons but continue for quality of work reasons. Sometimes something else drives the initial decision to offshore, for example, the lack of enough qualified workers in the United States during the Y2K era. This section shows that the situation is complex. There

are at least nine reasons, low-cost labor among them, why companies send work offshore, and often more than one reason is in effect in a company's decision to offshore. Here is a summary of those reasons. Chapter 4 gives examples of the ways in which particular companies of various types use offshoring as a strategic tool.

Table 1-5: Characteristics of Work Favorable to Performance Offshore Through 2004

- high wage differential with similar occupation/level in destination country
- high labor intensity
- clearly defined requirements, little nuance
- repetitive tasks
- rule-based decision-making and problem solving
- documented or easily transferred content and process knowledge
- discrete, separable; low degree of interaction across different services, applications
- low degree of personal interaction with end users, clients
- stable applications with minimum of "firefighting"
- long projected useful life to amortize offshore set-up costs
- low-to-medium business criticality
- less time-sensitive, longer transition periods
- projects involving simple and standard hardware and software
- digital, Internet-enabled
- low setup barriers
- low-to-medium technical complexity
- not-multidisciplinary
- projects in business areas in which offshoring is a broadly accepted concept
- tightly defined work processes
- stable process

Source: Sargent and Meares (2004). Note: as the Indian companies, for example, move up the value chain, the characteristics of work subject to being offshored may change.

1. *Reduced Costs and Increased Margins.* In the modern, investor-driven, globalized marketplace, there has been a compression of resources, both time and money, that companies, new and old, have with which to make a new business model profitable. One response to this compression has been to reduce costs. Labor costs are a major portion of service and other knowledge-intensive businesses so it is natural to want to reduce these costs. When a new software engineer costs $45,000 annually in the United States and only $5,000 per year in India, even with many additional overhead costs associated with offshoring, most firms anticipate substantial savings in sending work to the Indian software engineer over doing the work in-house in the United States. In this way, the companies can make their new business start-up funds last longer or increase their profit margins. While the focus in the public perception is on the low salaries, costs are also sometimes reduced because the offshore vendor has scale benefits in doing the work. (Another response to this compression, to address the time issue, is given in point 5.)
2. *Access to Skills.* The United States has the strongest postsecondary system in the world. It trains many highly qualified workers from both home and abroad, and it also imports workers who are educated or trained in other countries. But the United States does not have a monopoly on highly talented, educated, and experienced workers. As China,

India, Russia, and Eastern Europe have joined the world market, there is now an excess of educated workers in certain countries such as India, Ireland, Russia, and some Eastern European countries at a time when the US math and science educational system is slowing down its production. In 1999, for example, China graduated three times as many engineers as the United States. In particular, we are seeing strong pools of talent outside of the United States in the IT, telecommunications, engineering, and health care domains.

Thus another reason for companies to send work offshore is the size and quality of the available labor pool. The applicant pools available to the offshoring companies in the leading offshoring countries in many cases have been larger and stronger than the applicant pools available in the United States and Europe. In the late 1990s, many US firms turned to Indian vendors because they had available programmers with the knowledge of legacy systems to make Y2K fixes. Similarly, during the dot-com boom in 1999 and 2000, many US firms turned to offshore vendors to find enough people who knew the Java programming language. There was an abundance of such people in India, for example, not only because of the large labor pool but also because of the tendency of the Indian higher education system to react quickly to the marketplace and teach skills that are in current demand.

To take advantage of this labor pool, many of the best offshoring vendors spend substantial money on the hiring process, going through a lengthy and rigorous screening process to identify employees who have a higher average quality than those available for the client firms to hire directly. NASSCOM, the Indian software and services trade association, has expressed concern recently about the uneven quality of the Indian educational system, contending that while there are still large numbers of graduates, not all of them have the quality education that gives India this competitive edge in offering this access to skills.

