INFORMATION TECHNOLOGY OFFSHORING:

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DEDICATION

Dad, Mum, Venetia and Sunitha…..This one is for you!
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CHAPTER 1

INFORMATION TECHNOLOGY

We begin this chapter with defining Information Technology and look at its various interpretations. The second section of this chapter is a brief discussion of the current and future trends of IT. The purpose of this chapter is to instill an appreciation for an industry that is the area of study in this thesis.

1.1 DEFINING INFORMATION TECHNOLOGY

Information Technology - two words that describe a revolution in not just the global economies of today, but a generational shift in human perception of and correlation to technology, have roots in section 5002(3) of the Clinger-Cohen Act of 1996, more famously known as the Information Technology Management Reform Act of the United States Congress. The definition of Information Technology (henceforth also known as IT) according to the act states: "any equipment or interconnected system or subsystem of equipment, that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information" [1]. This definition, coupled with an addition of the term “Electronic” in the 1998 amendments to Section 508 of the Rehabilitation Act, required that the Architectural and Transportation Barriers Compliance Board (Access Board) establish "a definition of electronic and information technology that is consistent with the definition
of information technology specified in section 5002(3) of the Clinger-Cohen Act of 1996” [2]. The formal definition of information technology that was published in the Electronic and Information Technology Accessibility Standards is as follows:

“**Information technology.** Any equipment or interconnected system or subsystem of equipment, that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information. The term information technology includes computers, ancillary equipment, software, firmware and similar procedures, services (including support services), and related resources.” [3].

IT, while difficult to list various interpretations of it’s equally varied definitions, is part of the contemporary lexicon and its evolution a phenomenon that has had a profound effect on the way humans think, innovate and interact not just among themselves but with the surrounding environment. From radio to televisions, computers and calculators of all kinds, communication means and devices like the telegraph, telephones, and cellular phones; there is absolutely no dearth of examples of the technology that plays a pivotal role in modern life [4].

On the business plane, information technology has evolved from being a back office procedure to a decisive and strategic paradigm, the rapid development of which has impacted, on a global scale, the way businesses conduct their operations. At the office, IT has come a long way, metamorphosing from that punch card machine, extensive paper records and postal communiqués to enterprise project management systems, electronic trade and transactions, webinars, and distributed job processing.
1.2 IT – CURRENT & FUTURE TRENDS

With virtually all current dissemination of information having computer technology as its spine, it is no surprise then that the blossoming, or more aptly, the boom of IT has been fueled further with the sharp decline in the cost of research, design, development and manufacture of both hardware and software components and packages [Fig. 1 & Fig.2].

Paul A. Strassmann, former CIO of Xerox and the president of The Information Economic Press, lists information as a rare and valuable commodity, the cost of which has gone far beyond that of business capital. By rare we could assume the magnitude of effort involved in parsing through data in order to extract high value information. However, one can also point out that there has never been more information available in the past than in the present day and age. The complete lack of information management or a minimalist approach to it can be foolhardy. It is effective management of information that adds value to any business which would otherwise result in massive overheads [5].

A report by the federal government’s President’s Information Technology Advisory Committee (PITAC) deems IT as the current driver of the economy and a new foundation of the United State’s infrastructure. The report also highlights the fact that IT contributed to a third of the nation’s growth in the last decade of the twentieth century, which was effectively the longest sustained period of economic growth, retarded only by the dot-com slump at the onset of the twenty first century [6]. The IT industry did manage to jump-start its recovery but its growth in the subsequent years has not been as phenomenal as the mid to late nineties.
Fig. 1 Prices for Dynamic Random Access Memory 1978–2000. Source: Congressional Budget Office, based on data from Micron Technologies

Fig. 2 Dollars per Megabyte 1980–2000. Source: Congressional Budget Office, based on data from IBM
Not remaining confined to the existing trends in the United States, dramatic and monumental changes in the industry have take place all over the world. A survey conducted by the CIO Insight editorial board in 2006 [7] broadly identifies trends that may be making their way up to the frontline. A summary of these trends are given below.

Change is inevitable and where there are changes there is bound to be a more favourable trend among others. Changes, as witnessed in the IT sector of the global industry, are unlike anything ever seen before. It has been particularly challenging to identify a specific trend that has been followed owing to a very high degree of complicated business dynamism, fluctuating market scenarios and rearrangements of global economies. After its rebirth, it is moderately safe to assume that this sector, while not scorching growth graphs with a sharp upward spike, is in a priming phase that can only indicate scope for future growth and development which may not see an abrupt end after all. This prediction of a steady, yet, powerful surge has made identification of possible trends much easier. The four IT-specific trends, presented by CIO Insight editorial board in 2006 [7], that have been considered as paths for the immediate future are:

a. **Strategy:** The focus will not be on promoting innovation but improving existing business processes. This is a strategic plus for any IT business considering the fragmentation and disarray caused by unmanaged innovation. Important strategies to improve the business process would be aiming to see a sale completed, make web interaction with clients as lucid as possible, take steps to improve not just customer service but also Quality of Service (QoS) of other business processes,
incorporate legacy data i.e. data that any business has invested significant resources to acquire or develop and which is still of use in current development efforts but has been utilized sparingly because of its linkage to original development vehicles that are outmoded. This can be taken care of by porting over data from old or defunct repositories to newer data management and development systems. Another strategy would be to establish Information Governance principles.

b. Management: With all kinds of changes in the mix, it becomes important that they are managed effectively. About 57% of survey respondents (all IT executives) have remarked about the sweeping changes that are in effect. The most visible being i) the gradual integration of IT with the core business rather than being a completely independent entity that had till now been viewed as a lesser subsidiary, ii) rapid growth of the IT industry, iii) the shortage of business-savvy technologists compared to available job prospects, iv) management within an IT setup, v) the need to adapt to fallouts of outsourcing (including offshoring) and vi) the contentious demonstration of Return on Investment (RoI) as a result of outsourcing.

c. Security & Risk: A burgeoning IT sector has enemies of its own. They include prevailing political scenario, unfavourable government policies, unstable global economy, unreliable communication networks, etc. The risk factor is particularly
high considering the geographic spread of this industry and also the rapid evolution of technology that makes it easier and faster to defeat protection than set one up to guard against malicious or, in some cases, unintended attacks. Compliance issues need to be addressed and IT intends to no longer stick with providing the traditional firewall protection but develop a well-rounded sense of security threats and establish dynamic implementation of security solutions.

d. **Technology:** It forms the core around which other trends are structured. The unveiling of web service/service based architectures (Web 2.0) as an infrastructure of the future in 2006, has dramatically changed the infrastructure environment where technology is to be deployed. This architecture, while proving popular, is yet to show proof of sustaining that popularity and also its effectiveness in the long run. Business Intelligence is another technology that has shown a lot of promise and, if the predictions are correct, the best is yet to come. IT innovation is not a technologist-exclusive domain anymore and eyes are set on how user-driven innovation manages to make an impression. Technology user-base is also no longer confined to a particular geographic location and, thanks to the Internet, now has a global footprint. This has opened the doors for technology to be researched, developed and consumed in a globally distributed environment.

In addition to the four trends listed above, changes in Computer Science and IT Education will be an interesting trend to follow. Information technology has always attracted significant contribution from the field of computer science [8]. These contributions have, predominantly, been in the form of pure and applied theories,
software and hardware design and development strategies, and extensive corporate and government funded research at computer science colleges and universities that are, in fact, technology incubators. However, as we will see in the following chapter, the desire for obtaining a computer science education is fast waning and statistics related to enrollment in computer science and IT related studies show a marked downward trend [14] [15]. Does offshore outsourcing have a part to play in this? Can this trend be reversed? If it indeed can be, will it be a sustainable trend in the future? These are some of the questions we will try to find answers to.
CHAPTER 2

OUTSOURCING

This chapter introduces outsourcing as a current business strategy. We look at it not as a nascent paradigm, but one that has been in existence for a very long period of time and has evolved over the ages. The impetus will be on understanding the evolution of outsourcing, its definition, the different types of outsourcing methodologies and options available, and prevalent trends of outsourcing.

