CHAPTER 2- NATURE OF BUSINESS TRANSFORMATION

In the last chapter we have seen how IT adds value to an organization. This is the basis of the formation of consulting companies that are giants in the Indian context. In this chapter, I present a review of the existing literature on primarily three aspects of how IT and Management consulting firms have transformed their clients businesses by combining IT with changes in business practices, strategy, as well as incorporating IT into existing products and services – often creating totally different ones in the process. They have transformed relationships at the macro level with the business, suppliers, and customers. I cite some examples of these occurrences. These examples will provide both qualitative as well as quantitative inputs into the possible reasons behind these changes.

2.1 Methodology

I use the Case Based Methodology for the present research. The case based approach is the method of choice when the phenomenon under study is not readily distinguishable from its context. Such phenomenon may be a project or a program for evaluation as the present study is. Sometimes the definition of the project or program may be problematic, as in determining when the activity started or ended—an example of a complex interaction between phenomenon and its (temporal) context. Other examples of such complex interactions include situations such as micro-computer implementation, inter-organizational partnerships, and the implementation of information systems. These are typical situations warranting the use of case study methodology.

Inclusion of the context as a major part of a study, however, creates distinctive technical challenges. First, the richness of the context means that the ensuing study is likely to have more variables than data points. Second, it also implies that one cannot rely on a single data collection method but is likely to need to use multiple sources of evidence. Third, even if all the relevant variables are quantitative, distinctive strategies are needed for research design and for analysis.

In general, case based research can be divided into the following categories *(Yin, W, 2002):*

i. Exploratory: The exploratory case study has perhaps given all of case study research its most notorious reputation. In this type of case study, fieldwork and data collection are undertaken prior to the final definition of study questions and hypotheses.

ii. Explanatory: In comparison to factor theories, explanatory theories are more suitable for designing and doing causal case studies. In fact, the more complex and multivariate the explanatory theory, the better. The case study analysis can then take advantage of pattern-matching techniques.

iii. Descriptive: The purpose of this sort of study is not to determine which system is better or to prove/disprove a hypothesis. Instead, the purpose is descriptive—to define current practices in using non-categorical systems, determining whether such practices are indeed different from those in categorical systems.

Based on the above, the following emerges: A theory is simply a priori explanation of why some phenomenon might have occurred the way it did. The explanation is causal in the sense that it identifies cause-and-effect relationships among a series of events, with each relationship being expressed as a hypothesis. The causal chain also must conclude with some measurable outcome.

The case study approach may be characterized as seeking (a) to define specific questions of study ahead of time, (b) to emulate logical positivism in developing rival hypotheses and collecting external evidence bearing on these questions, and (c) to carry out fieldwork in a targeted fashion—that is, focusing on the evidence deemed relevant and doing the fieldwork in a time-limited fashion. This has been a popular choice for cases in Information Systems.

In contrast, an ethnographic approach may be characterized as one in which the investigation seeks to (a) gain a close-up, detailed rendition ("thick description") of the real world; (b) challenge the logical positivist position by claiming that all evidence is relative and therefore cannot be independent of the investigator—thereby favoring participant-observation as the

dominant mode of data collection; and (c) permit and even encourage fieldwork to continue for long periods of time and in a reasonably unstructured manner, so that the regularities and rituals of everyday life can surface in a natural fashion. This approach has not been prominent in studying MIS systems but has been increasingly suggested as an attractive alternative, based on its successful use in investigating certain topics.

Unit of Analysis: For case based analysis, one needs to define a unit of analysis. Examples of such units are:

- The workstation, including the machinery and individual at the workstation (e.g., studies of ergonomics)
- A local area network or an extended network (e.g., a study of electronic mail)
- The information flow within an organization (e.g., a study of the control over information within the organization)
- A collaborating set of organizations (e.g., a study of coordination among the affiliates of a holding company or the agencies in a single jurisdiction)

An example of the above in context of the present research is the hypothesis that "The case study will show why implementation only succeeded when the organization was able to restructure itself, and not just overlay the new enterprise system on the old organizational structure."

2.2 Changing Business

One of the best illustrations of matching organizational structure and products to IT and the associated challenges of change management and process re-engineering can be illustrated by "SkyChef" – a large meal manufacturer and airline catering service supplying to a variety of airlines worldwide. With an aim to provide greater product customization and variety, SkyChef made a large investment in IT enabled manufacturing and assembling. This venture was made in conjunction with necessary changes including the scrapping of unit rates for products, delegation of authority to floor workers, process and workflow changes, and incorporation of

feedback through more frequent and richer interactions with customers and suppliers, increased internal communication and collaboration, as well as necessary knowledge transfer of skills and processes. This is summarized in Table 2.1.