3. *Experience.* Companies from the United States and Western Europe sometimes choose to send work offshore because other countries have greater experience in a particular field than they do. This experience can be of four types:

   A. Experience with a particular technology. For example, China already has the largest number of mobile phones in the world and India may be the second in this regard by 2012; these countries have skipped a level by not putting the infrastructure in landlines but investing more in the wireless domain. Hence, it makes good business sense to do R&D on wireless in India, China, and other emerging wireless markets. A similar situation pertains to Linux which is a part of the Chinese government's national technology policy. While India and China are not yet the world leaders in these fields, they have a growing number of scientists and engineers with knowledge of these fields, and the overall level of knowledge in the country is growing rapidly.

   B. Experience with a particular scientific domain. There are, for example, several countries that provide offshore services with strong labor pools in the biomedical disciplines.

   C. Experience with particular management issues. For example, several of these countries have strong experience managing projects that operate multiple shifts per day.

   D. Experience with cultural and marketing issues in emerging countries.

4. *Time Shifting.* Offshoring enables companies to offer multiple-shift services that may not have been offered prior to offshoring. For example, US hospitals are using US-trained Indian physicians to read X-rays in India in time to deliver the results to the US doctors the next working day. This move can increase patient service at a reasonable cost.

Offshoring medical services can also provide rural areas with access to affordable medical services. Some IT companies have several offshore sites, located strategically by time zone, that enable them to provide round-the-clock services such as help desks and network monitoring, while requiring none of their workers to have to work the graveyard shift.

5. *Time To Market.* Some companies offshore work in order to reduce the time to bring a product to market. The types of work offshored for this reason include R&D, production, and other parts of the supply chain. One reason that time to market can be reduced is that companies can take advantage of time shifting. A design team in the United States can work regular business hours and then turn the work over to their team in China, which is just beginning its regular work day, to either continue the design work or do code checking. Then the Chinese team can turn the work over to their Indian colleagues for the next shift who work on it and turn it back to the US team to start the process all over again. Another way to take advantage of offshoring to reduce the time to market is to divide the work into self-contained tasks that can be worked on in parallel in several locations. Yet another strategy for achieving faster time to market is to compartmentalize the work into a set of tasks that require different skill sets and parcel the work out to the teams around the world that would be most effective or productive at doing a particular part of the work. With synchronization points, this modularized work process can be used effectively to create one single larger product developed on a distributed basis in a timely manner.

6. *Market Access.* Companies sometimes find it strategically attractive to have a market presence in countries in which they would like to sell their products. As Balasubramaniyan, general manager at Wipro Technologies, describes this issue: "Offshoring also helps a company be closer to its global customers, thereby providing appropriate offerings to its regional market and ensuring speedier problem resolution. Developers and support personnel in the relevant geographies have a better understanding of customers' needs, regulatory compliances and regional preferences, and can better implement the product or provide the service." (Balasubramaniyan and Guyer 2004).

7. *Ability to Send Overflow Work.* Many small IT companies, especially those in IT services, are usually faced with "feast or famine" situations, that is, during any given period of time, either they do not have enough work or they have too much work. These small companies cannot afford to keep a very large workforce on their payrolls because they cannot afford the payroll in lean times, and therefore they have to work with a minimum workforce. However, this causes problems for the company when it lands a large project that needs to be completed in a short period of time. These companies can benefit by sending work to large offshore providers who can supply very capable professionals with the right domain expertise at the right cost. Larger companies face this same problem. Companies are unlikely to want to hire extra staff for a project that might only have a six-month or one-year duration because of the cost of hiring and the morale problems of having to lay these workers off at the end of the project. The use of offshore workers enables a company to ramp up and down quickly without these problems.

8. *Extending Venture Capital Money.* After the dot-com and the telecom busts in 2001, many startups, especially in the IT, telecom, and biotech areas, have found it difficult to raise venture capital. Those that have been able to raise such funding – as well as those who are working on a "shoestring" fund provided by family and friends – are left with little choice but to make the funding stretch as far as possible. Lower-cost locations such as Israel and India become very attractive for them, and so it is not surprising that by March 31, 2005, more than 170 startups already had established their R&D centers in

India. Often, the venture capital firms themselves are pressuring the companies to use offshoring to keep costs down.