2.1 BRIEF HISTORY OF OUTSOURCING

Sin to some while salvation to others, outsourcing, contrary to popular belief, does not have its roots in the IT revolution of the eighties and nineties; but is a rather an old business paradigm. It would be very reasonable to say that outsourcing is as old as the human society itself, which dates back thousands of years. As humans interacted, formed living societies and understood the dynamics of co-existence, they have been able to outsource some form of work to each other. Moving ahead to the eighteenth, nineteenth and even the early to mid twentieth centuries, industries and businesses were vertically structured entities that strived to achieve self-sufficiency and self-reliance to the maximum. This worked out pretty well until the wave of globalization changed the way business was conducted. There was no way these old-school businesses could survive with rising costs, scarcity of resources and complete dependence on self. Survival of the
fittest got a new meaning in the global market and reforms were necessary and inevitable [9].

An outsourcing timeline compiled by Special Editions Editor of IT Web, Mia Andric [10] highlights its existence even in the eighteenth century. The Wealth of Nations by Adam Smith, published in 1776, contains strong proof of the idea behind outsourcing as a means of cutting costs. Eric Roberts of Stanford University, in the Political History of Offshoring [11], mentions that renowned economists from the US, John Maynard Keynes and Friedrich von Hayek, in the early twentieth century, developed economic theories that defined economic policies of capitalist states. Keynes was of the opinion that for a government to establish and maintain a strong economy, it would have to take the responsibility of controlling and protecting certain aspects of the economy. This was established in the form of strict trade barriers implemented by industries within states and the states exercised their responsibility by protecting industries and people associated with those industries within their boundaries.

This kind of protectionist form of running the economy existed in the US and other countries like Great Britain, till the early eighties. However, economic hardships experience by them in the seventies set the ball rolling for economic liberalization in the form of a modified General Agreement on Tariffs and Trade (GATT). While GATT was replaced by the World Trade Organization in 1995, it was instrumental in lifting 45,000 trade restrictions that existed among industries in the US and twenty two other countries [11]. The post-war period saw Europe emerge as an engineering and manufacturing power. The signing of NAFTA in 1994 saw jobs being outsourced from the USA to
Canada and Mexico. Further exploration and the rise of IT, thanks to the development of the Internet, in the eighties saw jobs heading towards countries in the East. While all outsourcing is not IT related, there is always an element of IT in a majority of outsourced businesses. Dr. Robert Handfield, in ‘A Brief History of Outsourcing’ mentions Eastman Kodak’s decision to outsource its IT services in 1989 [12]; this is considered an important milestone of the outsourcing industry. What started out as million dollar businesses in the last decade of the twentieth century, brought it close to half a trillion dollars in revenues for the year 2006 by leveraging outsourcing[13].

All this, however, has been at the cost of increased vulnerability of people and jobs, in states from which jobs have migrated, to the negative effects of outsourcing. An example of such a negative effect can be seen in the significant decrease in number of students applying for computer science programs in the United States colleges and universities.

2.2 OUTSOURCING AND THE COMPUTER SCIENCE COMMUNITY

As we mentioned earlier, towards the end of section 1.2, the computer science community, i.e. colleges, universities, students, educators, and corporate and government agencies that fund research and development, has a very significant contribution towards the development of technologies and standards that are employed by the IT industry. The study of computer science deals with laying down theoretical foundations of information and computation methodologies and also their application to computer and computer-based systems. The primary fields of education in computer science, namely,
mathematical foundations, theory of computation, data structures, algorithm design and analysis, programming languages, compiler design and construction, real time, parallel and distributed systems, software engineering, microprocessors, system design and architectures, network and communication systems, database design and management, artificial intelligence, computer graphics and image processing, human-computer interaction, scientific and industrial computing and teaching computer science [14], are the progenitors of practically all technologies being put into use by the IT industry.

Examples of technology contribution would be development of efficient data mining algorithms that would yield better results when queries are run. This could help many IT businesses having large data repositories to manage them effectively and save on costs resulting from delays. The design of newer encryption algorithms stems from extensive academic research which is then optimized for industrial or commercial applications. Designing and developing architectures of high performance computer systems could be seen as an instance of contributions by the computer science community to the IT industry not just in terms of complex algorithms and theories but also system development and feasible hardware models. It is also interesting to take note of the fact that most IT industry leaders like IBM, Microsoft, Intel and many others have either an association with computer science departments in universities, have their own computer science research and development centers or both. This establishes, quite strongly, the significance of the contributions made by the computer science community to the IT industry.
With regard to outsourcing and, consequently, offshoring, a study by Patrick Thibodeau of Computerworld states that enrollments in computer science and engineering programs are down by significant numbers. They further go on to cite Missouri State University in Springfield as an example of such a downtrend. Quoting Prof. David Meinert of the same university, “It’s almost like somebody flipped a switch on the undergrads”. This strong statement stems from the fact that the university, which had an enrollment of 982 in the undergraduate information systems program and another 216 in the computer sciences program in the year 2000, has seen a drastic drop in the fall of 2005 with just 310 and 161 enrollments respectively [15]. All this because of a prevailing belief among parents of prospective students and the students themselves that there seems to be no future investing into a career path that cannot provide job security because of the rampant and sometimes unnecessary outsourcing prevalent in the IT industry. It could also be because of patents and students who are themselves the victims of layoffs due to offshore outsourcing and who do not envision a growth in the domestic IT job market in the foreseeable future.

Parallels of such a downward trend can also be found in colleges and universities throughout the United States. For instance, the University of California at Los Angeles, where computer science enrollment between the years 2000 and 2004 dropped by sixty percent and, in 2005, stood at a very significant low of seventy percent. Boston University has experienced a similar trend with over hundred computer science graduates in the years between 1999 and 2002 to just fifty five students in 2005 [14] [15].
While the reluctance on the part of parents and students to invest in computer science education is justifiable to a certain extent, it is also a fact that the IT industry is not the same as it was in the pre-‘dot-com burst’ era, when IT businesses sprang up by the thousands and were more focused on quantity rather than quality of products and services. The same could be said for outsourcing and offshoring. In the past, jobs and processes were shipped out to different places within and beyond national boundaries, many times without proper justification and studies related to possible negative impacts on people left without a job and society [16]. This disorganized way of outsourcing was fueled by the prevailing belief that any process which could be outsourced must be outsourced. And in doing so, significant savings were to be made. This thought, coupled with an environment of free trade, played a part in many IT businesses, intentionally or unintentionally, making hasty decisions with respect to outsourcing and offshoring and can be considered to have contributed significantly to the current scenario in computer science education.

In subsequent sections and chapters, it will be our effort to look closely at outsourcing and offshoring with respect to their types, perceived advantage and important issues that need to be taken into account prior to considering outsourcing or offshoring as a strategy. We will look at how offshoring is handled currently and later present a model that has been derived from various other prevalent offshoring models, which not only handles offshoring in a more structured fashion, but also has the potential of creating high value jobs in the IT industry on both ends of the IT offshoring spectrum. This can have an
impact on computer science education considering attractive career possibilities as a result of a structured and regulated offshoring strategy.

2.3 THE NAME OF THE GAME

There exist differences of opinion regarding the need for outsourcing, the advantages and types of outsourcing. There also exists a lack of consensus in the understanding and interpretation of the term as a business strategy or practice of identifying and extracting certain processes from an existing organizational setup and moving them over to an external service provider. This service provider is contracted with the sole responsibility of either designing, developing, producing, implementing or supporting the solutions it eventually provides while co-ensuring that they can be integrated seamlessly with the source businesses.

Outsourcing is undertaken by a wide variety of businesses targeting a spectrum of services within those businesses. These services can vary from the fairly straightforward, e.g., outsourcing the maintenance of office grounds to a landscaping firm rather than have a grounds team on the payroll, to quite complex services like the design and manufacture of microprocessors to managing the finance portfolio of a large conglomerate. Outsourcing as a paradigm can have several advantages, though they are often viewed as an unfair disadvantage to the people, industry, society or country from where the processes migrate. Often considered as an economy retardant, it is a demonstrable positive ROI for many businesses that keeps the wheels turning [13]. However, this is not true for all businesses. There have been various cases where businesses bring outsourced
operations back home because of loss in revenue, quality and even business direction. We will look at certain features that sold to the world the very idea of outsourcing when we get into discussing offshore outsourcing or offshoring advantages that made it an industry of titanic proportions, having implications on almost every aspect of the present day world. And we will also look at certain important issues that businesses need to consider before even thinking of adopting outsourcing as a feasible strategy.