Table 2.1 - Before and after work culture at SkyChef

Old System	New system
Pre-specified fixed equipment with defined functionality and sequence of operation	Flexible IT based equipment conducive to multi-tasking / task switching.
Large inventory levels maintained	Inventory brought down to very low levels
Employee pay linked to the quantity produced	Standard rate of pay for all operators
Objective was to keep the assembly line running at all costs	Stop assembly line if not running optimally
Comprehensive final inspection responsibility of quality assurance function	Individual line operators responsible for quality
Some raw materials were sourced internally	All raw materials were outsourced
Narrow job functions – specific employee to specific function	Flexible job responsibilities with job rotation
Work areas designated by machine type	Work-areas organized in work cells or clusters based on process requirements
Decisions made by executives	De-centralized decision making – delegation to employees
Vertical communication flow	Line rationalization
Taller organizations with more than 6 organization layers	Flatter organizations

The new system initially could not come up to basic management expectations – greater flexibility and lower turn-around times. Closer examination revealed that floor workers still retained and implemented the 'obsolete' processes, not with malicious intent to undermine the change effort, but simply as an ingrained habit. To illustrate: an example of old wisdom was that the machine should not be stopped for product changeovers. While this was valid with the old equipment, it totally negated the flexibility of the new equipment as well as created large work-in-process inventories. This resulted in gross under and mis-utilization of the new machines. Thus, old work practices could not gel with the newer requirements.

In this case, the application of technology did not serve the purpose – it was a case of a square peg in a round hole. An alternative approach was therefore implemented – to introduce the new equipment in a "greenfield" site with a fresh set of employees who had no knowledge of the old practices. This worked and the resulting productivity improvements were significant enough to the company. While the competition could easily buy similar equipment, they would still have to make the much larger investments in change management and organizational learning before deriving any benefit from the investment. This was a non-trivial task. Similarly, large scale changes in business processes, change management and organizational learning have been documented in case studies of IT adoption in a cross section of industries and verticals *(Autor, 2000; Skuratowicz, 2000)*.

2.3 Changing relationships with suppliers

Because of problems in exchanging information and coordinating process dependencies with suppliers, large companies often try and source some of their required inputs internally. General Motors (GM) is the classic example of a company whose success rested on the pillars of vertical integration. However, technologies such as EDEI (electronic data interchange), Internet-based SCM (supply chain management), and other inter-organizational information systems like CRM (customer relationship management) have significantly reduced the operational cost, time and other issues traditionally faced in dealing with the suppliers. As an example, it is commonplace today for companies to electronically place orders with their suppliers based on inventory levels automatically, thus eliminating paperwork and the delays and errors associated with manual processing of purchase orders *(Johnston and Vitale, 1988)*.

An early successful inter-organizational system example is Baxter International, the $8.9-billion-a-year hospital products company with the Baxter ASAP (Analytical Systems Automated Purchasing) system – developed by the American Hospital Supply Corporation (AHSC) in the early 1960s. This is one of the best-known, most often-cited strategic information systems that let hospitals electronically order supplies directly from wholesalers (*Vitale and Konsynski, 1988; Short and Venkatraman, 1992).* The system was originally designed to reduce the costs of data entry—a large hospital could generate 50,000 purchase orders annually which had to be manually written out by Baxter's sales staff at an estimated cost ranging between $25 and $35 for every order. However, once this system was computerized, online data became available on levels of hospital stock. Baxter then decided to take more responsibility for the entire supply chain: designing stockroom space, setting up computer-based inventory systems, and providing automated re-stocking.

ASAP was directly associated with costs savings on the order of $10 to $15 million per year, which allowed Baxter to recover rapidly the $30 million up front investment and approximately $3 million annual operating costs. However, management at Baxter believed that even greater benefits were being realized through incremental product sales at the 5500 hospitals that had installed the ASAP system, not to mention the possibility of a reduction of logistics costs borne by the hospitals themselves – an expense which consumes as much as 30 percent of a hospital's budget.

The above description described only the first phase – highlighting the company's attempts to experiment with and assimilate innovative business practices developed by field sales representatives working with hospital customers. The second phase called Value Link – distinguished by a redefined relationship between Baxter and its customers, as well as a fundamental shift in technology away from the dedicated, customer-supplier, electronic order entry and towards a multivendor electronic infrastructure began shaping. This is described below.

Baxter learned from the hospitals that they were spending huge amounts of money simply storing and distributing supplies within the hospital. Baxter responded by developing ValueLink, a service that helped hospitals dramatically reduce inventory costs while improving

the distribution of supplies. With ValueLink, hospitals could delegate to Baxter the time-consuming task of making sure essential consumable items like needles, bandages, and syringes wind up in the right place in appropriate quantities. These hospitals had online links with Baxter and could send daily electronic information back to their warehouses on just how much inventory they needed. Further, the electronic feedback gave Baxter the utilization patterns for all these supplies. This left the hospitals in the position to focus on their core competency – administering healthcare, and not to worry about managing inventory. Baxter profits from ValueLink by charging a service fee equal to 3% to 6% of total sales. However, the bigger payoff is that Baxter could often become a hospital's preferred vendor and sole supplier. Further indirect benefits of establishing a bullet-proof supply chain and reaping volume discounts cannot be ignored as they translate to millions of dollars saving each year in the actual procurement process.