9. *Other Business Reasons.* Using offshore workers can have other business advantages. Given the low cost of labor, a number of the better offshoring vendors have expanded the ranks of their middle managers who have time to mentor and enhance the skills of the lower level employees and identify and implement process improvements that make the work effort more effective. The vendor might have access to tools that are not available to the client either because they are proprietary or because they would be too expensive for the client to buy but not too expensive for the vendor who can use them for many different clients. Clients who are not in the IT business may have more time to focus on their core business and maximize their overall profits if they offshore their IT tasks. Some companies have found that because the offshore vendors are eager to retain their business, there is a stronger focus on continuous business improvements and customer service than if the work had been done in-house. Public sector companies, who may be regulated against large cost overruns and have rigid work rules that make hiring new employees difficult, may find that offshoring provides them with new flexibilities.

1.8 What Are the Technical, Business, and Other Drivers and Enablers of Offshoring?

Offshoring has been made possible by a collection of technological, business, work process, policy, educational, and other changes over the past 15 years. The technological changes are the ones that are most often mentioned in the discussions about the growth of offshoring, but they are by no means the only ones.

(1) *Telecommunications infrastructure.* Since the late 1990s, there has been a dramatic increase in the telecommunications infrastructure. As part of the dot-com boom, various telecommunications carriers competed to increase satellite and optical fiber networks to the point where there was a glut in the market after the dot-com boom ended and prices plummeted. India now has readily available low-cost, high-bandwidth communication and access to all the major telecommunications applications such as email, fax, videoconferencing, and cell phone. Telecommunications capacity between India and the United States grew from practically nothing in 1999 to 11,000 GBS in 2001. The cost of a one-minute telephone call from India to the United States dropped more than 80% within several years after January 2000.

(2) *Changes in information technology.* A number of changes in information technology also changed the opportunities for offshoring. Low-cost computing power became readily available. Software platforms became standardized: IBM and Oracle provided the standard for database management, SAP for supply chain management, PeopleSoft for human resource management, and Siebel for customer relations. Offshoring vendors could invest in the purchase of a small number of standardized software platforms and train their employees in their use rather than having to deal with possibly hundreds of proprietary software systems. Workers could learn standardized skills that were then portable. Training and skill certification became simplified. A similar effect was created by using commoditized, inexpensive applications software packages. Standardization of data formats and networking protocols made it easier to move large data sets from client to vendor. Interoperability standards such as MDA, UML, CWM, CORBA, and OMA were established during the 1990s, making it easier to modularize software.

(3) *Pace of innovation.* The technological changes mentioned in (1) and (2) can be considered enablers. One study (Bartel et al. 2005) discusses technology as a driver of

offshoring. It found that a high level of IT use in an industry is not a predictor of greater outsourcing. However, an increase in the pace of information technology change does increase outsourcing. The explanation is that firms are more willing to gain access to the latest technology through their outsource vendor than by sinking fixed costs into a technology that is likely to change with great rapidity. One would describe the dot-com era as an era of rapid IT change, hence driving companies to outsource.

(4) *The downsized corporation.* Since the 1970s, businesses in the United States began to move away from vertical integration of the corporation, shedding activities that were not regarded as core competencies, through eras of reengineering and downsizing. During the 1980s and 1990s, more and more activities were pared from the list of core competencies and subject to outsourcing. As IT systems became more standardized, they were seen less as core activities. And as corporations focused more on core competencies, there was big growth in outsourcing of functions outside the core.

(5) *Other business drivers.* There have also been some business drivers of offshoring. When rival firms began offshoring, many companies felt that they had to offshore in order to remain competitive. Companies looked for ways to cut expenses to deal with the economic downturn that began in 2000. Venture capitalists began pushing startups to incorporate offshoring into their business plan so that the burn rate on start-up funds was lessened. Several high-profile business leaders, such as Jack Welch from General Electric and Carly Fiorina from Hewlett Packard, became evangelists for offshoring. As experience with offshoring mounted, some of the early mistakes were understood and some of the early problems with bureaucracy and infrastructure were fixed. It became more acceptable and less risky to offshore; offshoring was no longer restricted to the early adopters such as Texas Instruments or General Electric. Business leaders began to recognize the value of reengineering, both in cost savings and improved performance, that was often undertaken when work was transferred from client to vendor.