2.4 PICK YOUR FLAVOUR

It’s like taking your family out for ice-cream where they know there are a whole lot of flavours to pick from. Much like ice-creams, outsourcing comes in a variety of types and flavours. But not many people are aware of it. To most of us, it still is all about dialing a 1-800 number that ends up half a world away, a lay-off for some while a job opportunity for others, an economic recession for one country while an economy on fire for another. Moving away from the theory of Loss and Gain, it is time to take a pragmatic view of this phenomenon; a time to look at if from a perspective of global integration that has the potential to offset most of the losses incurred and compound gains exponentially on both ends of the outsourcing arch. An important first step would be to know what forms of outsourcing exist.
Fig. 3 Best of Breed Outsourcing
Based on existing policies or prevailing conditions of a business, two outsourcing philosophies can be taken into consideration. They are the ‘best-of-the-breed’ approach or ‘end-to-end outsourcing’ approach [9]. The former approach distributes processes or sub-processes of a single process across a varied cross-section of service providers selected from a pool, choosing the best of them to execute the outsourced processes [Fig.3]. This trend was more noticeable in the earlier days of outsourcing and resulted in a high degree of fragmentation making it difficult to keep track of outsourced processes. Often, managing and integrating these fragmented processes ate into profit estimates, rendering outsourcing unprofitable or at least less profitable than expected. With core processes being outsourced, it became necessary to maintain a greater amount of control on execution of critical aspects of the process. This was resolved by outsourcing the whole process (usually a large chunk of the parent business), including sub-processes to a single service provider who is responsible not just for the execution but also the maintenance of the process lifecycle as a whole. This is end-to-end outsourcing [Fig. 4].
Fig. 4 End to End Outsourcing
In terms of geographic distribution, the dichotomy of outsourcing presents us with two types: domestic outsourcing and offshore outsourcing, also known widely as just offshoring. While we will discuss more about the definition of offshoring and the big idea behind it in section 3.2, it is important to know that despite being different aspects of outsourcing, domestic and offshore outsourcing have considerable similarities in terms of basic philosophical and functional principles. The primary aims of both are to keep costs as low as possible, maximize ROI and help the parent business focus on the core operations as much as possible without diverting too much attention towards the outsourced activities. As the name suggests, domestic outsourcing focuses on moving processes from a business to a service provider within geographic borders of a society, locality, township, city, county, state or country. Offshoring, on the other hand, indicates the movement of the process to a service provider who has a setup beyond the geographic borders of a country.

In terms of the functional or operational aspect of outsourcing, there are three primary types: Technology Services Outsourcing (TSO), Business Process Outsourcing (BPO) [17] and Manufacturing Process Outsourcing (MPO). A fourth type, Knowledge/Innovation Process Outsourcing (KPO/IPO) [18], has been in the works and is fast gaining ground to establish itself as an important business strategy [Fig. 5]. We mentioned before that outsourcing is not just about information technology; however, in this day and age, technology services accounts for a majority of the outsourcing industry. Cutting edge technology in terms of high end and high speed networks, high performance processors, global connectivity and interactivity and most importantly speed are the
driving forces behind TSO. Next, but second to none in importance, is the BPO aspect of outsourcing. Unlike IT, the outsourcing of a business process isn’t a new trend but a well entrenched and established outsourcing paradigm. BPO’s globalization has not just opened the doors wider in terms of spread but also in terms of opportunities to explore and diversify in newer forms because of the variety of needs that exist. Common BPO functions include CRM, finance/accounting services, SCM, HR, etc. MPO, as the name suggests, focuses on outsourcing part of or entire manufacturing process.

KPO/IPO is a newer paradigm that has garnered a lot of attention and financial backing. Touted as the outsourcing paradigm of tomorrow but brought forth today, KPO/IPO exists on a higher plane of the outsourcing skill requisites, i.e., these complex outsourced processes require specialized execution. While being tied to the parent business at a lower level, a KPO service provider is set up as an independent entity that is involved in the research, design, development, implementation and maintenance of a high end domain specific process. Hence, KPOs are more domain specific rather than process specific [19].

2.5 OUTSOURCING TRENDS

Current statistics reported in a survey by CIO [20] indicate that, even though not at a blazing pace, outsourcing is steadily increasing with 46% of IT leaders choosing to outsource a up to a tenth of the IT functions. It has also been noted that the number of businesses who do not outsource anything at all has come down by nearly 40%. Talent management will be an issue that will be looked into in order to improve Quality of
Service (QoS). This means that candidates for employment at outsourcing locations will not be selected only on the basis of minimum qualification requisites but also on the basis of domain specific knowledge and aptitude for that specific service, i.e. academic background in computer science and information systems as well as management studies. There will be a direct negative impact on service providers who do not implement such talent management policies, in the form of lowered QoS as compared to providers who do implement these policies. Innovation and KPOs will benefit from the large pool of skilled talent which will be leveraged to attract more client investment [19].

There will be fresh impetus on continuing a phase of market consolidation to ensure increased profits for the service provider and less fragmentation for the client. Consolidation can, however, bring about predation, with big established conglomerates bringing in smaller competitors into their fold.

Another interesting trend that could just create minor ripples is the political situation prevalent in the client states. Taking the United States, for example, it has been observed in the current Presidential campaign debates that one of Illinois Senator Barack Obama’s priorities is to stem the loss of jobs that are a result of offshore outsourcing. The following statement was made in March 2004 during an interview with Chicago's local access political talk show, Public Affairs: “The No. 1 priority is jobs and job loss and that is something that is hitting communities downstate as well as here in Chicago. Everywhere I go people are out of work or they are insecure with the jobs that they have. The whole issue of outsourcing is enormously important. Not only are blue collar jobs being exported now, but you have got white collar jobs going to India and Singapore, and
so people feel enormous economic insecurity and that has to be priority No. 1.” With him as a frontrunner for the 2008 Democrat nomination, this is one presidential election that will be watched by the outsourcing industry with some interest.

With countless service providers eyeing the pie(s) and considering the frequent discovery of newer market niches, the onus is on the service providers to project themselves as the right candidate for job. As a result, the clients could now have to augment their business policy to include a mix of best-of-breed and end-to-end outsourcing approaches. In most cases, there will be a change in client-service provider relationships from that of just being a client or service provider to joint partners in business improvement. This broadens scope of co-operation while leveraging talent and resources to ensure mutual profitability. It will no longer be about just providing what is mentioned in the Service Level Agreement (SLA) but also about enhancing the process that calls for innovation.

Remote Infrastructure Management (RIM), a segment with a growth rate of about 20% and a projected rate between 60 to 70% in 2008, will find a lot of supporters in times of cost control. It promises better profit margins to service providers as they now will not have to invest in client-specific infrastructure. But it also spells concern about depletion in total value of service with the elimination of infrastructure costs in the financial agreement [21].
CHAPTER 3

IT OFFSHORING: BRIDGING THE OCEANS

The purpose of this chapter is to define our study of outsourcing in terms of IT offshore outsourcing. We begin with an introduction to offshoring. Moving ahead, we will delve deeper by defining information technology offshore outsourcing or IT offshoring and the reasons for its coming into existence and rapid growth. Also considered in this chapter is an overview of issues that help decide whether offshoring is a right strategy for all IT businesses.

3.1 OFFSHORE OUTSOURCING: LOOKING CLOSER

It must be noted that, in this thesis, impetus was given more to the global aspect and implications of offshoring. This does not indicate a bias but a natural outcome of such a study. Domestic outsourcing, while having unique features of its own, shares a large set of features with offshore outsourcing. However, it needs to be noted that not all offshoring involves outsourcing. Outsourcing is moving in-house services to an external service provider while offshoring could be that or just the geographical relocation of an in-house service. Offshore outsourcing has carved out a niche for itself by leveraging globalization very successfully. Data made available by the Bureau of Economic Analysis (BEA) [22] indicates that imported services or imports of services associated with offshoring are increasing at a very steady rate. The report states that “U.S. imports
of business, professional, and technical services grew from $20.8 billion in 1997 to $40.7 billion in 2004—an increase of about 10% per year.”