Computer-based supply chain integration has been especially sophisticated in the consumer packaged goods industries. Traditionally, manufacturers promoted products such as soap and laundry detergent by offering discounts, rebates, or even cash payments to retailers to stock and sell their products. Because many consumer products have long shelf lives, retailers tended to buy massive amounts during promotional periods, which increased volatility in manufacturing schedules and distorted manufacturers' view of their market. In response, manufacturers sped up their packaging changes to discourage stockpiling of products and developed internal audit departments to monitor retailers' purchasing behavior for contractual violations *(Demons, 1993)*. To bypass these inefficiencies, Procter and Gamble initiated a charter harboring effective consumer response *(McKenney and Clark, 1995)*. In this approach, each retailer's PoS (point of sale) terminal scanner data went directly to the manufacturer; ordering, payments, and invoicing were fully integrated and automated through electronic data interchange; inventory levels could be maintained on a daily basis; and sales promotions were replaced by an emphasis on consistent low pricing. These changes, in combination, greatly improved efficiency. Consumers directly benefited from lower prices and increased product variety and features as well as convenience. Without the direct inter-system links to PoS data and the electronic transfer of payments and invoices using data communication links this could not have been achieved.

IT innovations pertaining to the Internet have further dramatically reduced the cost of implementing such supply chain systems. E-procurement and online markets enable a reduction in input costs through a combination of lower inventory carrying costs, shorter lead times and more predictable deliveries, which reduces the need for buffer inventories and reduces wastage for perishable products, reduces price due to increasing price transparency, accessibility to a wider range of suppliers – often global, and reduced direct costs of order fulfillment. When deployed successfully, these systems are estimated to lower the costs of procured inputs by 10 to 40 percent, depending on the industry *(Goldman Sachs, 1999)*.

It can be seen that some of these savings clearly represent a cost re-distribution from suppliers to buyers, with little effect on overall economic output. At the same time, these deployments also result in benefits to the top line through productivity increases due to process improvement, as well as enabling an increase in output quality or the product mix without increasing cost. To take advantage of these technologies, organizations today are restructuring their supply chains and placing greater reliance on outside contractors. Concepts like JIT (just in time) and kanban have fast gained ground and common acceptability. Even General Motors, once the prime example of vertical integration, has reversed course and divested its large internal suppliers. To get an idea of the magnitude of this change, the GM offshoot – Delphi Automotive Systems created in 1999, only one of GM's many internal supply divisions, created a separate company that by itself had $28 billion in sales.

2.4 Changing Customer Relationships

The Internet has opened up a new range of possibilities for enriching interactions with the customers. One of the best examples in this context is the direct-to-consumer computer manufacturing giant – Dell Corporation. One of the first to implement such a model worldwide, it has grown in terms of sales and has taken significant market share from established players like IBM, HP and Compaq. It did this by offering customers cost advantages (upto 15%), improving service levels by placing configuration information, facilitating ordering and providing order tracking capabilities through its website. This was complemented by internal changes in systems and processes that emphasized just-in-time inventory, a varied product line through customized systems, and tight integration between sales and production planning. Some of these savings accrue due to the elimination of

wholesale distribution and retailing margins. Others significantly reduce inventory carrying costs throughout the distribution channel. However, a subtle but important by-product of these changes in production and distribution is that Dell can be more responsive to customers. When Intel or AMD release a new microprocessor, (as they do several times a year), Dell can sell it to its customers within seven days compared to eight weeks or more for some less technology-enabled competitors. This is a nontrivial difference in an industry where adoption of new technology and obsolescence of old technology is rapid, margins are thin, and many component prices drop by 15 to 25 percent each month.

Other firms have also built closer relations with their customer via the web and related technologies. For instance, web retailers like Amazon.com have setup effective B2C models – providing personalized recommendations to visitors (using personalization technologies and recommender systems), and allowing them to customize numerous aspects of their shopping experience. Merely providing Internet access to a traditional bookstore would have had a relatively minimal impact without the cluster of other changes implemented by firms like Amazon. Closer home, Indian Oil Corporation has setup a B2B portal that enables it to interact with its suppliers and reap cost benefits.

An increasingly ubiquitous example is using the web for handling basic customer inquiries. For instance, DHL handles a total of 700,000 package tracking requests via the Internet every day. It costs DHL $0.1 per piece to serve that information via the Web vs. $2 to provide it over the phone *(Seybold and Marshak, 1998)*. Consumers benefit too as they can track packages over the internet rather than the phone, DHL estimates that two-thirds of the web users would not have bothered to check on their packages if they did not have web access. Blue Dart and Federal Express also offer similar models in India. Infosys and Wipro have provided some of the consulting framework for these operators in the country.

2.5 Link with Productivity

Much of the earlier work on the inter-relationship between IT and associated productivity used data at the economy or sector levels and did not find too much co-relation. In fact, in the existing studies, there were conflicting results. For example, in a study conducted by *(Roach, 1987)* it was found that company spend on IT per employee in the services sector rose

manifold between the period 1977 - 1989. However, the measured output per employee did not increase in the same proportion – or even perceptibly. And yet companies kept spending on IT. In another study using data from the manufacturing sector found that the gross marginal product of IT (including computing equipment) was less than its cost and that in many industries these supposedly labor-reducing investments were associated with an increase in labor demand *(Berndt and Morrison, 1995; Morrison, 1996).* This has been summarized eloquently by Robert Solow *(Solow, 1987)* – One can see the information age everywhere except in productivity statistics.