(6) *Intermediaries.* The offshoring business created new specialty occupations and firms. Some of them did part of their work on the client's site and offshored the rest; some did all the work offshore on their own premises. Some served as brokers, placing the client's work with one or more of a number of offshore firms. Others served as consultants, helping companies to make the decision about whether to offshore, what work to offshore, and how to make contact and close a deal with an appropriate offshoring vendor. These consulting firms and brokers aggressively marketed the advantages – particularly the labor cost advantages – of offshoring. The presence of these specialty firms made it possible for smaller companies to offshore work by helping them with the management of offshored projects in a cost-efficient manner. Another group of firms emerged to provide support services to the offshore vendors: transportation services, catering services, access to specialty knowledge workers, and the like.

(7) *Changes to the work process.* Changes to the work process have enabled offshoring. Certain kinds of knowledge work have been digitized and business processes have been reengineered, making them suitable for offshoring. The value chain has been divided into separable work processes some of which can be routinized and made subject to offshoring even when not all aspects of the process are amenable to offshoring. This kind of fragmentation of labor process is much more easily done with software and services than with manufacturing. There is also more personal acceptance of having old ways of doing business transactions replaced by using the Internet or proprietary networks to acquire services so there is less resistance to service at a distance. All of these reasons add up to the fact that progressively larger amounts of work can be offshored each year.

(8) *Higher education system.* In the past, one of the great advantages of the United States has been its higher education system. However, some of the developing countries

are using higher education as an effective means to create a skilled workforce, and the numbers are impressive in comparison to the United States. Model curricula, established by professional organizations such as the ACM and the IEEE, have been adopted in many different countries, and the computing machinery needed for classroom instruction is inexpensive in these days of personal computing.

In India, for example, national policy since the Second World War has placed a surprising amount of limited resources into developing the post-secondary educational system rather than in supporting the primary or secondary systems. There are 160 universities and 500 institutes today in India offering computing degrees of one kind or another, and the number is growing rapidly. This is not yet as large as the number of colleges and universities awarding computing degrees in the United States where about 200 universities offer IT-related doctoral degrees and about 2000 colleges and universities offer four-year degrees. However, the number of technical degrees awarded in India as opposed to the number of degree-granting institutions tells another story. India is awarding a much higher percentage of its degrees in technical fields than the United States is. Each year, India awards approximately 290,000 engineering degrees which includes 120,000 information technology degrees, while the United States awards a total of approximately 75,000 computing degrees at the bachelor's, master's, and doctoral levels. India has also rapidly built up a set of institutions for training people for jobs in IT skills training and certification. To cite just one example, the offshoring firm Wipro has established Wipro University with 70 full-time instructors. It trains 2500 workers per year in areas directly pertinent to Wipro's offshoring work.

The United States still holds some significant advantages over India in the higher educational system. Although India has a much larger population than the United States, only a small fraction of its population attends college (7% as of 1997). The Indian system is strongest in IT skills training and undergraduate degrees. University research in India is very modest, and India produces only 300 master's degrees and 25 doctorates each year in the computing disciplines, compared to 10,000 master's degrees and 800 doctorates in the United States. For many years, the United States has been considered the place of choice for advanced degrees for people throughout the world, but this seems to be changing. Because of visa tightening and attitudes towards the United States in the post-9/11 era, the number of foreign students applying to graduate school in the United States has plummeted. The United States also has decreasing numbers of domestic students studying IT (or science and engineering subjects more generally).

(9) *Free-market world economy.* The development of a world economy since the Second World War has provided the opportunity for creating a global software market. International agreements such as GATT and increasing national participation in international organizations such as the World Trade Organization, the collapse of communism, and the liberalization of the economies of India and China have all contributed to making the software market global and in making India and China major participants in this market.