3.2 DEFINING IT OFFSHORING

Offshore outsourcing or, for simplicity, offshoring can be defined, in the general sense, as a business strategy of moving a business process; that could include corporate or back-office services, manufacture & production, research and innovation; from the parent business located in one country to an establishment belonging to the parent business or an external service provider in another country. This movement of the business process beyond shores of a country gives rise to the term offshoring.

The United States Government Accountability Office provides the following definition of offshoring [23]: “Offshoring is used to describe a business’s (or a government’s) decision to replace domestically supplied service functions with imported services produced offshore”. This definition and the one provided at the beginning of this section holds good for business sourcing.

With respect to services, when a business replaces services it had produced internally (or had sourced from a domestic supplier) with imported services, those services and the domestic jobs associated with them are said to have been offshored. Similarly, production offshoring can be seen as the investment of parent businesses in self or provider owned establishments at offshore locations exclusively for manufacture and production purposes. The results of production, depending on business policy, can be used to feed the market of parent business’s country or the international market.
IT offshoring is, in reality, a mix of three broad offshoring paradigms briefly described below [Fig. 5]:

a. **Services Offshoring**: As indicated in the definitions above, services offshoring can be further classified as self sourcing services or imported services.
   
i. **Self sourcing services**: These are parent businesses sourcing business services to self-owned/controlled establishments at offshore locations.

ii. **Imported services**: Services sourced out to external service providers located at offshore locations.

Specific instances of IT services offshoring are end-user support, security services, software design and development services, back-office computing services, network maintenance and connectivity services, data processing & information generation services, survey and reporting services, and many more.

b. **Production Offshoring**: This can also be classified in the same manner as services offshoring.

i. **Self sourcing production**: About parent businesses sourcing product manufacturing or fabrication to self-owned/controlled establishments at offshore locations.

ii. **Imported production**: Product manufacture or fabrication sourced out to external service providers located at offshore locations.
Instances of IT Production offshoring are production-scale manufacture of electronic hardware components like microprocessors, circuit boards, microchips, computer device and peripheral hardware, communication devices, physical IT infrastructure, etc.

c. *Innovation Offshoring*: This is when IT businesses invest in establishing innovation or knowledge centers at offshore locations as a means of incubating technology and talent. This type of offshoring is generally “self-sourcing” in nature, with the parent business owning/controlling its offshore investment. Instances of such a paradigm are IBM Corporation’s SOA-Solutions Centers in India & China and Microsoft Corporation’s Microsoft Research and Microsoft Innovation Centers.
Fig. 5 Offshoring Types & Paradigms

TYPES OF OFFSHORED PROCESSES

- Technology Service Offshoring
- Business Process Offshoring
- Manufacturing Process Offshoring
- Knowledge Process Offshoring

OFFSHORING PARADIGMS

- Services Offshoring
  - End User Support
  - Security Services
  - Software Design & Development
  - Back Office Computing
  - Network Connectivity & Maintenance
  - Data Processing & Business Intelligence
  - Survey & Reporting

- Production Offshoring
  - Electronic Hardware Components
  - Computer Systems
  - Communication Devices
  - Physical IT Infrastructure

- Innovation Offshoring
  - Innovation or Knowledge Centers
3.3 WHY OFFSHORE IT?

Before we consider the offshoring of IT specifically, it is important to realize the whole idea behind offshoring in the first place. Popular perception identifies offshoring as the most effective way to trim business costs. This is not true for many reasons and the primary being one size does not fit all and the cost saving benefits are not always realized [16] [23]. Businesses in the client states are now thinking twice and researching well before even considering adopting offshoring as a strategy not only to reduce costs but also to enhance the business in other ways. Yes, offshoring certainly is another strategy to minimize costs but there can be a limit to which its effectiveness holds good.

Offshoring is a tool that is being used to carve out a new global economy and as they very often say, it is “for the greater good”. The days of the cold war are long gone and forgotten and it is also not a true unipolar world in most senses anymore. Power centers are dispersed all over the globe. These power centers, for the most part of it, have an integration scheme rather than a divisive one. One must however be wary of certain economic powers whose goals may be in opposition to the rest. This integration scheme entails the formation of a global economy that is mutually beneficial and the fuel that feeds today’s global economy is technology. Leveraging technology to conquer has always been a strategy from times immemorial. The hunter with the sharpest flint got the game. The builder with the best tools could build homes, barriers and kingdoms. A well equipped army could win battles. Today, human society with the best technology can share it to make a better future for ourselves. Here, a question can be asked; are we willing to share and invest in technology for the greater good?
Technically, as mentioned above, the need to offshore IT operations stems from the need to keep the wheels of a technology driven global economy turning in addition to other primary reasons of saving money and remaining competitive. While visible benefits may not always be immediate in client countries, it is said that there is a sizeable impact on businesses that adopt this strategy in the right way. But what is the right or wrong way? What may be considered the right way for one business can very well be the wrong way for another. As mentioned earlier in the section, one size does not fit all and so there is no pre-defined strategy that all businesses can adopt regardless of type and still make a profit.

Streamlining of operations to focus on the core business, while improving profit margins significantly, has been very evident in a large number of cases. Offshoring IT operations have been known to increase efficiency and quality of client business while lowering establishment and infrastructure costs. It has also been a major factor behind forging of international trade relations. The strategy and statistics made public by the BEA [22] indicate that offshoring is a natural outcome of existing trade relations of the client countries (mainly the United States, United Kingdom and other European nations) and countries of service providers. Foreign Direct Investment (FDI) is one such important means of establishing trade with a country. It has been observed in the data that countries to which the United States makes the largest FDIs in terms of importing services are also one of the largest investors in the US market, especially in the technology sector. IT as a specialized sector accounts for a sizeable chunk of the investments in the technology sector of the United States. Quoting information and statistics made available by BEA:
“European Union, Japan, and Canada account for 82 percent of foreign direct investment in the U.S. Foreign firms investing in the U.S. employ U.S. workers. U.S. affiliates of foreign multinational corporations employed 5.3 million U.S. workers in 2003, accounting for 5 percent of total U.S. employment in private industries” [22]. Economic theorists predict that increased trade because of offshoring will soon translate into a steady economic growth for the client states. How true these predictions are will be something to look out for. Other important reasons to offshore other than cost reduction and FDIs are the ability to tap skilled workforce available at a convenient time zone such that there is an almost continuous execution of the business round-the-clock and gaining access to newer markets that would increase presence and help in getting a lead on competitors.

It has also been stated that offshoring is necessary for the client states like the United States to maintain its comparative advantage in IT [22]. Comparative advantage relates to the most efficient available development and production of high-end and high-value IT products and services. This advantage over other countries will enhance the domestic economy in a big way. This specialization of the United States in high-end innovation will be possible because of the availability of a highly skilled workforce, robust & far reaching financial framework and abundant financial resources which will, according to economic experts, generate more jobs for the domestic population, filling in the voids left by offshoring. The Economic Report of the President, 2004, gives a clear indication of the government’s predisposition towards outsourcing. In the words of the Council of Economic Advisers, “Outsourcing of professional services is a prominent example of a
new type of trade”. This recognition of offshoring as a trade has been said to be beneficial to the client country in the long run considering the impact of intra-industry IT trade. In this situation, trade occurs within a same industry by both the client and provider countries. This in turn results in a larger market and product differentiation, which is essentially a marketing strategy to emphasize on differences in ones own product range or that of a competitors’ in order to make it more appealing to the target market. Continuing trade with such intra-industry trade partners can be economically beneficial to client country as the partner develops [22] [25] [26].

3.4 IT OFFSHORING BENEFITS

The benefits of IT offshoring include all of the benefits of offshoring in general and other specific advantages. Trying to encompass all advantages is not possible as there are many that are not as visible and tangible as others. We will focus on some of the most obvious advantages of information technology offshoring.