However, by the early 1990s, studies done at the organization (micro) level were demonstrating that IT was a significant contributor to overall productivity. *(Lichtenberg, 1995)* used production function analysis to analyze data spanning organizations over a 4 year time horizon (1988-1992). Production functions relate physical inputs to physical outputs. Price and costs are not considered in the equation. Production functions, therefore, cannot completely model the production process: they deliberately ignore the essential and inherent aspects of the physical production processes, including errors, entropy or wastage. Moreover, production functions do not accurately model the business processes, ignoring the role played by management, sunk costs and the relationship of fixed and variable costs. These bring out that though there is a clear positive relationship, but also a great deal of individual variation in the company's success with information technology. And it is this, in my opinion that acts as the single most important differentiator between companies – it is not how much capital one has to invest, it is how one uses that capital to maximize returns on investment – particularly when one is talking about IT capital.

By increasing the amount of capital per employee (capital deepening), the general perception is that investments in IT have increased output per person hour i.e. labor productivity. The recent acceleration of increased investment in IT is primarily because of the facts that the rate of technological progress in the production of hardware has speeded up after 1995; and the importance of IT to consumption and production in the world economies has grown with it. Computing devices have now moved beyond traditional Personal Computers, and these devices are offering increasing quality as well as declining purchase prices. And it is only in the past decade that the production of computer hardware has accounted for a share of overall

economic output sufficient to make a sizable contribution to growth in productivity. Several studies have also been conducted to establish the returns to IT using data on the use of various technologies rather than the size of the investment. *(Greenan and Mairesse, 1996)* compared data on French firms and workers to measure the relationship between an organization's productivity and the percentage of its employees who give output using a personal computer at work. The results of their findings in terms of ITs contribution to output are consistent with earlier estimates of the computer's output elasticity. Similar trends can be seen closer home as per the ILO's (International Labour Organization) Visions for Asia's Decent Work Decade: Sustainable Growth and Jobs to 2015, report (2006), according to which, output per worker in the Asia-Pacific region grew by 30% since 2000 compared to only 7.8% outside the region. Between 2000 and 2006, real GDP growth in the Asia-Pacific region rose at an average annual rate of 6.3%, compared with growth of 3.1% in the rest of the world. India's share in the Asia-Pacific region's GDP is expected to rise from 7.2% to 8.7-10% by 2020, while China's contribution to regional output is expected to rise from 20.4% to between 31% and 33% by 2020. Much of this change is due to shift from labor-intensive to technology-intensive industries and IT enabled services.

Other studies have focused on the application of IT to manufacturing technologies. I elucidate two of them here – one conducted by Black and Lynch in 1996 and the other by Kelley in 1994. Both found that plants that either used IT enabled and controlled machinery or where a larger percentage of employees used computers were more productive across a cross-section of industries. The same is true when applied to government machinery *(Srinivasan, 1997)*. These examples can be enumerated by several recent e-governance projects in the country – where consulting has been provided by Tata Consultancy Services (TCS), initiated by various Governments – particularly in Southern India wherein substantial benefits have been realized through information technology investments. A good example of this is the Ministry of Corporate Affairs project MCA-21 that reflects India's Corporate Governance goal for the 21st century. Beginning with Coimbatore in Tamil Nadu, it has incorporation of new companies, filing of statutory returns and balance sheets, handling of investor grievances and public access to a document repository on a pay-per-use basis. The project is run on a BOOT model – Build, Own, Operate and Transfer whereby TCS will operate it for 6 years and then hand it over to the Government machinery to run.

Thus it can be seen that IT alone cannot bring productivity increases into organizations or economies. To do this, it has to be accompanied by complementing factors. These can be found using financial market data, and Tobin's q. This approach measures the rate of return of an asset indirectly, based on comparing the stock market value of the firm to the replacement value of the various capital assets it owns. If the market value reflected solely the recorded assets of a company, Tobin's q would be 1.0. If Tobin's q is greater than 1.0, then the market value is greater than the value of the company's recorded assets. This suggests that the market value reflects some unmeasured or unrecorded assets of the company. High Tobin's q values encourage companies to invest more in capital because they are "worth" more than the price they paid for them. On the other hand, if Tobin's q is less than 1, the market value is less than the recorded value of the assets of the company. This suggests that the market may be undervaluing the company.

Mathematically, Tobin's q = market value / asset value

Another interpretation is: q = value of stock market / corporate net worth

(This is normally used to determine the valuation of the market as a whole).

Historically, Tobin's q has been used to measure the relative value of tangible assets – those normally classified as capital assets. *(Hall, 1999)* has suggested that Tobin's q can additionally be used as providing a measure of the total quantum of capital, including the value of technology, organization, business practices, as well as other produced elements of organizations. Using a similar approach, and focusing on large companies between 1987 and 1994, *(Yang, 1997)* found that while $1 of normal capital is valued at approximately $1 by the financial markets, $1 of information technology capital correlates with almost $10 of additional stock market value. As these findings are based on data from large, established companies – mostly those in the Fortune 1000 – rather than hi-tech start-ups, and since they occur well before the dot-com 'boom' of the early 2000s, they are unlikely to be biased by it.