(10) *Immigration.* Immigration has played a role in the growth of offshoring. A large number of Indian and Chinese citizens came to the United States to study and many of them stayed on to work. In concentrated high-tech regions of the United States, most notably in Silicon Valley, communities of Indian high-tech entrepreneurs emerged and bonded with other Indians in the high-tech community, and similarly for the Chinese. In many cases, these technical entrepreneurs were the ones who started offshoring companies or who were the go-betweens to ease the difficulties of doing business across so many miles and such different cultures. US immigration policy, especially the H1-B and L-1 visa programs, have enabled Indians and other foreigners to gain valuable experience and contacts in the United States before returning to their home countries. Recently, there has been a reverse diaspora of engineers, and China and India are both recruiting technical

workers to return permanently to live and work in their native countries. China has been providing all-expense-paid trips to China, holding job fairs in Silicon Valley, and recruiting faculty members online to spend their sabbaticals working in China. India has been providing salaries, benefits, and stock options that make living in India attractive to Indian high-tech workers who had been working in the United States.

(11) *Other factors.* Other factors have also played a role in driving or enabling offshoring. The fact that English is the language of education and business has helped make India more attractive to US firms. That India's accounting and legal systems are compatible with the British and American systems has also been an attraction. An aging population in the United States means that the country will need to reach outside its national boundaries for its workforce of the future. The McKinsey Global Institute projects a US need for 16 million additional workers from overseas over the coming decades in order to maintain the present ratio of workers to retirees. Evalueserve predicts a 5.6M worker shortfall by 2010, including a shortage of 970K IT workers (assuming no work is offshored and not counting immigrants). This shortage would lead to higher prices, being less competitive, and loss in Gross Domestic Product. US temporary visa policy (for H1-B and L-1 visas) has been conducive to building the offshore vendor presence onsite in the United States and in building networks of people between India and the United States especially in Silicon Valley. For the offshoring of research, international projects such as the International Space Station and Human Genome project have built ties, involved many countries in the international research community, and made internationalization of the R&D process seem more familiar and feasible. The following case (Table 6) of the Indian state of Andhra Pradesh and its capitol city of Hyderabad illustrates actions taken by governments interested in building up an offshoring industry.

Table 1-6: Government Action to Build an Offshoring Industry: Andhra Pradesh

In the 1990s, the Indian state of Andhra Pradesh and its capitol city of Hyderabad developed a public policy to create an IT-enabled services offshoring industry in their locale. They created a government agency with the double entendre acronym APFirst (Agency for Promoting and Facilitating Investment in Remote Services and Technology) for this purpose. The government provided free right-of-way land for laying fiber optic cable and donated a 55,000 square-foot office building with reliable electric power service to encourage IT- enabled services firms to locate there. In 1999, the government created a new incentive policy that provided 25% discounts on power bills to IT firms, exempted software from sales taxes, and provided a rebate on the cost of land by up to 20,000 rupees per job created. In 2001, the Indian School of Business was enticed to relocate to the city. The state created the Indian Institute of Information Technology to provide IT education and the Information Technology Enabled Service Training Institute to offer courses in English and other subjects of value to the ITES offshoring firms. The state also declared the ITES industry to be an essential service, thus prohibiting its workers from labor actions (just as in other critical industries such as water and police).

Sources: Atkinson (2004), Dossani and Kenney (August 13, 2004), Balatchandirane (undated "…Hyderabad…")

There are some reasons why companies might not want to offshore. These have been grouped in Table 7 into eight categories: (1) the job process is not routinized sufficiently to offshore the work; (2) the job cannot be done at a distance; (3) the infrastructure in the vendor country is too weak for the work to be carried out there; (4) offshoring the work negatively impacts the client firm's workplace; (5) there are risks to privacy, security, and intellectual property of the client company from offshoring the work; (6) there are not workers in the offshore company with the requisite knowledge; (7) the cost of opening or

maintaining the offshore operation is prohibitive; and (8) miscellaneous other reasons. Although each specific reason is placed in only one category, a number of the reasons could fit in more than one category. Note that there is a certain parallelism between work that firms might offshore (Table 3) and work they are unlikely to offshore (Table 7).