Cost Savings: This is perhaps the most talked about and expected advantage of Offshoring [14] [24]. It can be a very visible advantage but at times it shows up a long while after. While offshoring is not just about saving costs, this advantage is welcome considering businesses that offshore are looking at streamlining their operations, reducing operating costs and increasing their profit margin. Offshoring IT operations of a business can result in drastic reduction of IT establishment, infrastructure and personnel costs. Actual savings in terms of cost reductions by offshoring to the tune of nearly 50% have been reported by the Gartner Group [27]. IT is a capital intensive business function and
its returns are hit by technology obsolescence and depreciation of infrastructure value. This can be handed over to service providers who are adept at managing IT operations exclusively and with a higher degree of control. The closer relations between service providers and infrastructure vendors in terms of a common domestic market result in reduced infrastructure costs owing to bulk orders which translate as cost benefits for the client [28]. While India continues to lead the world in providing lowest-cost IT solutions, this will change once India matures even more and begins providing high-end and high-value solutions [29]. However, India does not stand to lose in such an equation as the global trend is sharply veering towards quality solutions more than it is towards quantity. But it also needs to be noted that India or any other service providing country needs to adapt to this changing scenario by improving drastically on the quality of services it provides.

**Large Talent Pool:** Newer niches are discovered every day. There are always pursuit groups that follow closely and specialize in them, making themselves available as part of a niche talent pool. IT offshoring leverages the availability of a large concentration of skilled personnel from a population with a strong educational background in mathematics and science which makes their intellectual faculties a perfect match for jobs in the technology sector. India has the largest skilled English speaking population in the world and every year there are over 350,000 engineering and science graduates [29] and well over 2.5 million overall graduates [30] who are available to an already large talent pool within the country. What started out as a service provider country in terms of simple back-office process offshore outsourcing has leapfrogged into being the largest
offshoring market in the world with services, production and innovation in various fields in addition to IT, being exported to world clients generating staggering revenue.

**Quality of Service & Conformance to Quality Standards:** In-house IT operations often suffer from the step-child syndrome. While in-house IT provides the essential technological backbone for any business, it is often relegated to a second, third or an even lower position in the organizational hierarchy, e.g., a modern full-cycle steel manufacturing company that has a global footprint may utilize a massive chunk of IT in the form of networking, computer and information systems that are not just personnel workstations and email but high performance real-time data processing and number crunching systems like mainframes or even supercomputers, industrial automation components, physical and virtual security solutions etc. However, the company’s core business remains steel making and an in-house IT establishment, being a non-core entity, almost always suffers from cost and resource over-runs. If the same IT establishment is offshored to a specialized heavy industry IT solutions provider at a one-time, negotiated price, the steel company can benefit not only from saving on infrastructure, establishment and personnel costs but also an almost 100% IT services uptime resulting in uninterrupted execution of critical and non-critical services. Almost all major service providers at offshore location now have mastery over international quality standards like ISO 9000, Six Sigma, SEI CMM & PCMM level 5 standards, making offshoring not only a lucrative but also a very reliable option. In fact, three out of every four SEI-CMM5 companies all over the world are located in India [28]. This combination of cost savings and reliability is something that most in-house setups strive but fail to achieve otherwise.
**IT Specialists & Multi-vendor Expertise:** Businesses that need to establish or re-structure their IT departments, do not have to start from scratch in-house or even at an offshore location because of the presence of well established infrastructure that can be guaranteed to a large extent to provide reliable services. These service providers are a one-stop-shop for many client businesses looking out to offshore processes (end-to-end outsourcing). Service providers, for the most part, have multi-vendor expertise which effectively provides a larger pool of resources to draw from and also, due to the competition between vendors, comes up with high grade solutions. Multi-process expertise makes service providers more appealing and lucrative considering that solutions to multiple processes can be provided by a single provider without having to fork sub-processes out to multiple vendors. It is not uncommon for service providers to provide unfragmented process life-cycle solutions and support. Further, full-service providers include support and maintenance as job-critical fixtures.

**Competitive Global Market:** A recent study conducted by A.T.Kearney made the geographical spread of the offshoring industry very clear by coming up with the Global Services Location Index [31]. According to the study, the performance of low-cost offshoring locations varies considerably. Companies do not expand operations at a particular location in order to replace another but in fact it is established to complement operations established at another location. The direct result of such expansions is the creation of a competitive market. Today, major IT businesses could face stiff competition from comparatively smaller businesses which have comparable operations. This has been possible because of the existence of multiple low cost service providers spread all over
the world giving even small IT businesses the ability to offshore their service or production units across a larger cross-section and achieve nearly the same volume of business as its larger counterparts.

**Cost Stability:** It is more likely that offshoring IT operations to countries that are close to production and innovation markets tend to have a more stable operating cost. This higher degree of cost stability results in client businesses planning their organizational budgets more effectively, further streamlining cash outflow.

**Need for Managers:** According to a study by Foote Partners LLC, it has been noted that there was an increase of 14.3% in managerial workforce pay in client locations [32]. This indicates creation of newer employment opportunities in the domestic/client market for people who have the ability and qualifications to be effective managers of global operations.

**Focus on Core Business:** As the result of offshoring a capital intensive process that formed the second string of organizational hierarchy, a business can focus exclusively on its core business and spend capital and talent on improving existing strategies which inadvertently result in a form of double profit. One resulting from offshoring cost savings and the other from innovation.

Advantages listed above, like the need for a larger talent pool to perform specialized operations, the constant demand for quality services as opposed to only quantity in the early years of offshoring, the creation of a competitive global market, the requirement of qualified managers in the field of IT offshoring and renewed focus on core business, spell out the creation of jobs in client countries like the United States [27]. However, it needs
to be seen if the education provided in the fields of computer science and information systems [14] are adequate to prepare students in developing appropriate skills for these changes taking place in the IT industry.

3.5 IT OFFSHORING: ISSUES TO BE CONSIDERED

While there exist tangible and high visibility benefits of offshoring IT operations, they come along with certain riders. We will look at certain hidden costs that have the potential to either reduce savings considerably or in worst cases, negate all benefits [33].

*Pursuing the Low-Cost Worker:* Offshoring is not only about sending processes to places that will execute at low labour cost. That, today, is no longer the primary reason offshoring is adopted. Quality is of equal or, sometimes, more importance. Businesses, instead, are proceeding with caution and only select offshoring as a strategic option after having completed a detailed cost-benefit analysis and have a reliable projection of ROI. They also need to be satisfied with the quality and standards of the product they will receive.

*Choice of Service Providers:* Not all service providers guarantee cost savings. And not all service providers are willing to provide an exclusively client customized solution. Businesses not cautious in their approach to offshoring their IT services often end up in the wrong hands considering that IT solution providers are springing up by the thousands. It is absolutely essential that clients perform an extensive in-house cost-benefit analysis and identify processes that can still be retained cost-effectively if offshoring can be avoided. Solution/Service provider selection can for the most part account to three
percent of the total contract value [33]. The choice of service providers is an issue that needs to be followed more closely.

**Initial Costs**: Moving the IT process from one shore to the other entails the establishment of a robust communication infrastructure that is reliable and secure on both ends. This tab is usually picked up by the client else is included as a service execute by the provider in the Service Level Agreement (SLA). These initial costs not just involve physical infrastructure costs but also cost of training service provider personnel in client business methodology, and home personnel redundancy while the process is in a migratory phase.

**Productivity**: The product of a solution provider or developers’ productivity and the hourly pay scale account for the bulk of an offshore software development process. Once again it is a direct impact of choices made by the client. An inexperienced service provider establishment may sound good in publicity documents but if it is not able to back up its claims with a high productivity to cost ratio, it is the client who stands to lose in terms of revenue, investment and competitive edge in the market.

**Communication**: 100% uptime is not only desired but needed. In a world where data is processed into information within nanoseconds, any breakdown of communication is fatal for the information technology industry. This holds good not only for outsourced processes but also those processes that are in-house but at offshore locations. With simultaneous churn of code, data and information at different locations, the need to manage inflow and outflow is very critical and the maintenance of connectivity and communication is of paramount importance.
The very recent breakdown of two major underwater internet and communications cables, the SME4 owned by a global consortium and Flag owned by Reliance Communications [34], in the Mediterranean Sea (January 31–February 01 2008) has caused a major disruption of Internet-based services in the Middle Eastern regions of Saudi Arabia, UAE and the Indian Subcontinent. Reports suggest that this breakdown while being immediately attended to could take about 15 days to restore normality. This, right here, is loss of billions of dollars. The IT industry in these regions, which accounts for nearly 85 to 90% of IT providers worldwide, has taken a major hit with communications and connectivity degraded by 50%. The major ISPs of India, VSNL, Reliance and Bharti-Airtel along with their Egyptian counterpart Telecom Egypt are assessing the damage and continuing to provide degraded services through the Pacific underwater communication cables. It remains to be seen what temporary and permanent impact this has on the IT industry in the region and world over.