Table 2.2 - Average annual labour productivity growth for Canada and the United States (1971-93)

Average Annual Labour Productivity Growth for Canada and the United States, 1971-93

ISIC Rev. 2	Canada	United States
1. Food, beverages & tobacco	0.97	1.75
2. Textiles, apparel & leather	2.54	2.88
3. Wood products & furniture	1.00	0.76
4. Paper & printing	0.77	0.31
5. Industrial chemicals[1]	2.65	3.24
6. Drugs and medicine	3.80	...
7. Petroleum & coal products	2.44	0.91
8. Rubber & plastic products	1.33	1.32
9. Non-metallic mineral products	1.02	1.54
10. Iron & steel	2.30	1.62
11. Non-ferrous metals	3.92	0.33
12. Metal products	1.10	1.61
13. Non-electrical machinery	0.70	2.65
14. Office & computing machines	18.74	7.78
15. Electric apparatus, nec	2.15	4.11
16. Communication equipment	3.34	5.36
17. Shipbuilding & repairing	5.25	1.29
18. Other transport	4.37	3.32
19. Motor vehicles	2.21	0.44
20. Aircraft	1.82	0.98
21. Professional goods	...	1.35
22. Other manufacturing[2]	0.53	1.50
Total manufacturing	**1.80**	**1.98**
23. Electricity, gas & water	1.68	0.95
24. Wholesale & retail trade[3]	0.66	1.33
25. Transport & communication	3.17	2.72
26. FIRE & business services	0.72	-0.94
27. Social & personal services	-0.35	-0.47
Total services	**1.13**	**0.47**
28. Construction	0.47	-1.24
Total business sector[4]	**1.24**	**0.86**

1 The industrial chemicals industry includes drugs and medicine for the United States.
2 Other manufacturing includes professional goods for Canada.
3 Includes restaurants and hotels.
4 Here, the total business sector is defined to include manufacturing, services and construction industries.

As shown in the above Table 2.2 *(Gera, 1998)*, the real IT investment rate between 1971 and 1990, increased in 23 out of 26 industries – both manufacturing and services while the real non-IT investment increased only in 7 industries.

A more likely explanation for these results is that IT capital is disproportionately associated with intangible assets like the costs of application development, data transformation, process re-engineering, staff skill development, or business transformation, all of which cannot appear

on the balance sheet. These results imply that, for every $1 of IT capital, the organization has also got another $9 in additional intangible assets. A necessary implication therefore is that organizations must incur substantial implementation and change costs before realizing value from IT. These additional costs differentiate the value of a computer in a storage area with one that is fully integrated into the ERP system in an organization.

Both the above hypotheses lead to certain observations into the properties of these intangibles, even if direct measurement is not possible. These intangibles have a large market valuation – of one order of magnitude when compared to the investment. Yet, it is not possible for them to appear on the balance sheet of the company. They have a similar role to play as a quality certification, for example, ISO 9001. They offer the company with a strategic advantage within its industry. And lastly, they appear to be more pronounced in the long than the short term, suggesting that multiple years of acceptance and investment is required before their influence is maximized.

2.6 Value Addition

If we take the example of India's largest consulting and IT services firm – Tata Consultancy Services (TCS), and trace its origins, we find that the Tata group has come a long way in its 136-year history. It was founded by Jamsetji Tata, who started a textile-trading business in 1868 in Bombay and then built the country's first steel mill and hydroelectric plant. Since then, Tata products have become coupled in a lot of ways with Indian lifestyles. Indians season their food with Tata salt, drink Tata tea, drive Tata cars, and use Tata's power, air conditioners, and phone networks. They stay in Tata hotels and wear Tata watches, fly Tata airlines and wear Tata sunglasses and designer jewelry. India's infrastructure is built with Tata's steel, and its companies and government agencies run Tata's software. *(Businessweek, 2004)* TCS as a company was founded in 1968 and is based in Mumbai, India. It has currently more than 150 offices worldwide.

Whichever example we look at, these consulting companies have focused on one aspect as far as their clients are concerned – adding value. 'Value' is defined as the worth, importance, or usefulness of something to somebody *(Fitzgerald, 1999)*. This is, by definition, a subjective assessment. Strategic positioning, increased productivity, brand visibility, improved decision-

making, cost savings or improved service levels are all ways value could be derived. Most organizations have moved away from defining value as simply a financial concept (*Ginzberg, 2000).* Ideally, this is tied to the organization's business model since adding value with IT should enable a firm to do its business better.

For more than the last 5 decades, managers and executives have tried to determine how IT can be used to enhance their core business competency. IT consulting companies have been formed and have grown and matured out of this need of trying deliver this value. In the initial days of IT, and process automation, productivity and value was relatively simple to measure – it was primarily in terms of reduced head counts – normally for routine, mundane tasks – and/or the ability to process more transactions per employee, or by reducing the percentage of errors made by employees. However, as IT's scope and consequently systems grew in scope and complexity, so did the associated risks. There would be very few examples of companies who have not made at least one futile investment in some technology fad they believed would transform a function in their organization – the delivered value did not meet with their expectations of the perceived value. The issues in delivering this value rest either with how the value proposition is presented (expectation management), or what is done to implement a particular project thus adding that value, i.e., selecting the right project and doing the project right *(McKeen, 2003).* There are a number of scientific ways to calculate the return on an IT investment. However, these are not all applicable to all situations and project types – especially when dealing with intangible costs and/or returns.