Table 1-7: Reasons a Firm Might Not Offshore Work

Category	Specific Reason
Job process is not routinized.	*Uncertainty about the nature of work; uncertain specifications in some jobs. *Project has a highly iterative development process. *Applications involve complex processes that require frequent intervention to fix algorithms or data. *High-skill work such as research, process design, or business analysis. *The work involves system analysis.
Job cannot be done at a distance.	*Face-to-face interaction is required for the job. *It is too difficult to coordinate the non-standardized parts of a project if they are geographically distributed.
The infrastructure is too weak in the vendor country.	*Telecommunications, transportation, or specialty vendors are not adequate.
The offshoring impacts negatively on the client firm's workplace.	*The company loses control of the work process. *The company loses in-house expertise needed to maintain, improve, or replace the offshored product or service. *Worker morale in the client organization deteriorates because of potential loss of job, loss of wage power, or deskilling of job.
There are risks to the client company in offshoring the work.	*The work requires security clearance. *Giving the vendor's employees VPN access to the clients information systems makes security difficult. *Data privacy and security are hard to control at the vendor site. *It is difficult to ensure that the vendor will protect the client's intellectual property. *The vendor may not be able or motivated to follow the privacy and security mandates in legislation from other countries such as HIPAA, Gramm-Leach-Bliley Act, Sarbanes-Oxley Act, California State Bill 1386, and European Union Data Protection Directive. *The vendor may not be able or motivated to meet professional qualifications required to do certain kinds of work such as being an accountant certified as required by the client's country. *Legal recourse to privacy, security, or intellectual property problems is non-existent or unenforceable in the vendor country's legal system.

There are not workers in the offshore company with the requisite knowledge.	*Application domain knowledge is required to do the job. *The work crosses multiple disciplinary boundaries. *The work depends on craft or proprietary knowledge held only by the client company's staff. *The work involves business as well as technical expertise.
Cost of opening or maintaining the offshore operation is prohibitive.	*The client needs to implement new bureaucratic structures such as explicit authority relations, operating procedures, and incentive systems. *There is an extra cost for evaluating vendors, managing contracts, improving security, travel, and severance pay for laid off workers. *Alternatives to offshoring such as downsizing, consolidation, and reorganization are more cost-effective.
Other reasons	*Cultural issues exist between the vendor and client countries (social behavior, attitudes towards authority, language issues). *Gain occurs from being located near to other companies doing similar work (agglomerated economy), e.g., jobs in complex functions that need to be located near one another to thrive, adapt, and innovate such as in activities in corporate centers or less routine consulting practices.

There are also reasons that professions or countries might want offshoring not to occur. If low-level programming jobs are shipped overseas, then there might not be a viable career ladder for IT workers to climb in order to attain the higher-end IT occupations that people hope will remain in the high-wage countries. Salaries of IT workers in the client (high-wage) countries might be pushed down by offshoring. The ingredients for innovation (including labor, capital, knowledge, facilities, and technology) are threatened at home since innovation is widely regarded as the driver of higher productivity and standard of living for a nation. The locus of entrepreneurship begins to move offshore.

1.9 Is IT Still a Good Career Choice for People Working in Countries That Ship IT Jobs Overseas?

Almost every day one can find stories in the US press about people losing their IT jobs because their positions were sent to a low-wage country. Many of these stories quote talented young people who are choosing careers in other fields because they believe there are no longer opportunities in IT. There are fears that it will not only be low-level programming jobs that are sent to low-wage countries but also jobs that require higher skill levels and are more highly compensated. If the world really is flat, as Thomas Friedman proclaims, and a job can as easily be done in Bangalore or Beijing as in Boston, then even if the job remains in Boston, eventually the wages will fall in order to remain competitive with wages in other parts of the world. One study has shown that if you are one of those who loses a job to trade, the chances are that you will be paid less in your next job (Kletzer 2001).