**Data Security**: With information being so readily available for a price, its security is something giving nightmares to clients and service providers alike. Importing services has a higher risk than in-house development and data operations because of external personnel not under direct control of the client business. It sometimes becomes a matter of trust with such issues and most top-level service providers have established an industry-wide goodwill that prompts more business to come their way. It is difficult these days, where clients are spoilt for choices, for start-up IT providers to establish quickly and draw in big revenues. It is vital that clients steadfastly ensure data security clauses are incorporated in the service level agreements (SLAs). These clauses are also known as
Non-Disclosure Agreements (NDAs). Also, clients must be convinced that adequate physical and virtual data and information security measures are put in place by the provider. Highly sensitive information like weapons system technology, government financial and national security data, banking industry information, proprietary software development information and even personal information like medical and social security data need to be protected from malicious or unintentional attacks and damage.

**Intellectual Property & Legal Issues**: The onus of protecting intellectual property in the form of project designs, details, code and other innovation falls on the service provider, after extensive legalities are agreed upon with the client. It is an important aspect of offshoring IT operations because laws are not the same everywhere and tying up loop holes is not just beneficial for the client but also for the service provider in case it needs to defend itself against alleged plagiarizing and profiting from illegal sale of information or technology to a third party or client’s competitor.

**Service Enhancement**: This is one of the issues that need to be considered prior to adopting offshoring. The trend will be more towards not just providing reliable service but also the ability to innovate and enhance the existing process. This results in not just the client getting a better product; it establishes a lot of positives for the service provider in terms of technical advantage of innovation, industry goodwill, expansion of market presence and increased revenues from better services.

**Project Management**: Any process, offshored or not, needs to be tracked, managed and reported as a means of good development practices and establishing accountability. Operations spread across the globe offer a big challenge in terms of managing different
projects spread across very diverse demographics, worked on by different talent pools, supervised by different managers and connected to each other with inherently unreliable technology e.g. a global network of fiber-optic cables that can either be broken by malicious or unintentional actions or by natural environmental causes. One important way to address this issue is to align provider development methodology and tools used with that of the client. This way, personnel in-house and offshore are at the same comfort level with using tools and development methodologies, resulting in compatible code churn, seamless porting of services and solution across borders, easier project management, greater accuracy and higher accountability.

**Cultural Differences:** In India there are over 1600 known and documented languages and dialects. This however does not include the languages of the four major Southern states which could otherwise contribute a thousand more, at the very least. Examples in diversity abound all over the world and while globalization brings a McDonalds or a Citibank into many countries, one should not mistake it as a growing alignment. Differences are an omnipresent constant; it is the degree of these differences that vary. While service providers of different countries put in their best efforts to minimize the differences between them and the client, it is not a reasonable expectation on the client’s behalf to have the service provider align with them on a one to one basis. It is part of international business strategy to exploit these differences to bring out the best and try to keep retarding differences to a minimum. Language, accent, culture, traditions, business and social ethics, work cultures, laws and a whole lot of other factors vary from region to region and country to country.
While they cannot be ignored completely, efforts must be made by both ends to focus on keeping operational differences to a minimum. This is easier said than done considering other factors have a direct or indirect impact of the way operations are carried out. A possible solution is constant people to people contact among onshore and offshore teams. This will give team members the opportunity and time to acclimatize and get used to different cultures, enhancing mutual respect and a better understanding of the others methodology. A team of onshore and offshore personnel that is comfortable with each other results in greater and more effective communication, which leads to greater productivity and finally translates to a stronger products and increased revenues.

Summarizing all these issues, it is important to have customized long-duration contracts, establish very good and close communication with service provider and distributed teams, make certain that adequate data and information security measures are in place, not place all eggs in one basket and have a fail safe measure by distributing processes to more than one solutions provider if budget allows it and always have a backup plan.
CHAPTER 4

IT OFFSHORING MODELS

According to the U.S. Department of Commerce [35], governments and businesses view global economic development as “the best way to increase prosperity within and among countries and to create opportunities for millions of people, especially in the developing world, to secure a decent life for themselves and their children”. With IT offshoring being the major contributor to this development, it is imperative that such a contribution be a balanced one. It should not be at the cost of affecting the technological advantage of the home state, i.e. United States, diminishing interest in an important field of education, computer and information sciences, that is the driver of information technology in the first place and uncalled for layoffs owing to ill-managed offshoring decisions, among other factors.

4.1 EXISTING OFFSHORING ARCHITECTURE: AN OVERVIEW

Maximizing ROI is the basis of formulating most architecture for offshoring an IT process [11] [14] [24]. We present here a global view of the offshoring process [Fig. 6]. While there have been no consistent offshoring models to depict the big picture of how offshoring actually takes place, the global view of offshoring, represented by figure 6, reflects some commonly adopted practices. It must be noted that not all businesses have the ability to perform extensive pre-offshoring analyses. Hence, this model, while
representing a general offshoring model also includes our enhancement in terms of dual cost-benefit analysis stages.
Fig. 6 A General Offshoring Model
Before a client organization decides on a service provider who will take over the responsibilities of their business process, the organization’s corporate management, based on inputs from workgroups, investors and stakeholders, initiates the offshoring process on many levels. From an organizational perspective, the business may be divided into many different processes or departments. These can in turn be divided further into sub-processes. An extensive study is performed on these processes and sub processes by including historical data of finance, returns on investments or profitability of the processes. Predictive models to analyze cost-benefit ratio of continuing to sustain a process in-house is performed. This is stage one cost-benefit analysis (CBA).

A detailed survey of various options and strategies available to reduce investment while maintaining or enhancing returns, as well as ensuring quality of service and product, is undertaken. This survey is also part of stage one CBA. Following this, selection of specific options or strategies based on issues like business ethics, corporate social responsibility, fiduciary, stakeholder and legal responsibilities and also focus on streamlining business operations, is an important aspect. It may, however, not always be possible to go through such a detailed analysis. This holds true for smaller sized businesses who do not have a strong cost management infrastructures [24]

Offshoring does not always have to be the strategy but it can be one of the strategies that may be adopted to achieve organizational goals. Another important strategy that can be applied to enhancing a process is to re-engineer the process and make it more aligned to business objectives by trimming excess baggage and remain in-house by doing so. This is achieved after performing the second stage CBA which includes performing the same
actions as in stage one. If the second stage cost-benefit ratio is still higher than acceptable norms, offshoring is a strategy that could be adopted after extensive research in finding a service provider who either is a best-fit for taking over the partial or complete operations of a process or can provide end-to-end service for a single process or a group of processes known as candidate processes.