From a value proposition 30 years ago of delivering the right technology to the organization and calculating the financial benefits that followed *(Marchand, 2000),* organizations have come a long way. Now IT is used as a strategic and productivity supporting tool. Therefore, from the early days, when computers were most often used as capital equipment equated to machines thus reducing the labor force, this equation was understandable, even if it wasn't that simplistic. It was fairly easy to compute a bottom line benefit when 'x' dollars of technology could be invested to save 'y' dollars in salaries – especially over time. However, in the latter scenario, decisions were more complex and unquantifiable. For example, would the investment save time? How much? Would it help them make better decisions? To what extent? Would it improve service? How and to what level? Therefore, other factors, such as how well

technology was used by people or how IT and business processes worked together became important considerations determining whether an investment was the right thing to do or not.

Twenty years ago, *(Roach, 1989)* created waves with the statement that IT investment resulted in absolutely no impact on productivity at the macro-level. Recently too, many organizations felt they were lured into spending millions on web sites and online shopping with very little payback *(Earle and Keen, 2000)*.

This made the work of consulting companies more difficult. Most organizations in the world are beginning to change their understanding of derived value from IT, though "silver bullet" thinking still rules. i.e. Plug 'n' play – plugging in new technology immediately will deliver bottom line impact. This is exemplified by *(Warner, 1987)* 'Information technology as a competitive burden,' that focuses on the risks and costs of IT investments, and on the difficulties of integrating IT with strategy.

However, management temperaments, inclination and vision play a key role in creating IT business value. This is substantiated by the fact that these practices account for over 50% of the variance in corporate performance *(Hitt, 1995)*. Consequently, an assessment of these practices is important to understanding how IT creates value for an organization. If we focus on strategic alignment and IT investment evaluation, we can see that both these practices are complementary in the sense that as IT deployments go through successive stages of planning and appraisal, some effort is made to better align the IT investment with the business strategy *(Luftman, 1996)*. In this way, each deployment is likely to contribute to IT business value.

Of these, the first - strategic alignment, (the alignment of IT with corporate strategy), has been often rated as the single most important issue facing top level decision makers in both consulting firms as well as the organizations they serve *(CSC, 1998)*. A popular hypothesis is that the ability of and organization to realize value from IT investments is due in large part to its level of strategic alignment *(Henderson, 1993), (Woolfe, 1993). Strassmann (1997)*. It reinforces the point in by saying that investments have a chance of becoming catalysts of organizational change instead of discrete expenses if they are made in the context of alignment.

After the dot-com bubble burst, worldwide IT spend declined. IT investment therefore had to undergo a rigorous series of tests in the form of feasibility analyses to determine, among other things, the likely impact of the investment on the company. For example, the investment might be contingent on a positive cost-benefit analysis or a favorable net present value (NPV) calculation. As the applications of IT are increasingly for strategic purposes, there is an even greater need for these investments to undergo such evaluation - not only prior to embarking on a project, but also during and post-implementation.

Besides using these techniques to establish the feasibility of specific IT investments, *(Venkatraman, 1987)* argues that IT evaluation or 'value management' is a useful mechanism for minimizing risks related to strategic alignment. Value management incorporates actions that are taken to

1. define the methods for selection and short listing of proposed IT investments,

2. define the metrics or critical success factors that will maximize the likelihood that these investments will achieve the desired benefits, and

3. refine these techniques over time.

Implicitly, a central postulate of ascertaining this value is the ability to somehow segregate investments on the basis of their perceived organizational impact. If the firm is strategically aligned, it will allocate resources to the most needy areas of the organization according to an established set of priorities and investment criteria. Without such a policy or guidelines, there is a risk that IT investments will not support the business strategy. The stated objectives go beyond the traditional ones of time and cost (on-time and within budget.) An example is when TCS launched its accounting package (EX) to compete with established brands like Tally in the SME segment in India. The package was lacking functionality, so though its implementations typically were 'on-time' and 'within budget', it added little or no value to the organization making it defunct within a very short span of time.

There is also a strong contention that post-implementation reviews and audits provide a foundation for future investments to yield higher returns by reducing the level of risk the

organization has to cover *(Earl, 1989)* Pre-implementation techniques are planning oriented since they focus on the techno-commercial aspects of an investment. Such reviews allow executives to differentiate between IT investments on the basis of implied net benefits and hence manage their project portfolio. Post-implementation reviews are even more critical. For example, by conducting reviews at regular time intervals, and getting what is commonly called negative feedback, mid-course corrective action can be taken where applicable. They also serve as learning tools as they bring out common mistakes and things to avoid that help future implementations.