All of this sounds bleak, but consider some interesting statistics on jobs as shown in Table 8 and on salaries as shown in Table 9. They are both based on data from the US Bureau of Labor Statistics, one of the most reliable sources available. There is some lag in collecting

and analyzing data so the most recent data is only from May 2004. Note what David Patterson, a computer scientist from Berkeley who is president of the ACM, has to say about these numbers:

"Moreover, most of us believe things have gotten much better in the year since the survey was completed. Does anyone besides me know that U.S. IT employment [in 2004] was 17% higher than in 1999—5% higher than the bubble in 2000 and showing an 8% growth in the most recent year—and that the compound annual growth rate of IT wages has been about 4% since 1999 while inflation has been just 2% per year?" (Patterson 2005)

How could it be that, at the same time jobs are being shipped overseas, the number of IT jobs in the United States is growing rapidly and is even higher than at the height of the dot-com boom? There are several possible explanations, but we do not have adequate data to identify the one at play. One possible explanation is that the very companies that are sending jobs overseas are prospering from the lower costs of overseas labor which is enabling them to grow and create new jobs in the United States and elsewhere. Another possible explanation is unrelated to offshoring except that the background factors that make it possible are the same background factors that make offshoring possible, namely, many industries are being reorganized to make them more productive through the use of IT. Catherine Mann, the economist from the Institute for International Economics mentioned earlier in this chapter, has conducted a study of Bureau of Economic Analysis data for the years 1989-2000. (More specifically, her data is taken from BEA Digital Economy 2002, Table A.4.4) She has found a strong correlation for industry sectors between high productivity growth and high investment in IT (Mann 2004). She has also identified a number of sectors that still have low IT intensity and thus are poised to take off as IT is introduced. These include health care, retail trade, construction, and certain services. As IT becomes more pervasive in society, there are more jobs involving either pure IT skills or combinations of IT skills and skills associated with a particular domain such as finance or health care. Most of the forecasts suggest that perhaps 2 to 3% of US IT jobs will be lost annually to offshoring on average over the next decade. With the expanded use of IT in society, it is very possible that the total number of IT jobs will grow at more than a 3% rate over the decade. Thus it is not surprising that the US Bureau of Labor Statistics forecasts that three IT occupations will be among the ten fastest growing occupations over the coming decade (BLS 2002).

Even if the IT job market is a growth area over the next decade, some types of jobs are likely to fall off, probably including routine programming jobs. As explained in Section 1.8, there are many reasons that companies do not send work offshore so there are likely to be jobs in almost every IT occupation to be found somewhere in the United States; but perhaps in some of these specific occupations there will be fewer jobs that there are today. It is very unlikely that the United States will be completely devoid of even these most at-risk, routine programming jobs ten years from now.

There are no fail-safe recipes for having a successful IT career, but there are many things people can do to make themselves more attractive to employers. They can get a good foundational education and keep up with current technology. They can improve soft skills such as oral and written communication and teamwork skills. They can get management training and experience. They can learn the processes of a domain in which IT is likely to be increasingly important in the future such as in the health disciplines. They can be prepared to work on tasks that are less routine and that require regular discretionary judgment or that require regular interaction with others (e.g., with customers or domain specialists within the company). They can seek out jobs that involve knowledge of trade secrets or fundamental processes of the company or that are involved with national defense. They can learn about other cultures, the technologies for doing work in a geographically distributed fashion, and other things about managing distributed work so

that they can take advantage of offshoring instead of being a victim of it. They can gain a wide array of experiences so that they can be employed flexibly by a company and so that they gain an overview of the way IT is being used in the company and its industry sector.

There are also some things that American (or British or German or Japanese) society can do to assure that there continue to be good IT jobs for their workers. They can nourish the innovation base that creates these jobs. This can be achieved by adequately funding research and development, improving the educational system at all levels, making sure that there continue to be opportunities for foreign scientists and technologists to study and work in the country because of their important role in driving innovation, and developing and enforcing rules for fair competition in the international marketplace. These issues are all discussed in the policy chapter (Chapter 8).