Once service providers have been identified, a formal contract needs to be drawn up. The Service Level Agreement or SLA is one of the most important documents in an offshoring contract between a client business and service providers. It contains essential terms of the contract to which the client and service provider are bound through the lifetime of the said contract. An essential aspect of this SLA is the definition of a business model that will be the core of the relationship between the service provider and client organization. According to the Federal Deposit Insurance Corporation (FDIC) [36], there can be four main types of business models that can be adopted to structure an offshoring SLA. These are:

a. *Captive Direct*– Parent organizations leverage in-house infrastructure and resources established at low-cost offshore locations. These in-house centers are known as captive centers. Primarily the domain of larger organizations that have the capital to invest in setting up the infrastructure, it maintains a relatively low risk profile.

b. *Joint Venture*– describes a business model where the parent organization and an offshore business or service provider have a joint holding in an establishment that can be operated either to serve exclusive purposes or complement each others
goals. While this models has a higher risk profile that a wholly captive center, majority or high managing stakes of the parent organization help it to manage the operations with much reduced risks.

c. **Direct Third Party**- a completely independent service providing business entity takes complete responsibility of the process offshored by the parent organization. Risk factor is relatively high and the only control the parent business has over operations is limited to what is specified in the SLA.

d. **Indirect Third Party**- this model involves outsourcing and offshoring. An organization outsources parts of or a whole process to a domestic service provider. The provider then offshores that process as a whole or in parts to another service provider at an offshore location. The information of parent company being sent offshore may or may not be with its express consent and hence this business model presents the highest risk profile.
4.2 STAGED IT PROCESS-OFFSHORING MODEL

The IT process-offshoring model that we present as part of our study is one that has been derived from other models widely adopted by a large number of client businesses and service providers, albeit customised to reflect specific process-offshoring needs. Some of the models we have considered are Cressanda Solution’s Offshore Execution model [37], CMS Group’s Outsourcing Partnership model [38], Nagsoft’s Outsourcing model [39], Auriga’s Offshore Development Center model [40], OCS-Consulting’s Outsourcing Pyramid model [41], and Stylus Incorporated’s outsourcing process model [42].

The entire offshoring process should not be confused with process-offshoring. While the overall offshoring process encompasses process-offshoring; process-offshoring is essentially the stage where a business process which has been identified as a candidate process and physically or virtually migrates to an offshore location. This stage is preceded by various other stages like identification of processes that could be offshored, study and analysis of those processes to identify candidate processes, selection of service providers and business models for offshoring and finalizing the SLA, all of which have been mentioned in previous sections.

The layered architecture [Fig. 7] is essentially a simplified view of Mohan Babu’s Offshoring Management Framework [43], which is the primary inspiration for our model. We call our model the staged process-offshoring model because it includes, in addition to the layered architecture, an implementation of the waterfall model of software development in the execution layer [Fig. 8]. It is important to note that other models
considered were designed and developed by service providers and vendors. Client modeled studies, plans, and strategic offshoring models are not visible in the open owing to them being trade secret material. However, since the service provider models have been successful in influencing clients to forge relations, a certain degree of confidence in these models can be assumed. While the original framework described by Mohan Babu focuses on projecting well managed process-offshoring practices at “both ends of the shore”, the simplified, staged IT process-offshoring model establishes a balanced view of process-offshoring events taking place at both ends of the offshoring spectrum. The events described in our model are preceded by those described in the general offshoring model [Fig. 6]. It also identifies possibly immense potential for high value job creation in client states that will need individuals to seek education in the fields of computer science, information systems and business and systems management.
Fig. 7 Layers of Staged Process-Offshoring Model
To begin with describing the staged process-offshoring model, it is necessary to identify the three main layers that constitute this architecture. Each layer is present on the onshore and offshore end of the architecture and contributes towards the construction of a regulated offshoring management architecture [43]. These layers are:

a. **Governance Layer**: While this layer may not seem to be directly involved in the intricacies of the architecture in consideration, it serves as a conduit for information sent up by the lower, management layer, to pass on to the governing body, investors and stakeholders of the business. This layer could either constitute the actual corporate management or a workgroup delegated governing powers by corporate management to oversee the process. The primary responsibilities of entities that constitute this layer include, development of effective offshoring strategies based on mutual consensus among officials at the client end as well as the service provider end, defining a model for executing offshore process and seamless re-integration of the result with the client product-mix and governing adherence or compliance to contract terms defined in the SLA.

b. **Management Layer**: This layer is the nerve center of immediate planning, decision making and direction providing and damage control capabilities of the process-offshoring stage. Each side, i.e. onshore and offshore, have offshore co-coordinators who are primarily responsible for coordinating activities on both ends, especially keeping channels of communication open and clear, resulting in uninterrupted flow of data and information. They are also responsible for chaperoning the process to keep it aligned to process objectives outlined in the
SLA. There is a **Program Manager** on the service provider end, who is responsible for managing multiple projects that have been offshored or a single project that has been split into many sub-projects. The program manager on the client end is responsible for monitoring the operation on these projects or sub-projects from as much a distance as the SLA allows. The provider end has a **Project Manager** whose responsibility is to manage a project or a sub-project assigned to him, at a finer level with close interaction with developers, testers and quality assurance professionals. Following the development, the delivery of a product is managed by the **Delivery Manager**. Other important professionals at this level are the **Finance Manager** who looks after the financial accountability aspect of the program and the **Legal Advisor** who provides a reference to issues, implication and solutions to legal affairs defined for the program in the SLA. These two professionals are part of the architecture at both ends.

The management layer establishes the need for professionals highly skilled in finance, business management, systems management, international business laws, global operations, personnel and project management, global logistics management, etc. at not just the service provider location, but also, at the client location. Though it is hard to establish the number of jobs that will be available at both ends of this layer, it is safe to consider that almost an equal number of jobs need to be created at the client’s end to support a well structured offshoring process.

c. **Execution Layer**: This layer is where an offshored process eventually ends up.

Populated by a majority workforce of IT professionals, it is in this layer that the
offshored process is worked on by data operators, developers, testing and software/hardware/data/technology quality assurance professionals. An IT process may include anything from simple data processing, software design and development, portfolio management, tax and mortgage payment management, to healthcare IT. We have modeled our architecture around a typical software development process. At the onset of process execution [Fig. 8], service providers are handed over a set of requirements by the client. These requirements can be split among the three provider-end layers, i.e. governance, management and execution. Each layer formulates and implements strategies that aim to fulfill these requirements. Focusing on the Execution Layer, we can split it again into three stages.

Stage one is more of a planning and prototyping stage where the set of requirements received are studied and a pool of strategies or approaches are drawn. These strategies are utilized to formulate a low-level design that is sent to the client via the upper layers. After an initial approval of the low-level design, a functional prototype is developed which may or may not be sent to the client for approval. Internal testing and quality assurance may set flags to indicate room for improvement which results in optimizations and further testing till the product satisfies conditions put down in the SLA.

In the second stage the prototype is converted into a high level design that incorporates all features required according to specifications, development of the process and final testing. This stage is critical to the project in terms of
developing the right product conforming to the right specifications, for the right client and within the estimated time frame. In this stage too there is a possibility of client’s wanting to approve the high level design before it enters development or production.

The last stage is primarily where the actual handover of product or deployment takes place, following which the client verifies compliance to SLA specifications and either accepts or rejects the product. Another event critical to this stage is maintenance, where, if previously agreed upon, the provider extends support and service options and facilities to client for a product that it has delivered.

The execution layer on the client end is responsible for validating the product at different stages of execution on the service provider end. This must be carried out by skilled professionals who have a sound knowledge of the product and are proficient in testing and quality assurance. Once the product is handed over by the service provider, the client side execution layer must be capable of not just integrating the product into the client product-mix but also managing operations efficiently in compliance to the businesses’ internal technical and business objectives. Here again, the need for qualified individuals as part of the product integration team is highlighted in our model. Even though, predictably, there could be a larger number of people working on the project at the service provider end compared to the size of the client end integration team, the importance of high value job creation at the client end that calls for individuals with requisite qualifications is not undermined in our model.
This model helps in depicting the process offshoring operation as a structured strategy that is regulated at all levels by the client and service provider. From our perspective, it also demonstrates the job creation potential at not only the service provider location but also at the client location. From the model it is evident that though there may be low cost software development teams available at offshore locations, a high value project management, testing and integration team is essential at the client end.
Fig. 8 Waterfall Development Model in the Execution Layer of the Staged IT Process-Offshoring Architecture
4.3 SCOPE FOR DEVELOPMENT

Even though software development tools have improved drastically over the years, the development cycle has more or less remained unchanged for the past twenty years. A survey conducted by the Standish Group in 2001 indicated that 28% percent of development projects failed while 23% suffered from severe development challenges [44]. Despite advance tools and abundance of skilled professionals these figures are disheartening. The development cycle implemented by the execution layer of the staged IT process-offshoring model in section 4.2 is a commonly used one in the software development industry. Known as the Waterfall model or the linear model, the development process is represented as a sequence of stages that are dependant of the preceding stage to have executed successfully in order to begin. The drawback of such a cycle is a lowered level of flexibility and ability to implement change. This in turn reduces process resilience and increases risk of failure. While the feedback cycle or final handover and review by client is usually a much later stage in this model, the ability to respond quickly to any change is compromised. The main failing of the waterfall model, according to Murphy [44] is its assumption that progress of a project can be benchmarked with a greater accuracy right from the start and that the end of cycle can be estimated from this.