2.7 Changing Communication

A discussion of value would be incomplete without a discussion of the changing environment that impacts the organization – especially in the area of communication. Advances in communication capabilities (both data and voice) through 'I' are enablers of drastic changes in the way a business operates by offering capabilities to overcome constraints on time and distance – the key barriers around which organizational forms traditionally have been designed. Advances in communication technology have long been recognized for their impact on the organizational form. The early forms of communication and information exchange, the PBX, memorandums, and business meetings contributed to the development of hierarchical organizational structures, enabling coordination and control among departments and functions *(Orlikowski 1992)*. This fact has also been exploited by the consulting firms – which have developed specialized SBUs that exclusively deal with communication technologies and their application to organizations. For example, TCS, Wipro, and IBM all have dedicated SBUs that cater to network and telecom, within networks different technologies like VPNs, MPLS etc. as well as technologies that use communication as the backbone like Mail and Messaging, Electronic commerce etc. Their clients in the Energy vertical have been traditionally dependent on paper based and telegraph transfers of information between locations. This has given way to near real-time high speed data exchange using satellite links.

Five key features of these new technologies have resulted in their being key enablers of growth in modern-day organizations. The first is the dramatic increase in the speed of communication, with high volumes of data moving from one location to another at rates unimaginable a quarter of a century ago (when the slow serial links over dial up modems used to be considered

state of the art.) The second is the dramatic reduction in the costs of both data and voice communication due to technical developments, the convergence between the two, and wider penetration of technology due to economies of scale. The third feature is the increase in bandwidth that is commonly available, with effective multiplexing (more information on multiple frequencies travelling at the same time down a common communication line) becoming commonplace. A single pipe concept is emerging – with providers looking at becoming the source of providing a single wire (or wireless) connection into companies that provides voice, data, digital quality television and infotainment. Such trends are now emerging even in India. Technologies like Web 2.0 are enabled as sender and receiver bandwidth increases at constantly falling costs. Fourth is the rapid expansion of connectivity, with literally millions more people and machines linked together via local, wide-area, and wireless networks than was the case ten or even five years ago. Fifth, Information and communication technologies (ICT) can now store and retrieve information electronically from shared databases, enabling collaborative capabilities in communication.

These changes have, among other things, resulted in the breakdown of the tall, bureaucratic structures being replaced by decentralized, more flexible approaches to arranging and coordinating activities *(Lundberg 1994)*. This is exemplified by organizations like Chevron, and British Petroleum responding to varied environmental pressures – including heightened market volatility, globalization of business, increased uncertainty, and demographic changes in labor and consumer sectors *(Daft and Lewin 1993)*. These organizations, embraced, for example, the implementation of electronic communication systems (with varying degrees of success), not just simply absorbing whatever technology was available in the market to meet their internal and external coordination needs. This fact assumed importance with the number of remote locations (for example, offshore rigs) in which communication was required and where terrestrial links could not reach easily.

The clients of these consulting companies – as did most firms in the world – underwent resultant changes in internal organizational structures as well – both vertically and horizontally The entire organo-gram became flatter – with the middle management levels shrinking as well as the administrative support staff numbers reducing. This happens typically because organizations develop control systems through rationalization of activities via rules, processes

and procedures that standardize information flows within the organization to permit more efficient processing *(Weber 1922/1968)*. IT provides a means of easing this coordination thus reducing the need for human co-ordination. The organization of a company into cells, divisions and departments has traditionally been based on the need to collocate activities that are interdependent on each other, in order to reduce the communication costs associated with this inter-dependence *(Thompson 1967)*. However, advances in electronic communication, and its integration with IT, preclude the need for the physical proximity of these entities *(Monge and Fulk, 1995)*. Worldwide trends in distribution systems away from centralized warehousing to locating storage facilities in different regions – including different continents exemplifies this. Dell Corporation has manufacturing facilities in Penang, Malaysia,. Although their warehouses are located in Shanghai, China with the primary means of co-ordination being based on IT – especially email.

IT has a major effect on product design as well. Traditionally, product design has involved sequential processing across functions, with deliverables at the end of each stage. This chronological processing has been replaced by a different paradigm of engineering enabled by IT – whereby engineers can work on different parts of the design simultaneously and with continual coordination with each other *(Davidow and Malone 1992)*. These virtual teams can physically be working from many different parts of the world – as exemplified by IBM, SAP and a host of other mainstream IT vendors. In fact, if one includes the host of companies in the world currently that are smaller setups, one can see a trend wherein virtual organizations are formed – supported entirely by IT.

Such organizations consist of individuals working out of geographically widespread workplaces, or even individuals working from mobile devices and not tied to any specific workplace. These workers are totally sustained by communication links – including both data and voice. *(Nohria and Berkley, 1994)* describe such virtual teams as having the following primary characteristics:

1. Physical files and records are replaced by electronic equivalents,

2. Increased dependence on electronic communication and tracking

3. Blurring external boundaries by networking across organizations

4. The creation of a totally new type of cross-functional, IT-enabled jobs that enable individuals in the company to perform complete departmental functions w.r.t. customer/supplier facing roles.