Table 1-8: IT Employment in the United States (US Bureau of Labor Statistics)

	Employment								
					May	Nov.	May	Change, May 2003 to May 2004	
Occupations	***1999***	***2000***	***2001***	***2002***	***2003***	***2003***	***2004***	***#***	***%***
Computer and Information Scientists, Research	26,280	25,800	25,620	24,410	23210	23,770	24,720	1,510	6.50%
Computer Programmers	528,600	530,730	501,550	457,320	431640	403,220	412,090	-19,550	-4.50%
Computer Software Engineers, Applications	287,600	374,640	361,690	356,760	392140	410,580	425,890	33,750	8.60%
Computer Software Engineers, Systems Software	209,030	264,610	261,520	255,040	285760	292,520	318,020	32,260	11.30%
Computer Support Specialists	462,840	522,570	493,240	478,560	482990	480,520	488,540	5,550	1.10%
Computer Systems Analysts	428,210	463,300	448,270	467,750	474780	485,720	489,130	14,350	3.00%
Database Administrators	101,460	108,000	104,250	102,090	100890	97,540	96,960	-3,930	-3.90%
Network and Computer Systems Administrators	204,680	234,040	227,840	232,560	237980	244,610	259,320	21,340	9.00%
Network Systems and Data Communications Analysts	98,330	119,220	126,060	133,460	148030	156,270	169,200	21,170	14.30%
Computer and Information Systems Managers	280,820	283,480	267,310	264,790	266020	257,860	267,390	1,370	0.50%
Computer Specialists, All Other							130,420	130,420	
TOTAL (The "Change" columns do not include "Computer Specialists, All Other")	**2,627,850**	**2,926,390**	**2,817,350**	**2,772,740**	**2,843,440**	**2,852,610**	**3,081,680**	**107,820**	**3.80%**
Computer Hardware Engineers	60,420	63,680	67,590	67,180	72,550	70,110	74,760	2,210	3.00%
TOTAL, including Computer Hardware Engineers ("Change" columns do not include residual "Computer Specialists, All Other")	**2,688,270**	**2,990,070**	**2,884,940**	**2,839,920**	**2,915,990**	**2,922,720**	**3,156,440**	**110,030**	**3.80%**

Table 1- 9: IT Mean Annual Wages (source: US Bureau of Labor Statistics)

	1999	2000	2001	2002	May-03	Nov-03	May-04	CAGR (1999-May 2004)	May 2003 - May 2004
Computer and Information Scientists, Research	$67,180	$73,430	$76,970	$80,510	$84,530	$85,240	$88,020	5.60%	4.10%
Computer Programmers	$54,960	$60,970	$62,890	$63,690	$64,510	$65,170	$65,910	3.70%	2.20%
Computer Software Engineers, Applications	$65,780	$70,300	$72,370	$73,800	$75,750	$76,260	$77,330	3.30%	2.10%
Computer Software Engineers, Systems Software	$66,230	$70,890	$74,490	$75,840	$78,400	$79,790	$82,160	4.40%	4.80%
Computer Support Specialists	$39,410	$39,680	$41,920	$42,320	$42,640	$43,140	$43,620	2.10%	2.30%
Computer Systems Analysts	$57,920	$61,210	$63,710	$64,890	$66,180	$67,040	$68,370	3.40%	3.30%
Database Administrators	$52,550	$55,810	$58,420	$59,080	$61,440	$62,100	$63,460	3.80%	3.30%
Network and Computer Systems Administrators	$50,090	$53,690	$56,440	$57,620	$59,140	$60,100	$61,470	4.20%	3.90%
Network Systems and Data Communications Analysts	$55,710	$57,890	$60,300	$61,390	$62,060	$62,220	$63,410	2.60%	2.20%
Computer and Information Systems Managers	$74,430	$80,250	$83,890	$90,440	$95,230	$95,960	$98,260	5.70%	3.20%
Computer Hardware Engineers	$66,960	$70,100	$74,310	$76,150	$79,350	$82,040	$84,010	4.60%	5.90%
								3.90%	3.40%
								3.80%	3.30%
11					24,720	5.60%	4.10%	3.60%	3.00%
					412,090	3.70%	2.20%		
CAGR	2%				425,890	3.30%	2.10%		
1999	$100.00				318,020	4.40%	4.80%		
2000	$102.00				488,540	2.10%	2.30%		
2001	$104.04				489,130	3.40%	3.30%		
2002	$106.12				96,960	3.80%	3.30%		
2003	$108.24				259,320	4.20%	3.90%		
2004	$110.41				169,200	2.60%	2.20%		
					267,390	5.70%	3.20%		
					74,760	4.60%	5.90%		

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