A solution to this problem is the utilization of development strategies that will not only decrease the risk curve but do so effectively by making the development cycle adaptable to any possible change from very early on in the cycle. This can be achieved by implementing an iterative approach towards development. Successive iterations will learn
from errors or changes experienced by the previous one and, consequently, incorporate these changes. Each iteration could result in the client receiving the complete product or working parts of the product which are integrated at a later stage, after all constituent parts have been validated by the client. Here the feedback cycle is much shorter than the one in a waterfall model as it is provided to the client at almost every important stage of the development cycle and issues can be addressed much faster. This approach, proposed by Murphy [44], is part of our improvement on the waterfall model [Fig. 9].

While he lists other factors like the involvement of higher level management and incorporation of specific use-cases for different problems as opposed to the same approach each time, a definitive model of the iterative approach was lacking. Our model specifically identifies the flow of events from receiving a set of client requirements, to analyzing those requirements by the service provider, splitting of the development process into sub-processes or iterations, passing on results from each iteration to the client for feedback, implementing those optimizations in the successive iteration and finally delivering the finished product after integrating the various completed and validated sub-processes to the client. This model demonstrates the importance of client feedback to the development process as it saves time, personnel and financial resources and results in a product that the client is more confident about considering the degree of their involvement in its execution.
Fig. 9 Iterative Development Model
4.4 IMPLICATIONS ON COMPUTER SCIENCE EDUCATION

As we observe trends predicted in the preceding chapters, a large talent pool of skilled professionals in the information technology field is much sought after. This leads us to ask the question if the talent pool in client countries like the US is shrinking and will have no relevance to IT offshoring now and in the future. The US has always maintained a significant edge over other nations in terms of high value research and innovation. This spans the fields of science, arts, technology, etc. While it still maintains its edge in other fields, the significant drop in enrollment in computer and information science and technology programs does not augur well for a nation which has always been at the forefront of technological innovation.

However, all does not seem lost with the American Electronics Association announcing in April 2006 that the total number of IT jobs in 2005 stood at 5.6 million and is only headed upward because of the demand of highly educated, trained and specialized personnel for future IT industry operations. The US Bureau of Labour Statistics listed close to half a million software engineering jobs in the United States and an increase to about 682,000 jobs by 2014, an effective increase in the need for software engineering professionals of close to 48% [15]. It may also be the right time to realize that the question, now, is not about if jobs will be available for computer and information science graduates, but if a person is qualified enough for the jobs that are and will be available. Former president of the United States, Bill Clinton, stated in the 1992 presidential debate that “Offshoring will, on the whole, do more good than bad… if [the US] has a genuine commitment to educate and retrain American workers who lose their
jobs.” How genuine has been the commitment to educate and retrain the American workforce that has been laid off as a result of offshoring? While job creation in fields other than IT is beyond the scope of this thesis, recent statistics provided by the US Census Bureau in the 2008 Statistical Abstract that the largest and most rapidly growing industries in the United States include computer systems design and related services and management, scientific and technical consulting services [45]. The total number of jobs in both these industries alone for the year 2004 was close to 2 million and the projected number of jobs that will be available by 2014 is close to 3 million [46]. The creation of a million jobs in these two industries in the domestic market over a period of six years is heartening news. It must also be considered that these figures do not include industries that are closely related to the IT industry.

While statistics do have a role is providing a macro view of industrial demands, the responsibility of creating a talent pool of professionals to meet those demands lies primarily with the government, educational institutions and the IT industry itself. A good example of the government playing a role in promoting the study of computer science would be the initial days of Google. According to Thomas Kalil [47], it was Federal funding under the Digital Libraries Initiative that Larry Page and Sergei Brin, graduate students at Stanford University, utilized to develop PageRank, precursor to the Google search engine. Google is today not just a company that dominates the global search business but is also a technology incubator where researching and developing new technologies based on fresh ideas play an important part in its progress.
Bobby Schnabel of the University of Colorado, Boulder, has made some very interesting observations regarding the impact of globalization on computer science education and the responsibilities that educational institutions have towards preparing students for trends like globalization and offshoring [48]. Putting his observations into perspective, there are certain assumptions that need to be made. These are: i) professional prospects for a computer science student will not be brighter by just being a good programmer. Good programmers can be found by the thousands all over the world. What really enhances a student’s prospects is the ability to correlate with and differentiate among other aspects of computer science education, like management, decision making etc.; ii) globalization of the IT industry and, consequently, offshoring are trends that will only grow in the future. He attributes reasons for such growth to IT itself, changes in the way business is conducted and government policies that support it; iii) high value jobs requiring greater skill, precision and effective management will be job creators in the domestic market. This calls for proper education in fields of computer science, information systems, business management and ability to perform quality research; iv) in order to maintain an edge over other nations in terms of technological superiority, governments and consequently, educational institutions must promote an atmosphere of innovation. This can be done by augmenting or formulating national educational policies that foster growth in fields like computer science.

There exist certain complexities related to bringing about changes in computer science education in order to generate student interest. It must be considered that the IT industry is an industry of enormous proportions spanning healthcare to defense. Students
must be introduced to as many prospects without losing making them lose their sense of direction and be guided through the process of selecting the right courses leading to the appropriate degrees. There is always the opportunity to develop more than one career path by making the right choices in terms of selecting courses. It is also very important that the student be made aware of the relationship that exists between their education and their career path. The onus of guiding students with regard to the mentioned complexities lies with educational institutions.

The educational institutions also need to identify trends prevalent in the computer science and IT fields. This will help the curriculum to evolve and better the prospects of graduates with their contemporary knowledge [14] [15]. This evolution of curriculum relative to developments in the industrial arena is essential regardless of globalization. It is also important to enhance the value of education imparted by making student aware of changes taking place not just in the domestic environment but also on a global scale. This will enable students to have a better grasp of and adapt to changes taking place.
CHAPTER 5

CONCLUSIONS

As we draw to the close to our study, we can only claim to have merely scratched the surface of information technology offshoring. Nevertheless, there are a few important outcomes and results that need to be revisited. The IT industry, after having recovered from the “dot-com slump”, is growing at a steady rate. While the growth is not as spectacular as it was during the boom years of the nineties, its reach and impact have never been more profound. What was once a subsidiary or support facility is today a full fledged industry in its own right that forms the spine of most other industries. This has been possible because of globalization. As a result of this study, we have identified that offshoring as a business strategy has played a very instrumental role in leveraging globalization to the industry’s advantage. However, while cost-savings achieved as a result of offshoring parts of or whole businesses to low-cost production locations, was the primary reason this strategy was adopted, there has been a significant change in perception. This change has been due to many factors. Not all businesses have achieved actual savings by implementing offshoring. Unemployment, as a result of jobs migrating beyond shores, has contributed towards weakening domestic economy. And the lack of interest shown by individuals towards investing in computer science and information systems programs at colleges and universities has retarded innovation in the respective fields, which in turn has lowered the comparative advantage of many countries quite
significantly. In order to stem the rot, it is essential to realize that one strategy does not suit all businesses and adopting offshoring as a business strategy should not just be about cost savings but also focus on product quality, increasing comparative advantage and, most importantly, adding value to the business and society. We have identified certain benefits of offshore outsourcing that can be achieved as a result of considering certain issues in the first place. A general offshoring model that formalizes offshoring procedures is an important outcome of our study. It is our contribution towards the development of a structured offshoring process. In this thesis we also present an IT process-offshoring model called the staged process-offshoring model, which has been derived from other available models. While our model incorporates the standard waterfall development approach in its execution layer, we have also proposed a possible solution to the drawbacks of this approach by presenting an iterative development model. A structured and regulated offshoring process has the potential to minimize the negative effects of unregulated offshoring practices. Our study projects the potential of these models to create high value jobs at the client location. The availability of a significant number of high value jobs in terms of compensation and innovation will renew interest in educational fields like computer science, information systems and business management.
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