These changes also have an impact on size reduction of a firm – large, dispersed organizations are replaced by leaner, integrated ones; and coordination is accomplished by individuals and teams with cross-functional, IT enabled jobs. The 1980s are commonly described as an era of vertical integration and conglomeration of firms, with the 1990s spearheading a reversal of the same. Earlier, backward integration to assure sources of supply (or forward to assure markets) was the mantra; the current trend is away from vertical integration in favor of working with suppliers and customers. This has, in fact, opened totally new avenues for consulting firms in the technology space in areas like Supply Chain Management (SCM) and Customer Relationship Management (CRM). These initiatives are supported with highly integrated IT applications that eliminate the need for one firm to fully subsume the other. Such strategies not only improve supplier performance but also increase customer loyalty towards the organization.

This increased capacity for both vertical and horizontal coordination across smaller, geographically diverse entities enables the creation of new organizational entities. An example of this is when an organization capitalizes on emerging market trends or the opening of a new market and creates a totally new legal entity in which the parent organization retains some ownership and control *(Reich 1991)*. IT makes it possible to keep close contact with the new entities without impinging on their autonomy. Wipro Ltd, in fact was born out of exactly such an outcome. (Wipro was set up in Amalner, Maharashtra in 1945. Primarily an edible oil factory, the chief products were Sunflower Vanaspati and 787 laundry soap (a by-product of the Vanaspati operations). The company was called Western India Vegetable Products Limited – hence the name Wipro.)

2.8 Impact on workforce

The overall impact of the above and empirical evidence shows a shift from manufacturing to services in most developed economies. With this comes a focus on managing information as

opposed to products – typically across geographies. This requires a robust IT system. The evaluation criteria of the effectiveness of these processes also undergo a change when an organization processes information rather than physical products *(Heydebrand, 1989)*. When the output product is tangible, it is separate from the process that created it. There are standard tools like quality control charts etc. to measure the quality of the product. However, when the output product is services or information, however, the process itself becomes the product. Thus we see new emerging trends like Best Practices – promoted by SAP – in a vertical and their applicability across multiple organizations. The measurement metrics also undergo a corresponding change – towards customer satisfaction and related metrics as key evaluative measures. Another characteristic is that these organizations rapidly learn and innovate. Employees who work in these organizations learn to form ties with others electronically, even if they haven't met in person. These links have been shown to be strongly linked to innovation *(Rogers 1983)*.

These firms also have been seen getting into a number of strategic alliances with other firms across industries and with IT enabling such alliances. An example is the linkage between major banks and airlines to offer frequent flier miles for bank credit cards users – American Express and Indian Airlines in the Indian context is one example; Citibank and Jet Airways is another. Such tie-ups are based on information as a core product, and would not be possible without the enhanced capability of communication systems to share real-time data between otherwise separate companies. When expanded along seemingly diverse verticals like banking, transportation, and insurance one organization can simultaneously act as not only supplier to another but also competitor, customer, and consultant. It is this fact that has led some of these consulting companies to diversify in terms of their vertical catering as well as consolidate their management consulting and technology consulting divisions (TCS being an example)

2.9 Internal Transition in business

This brings us to an interesting question – can IT be used to provide a company with sustained competitive advantage? The consulting companies that are the focus of this research work certainly believe so. So do most of their clients. Historically, a commodity view of IT has been proposed that states that since IT is available to everyone, eventually, its acceptance in general would erode most of the advantages accruing from its adoption. Companies that do not adopt

IT run the risk of being eliminated from the industry completely. This is generally called the 'strategic necessity hypothesis' *(Kettinger, 1994).*

The hypothesis consists of two propositions:

1) IT provides value to companies by increasing internal and external co-ordination, and organizations that do not adopt IT will have higher cost structures and therefore a competitive disadvantage – this is akin to the Hygiene theory *(Herzberg, 1959);* and

2) Organizations cannot expect IT to produce sustainable advantages because most IT is readily available to all organizations in the industry across the value chain including competitors, buyers, suppliers, and potential new entrants.

As per this approach, an organization would have only three routes to IT-based competitive advantage:

a) re-invent such advantages perpetually through continuous, leading-edge IT implementation and adoption of new technologies; or

b) move first and erect incontrovertible early-adopter advantages; or

c) embed IT into the organization in such a way as to produce valuable, sustainable complementing of resources.

The first two paths are difficult to tread. Early adoption of technology may hypothetically prove advantageous, but the advantage vanishes the moment an implementation goes sour or incorrect. Further, this is difficult to maintain since product and technology release cycles are ever-shortening due to competitive pressures. The first-mover approach unfortunately does not exist since technology that is standards based is made available to all, thus removing barriers to entry. Of course, one can argue that if a firm adopts closed, proprietary systems, then such barriers can be built. However, worldwide trends show that technology and products are moving away from proprietary systems to open standards based system where inter-operability is of prime concern. This analysis leads us to the third route as being the most viable. It points towards a more balanced perspective – one that goes with the ubiquity of IT,

yet allowing the possibility IT leading to competitive advantage. To put this in perspective, suppose one were to offer INR 400 crores to 20 firms without any strings attached – the net sum gain or return from capital would be different for all those firms – because of the strategic and differential utilization of a scarce resource – capital. This principle, when applied to IT resources is no different.

When talking about IT as a resource, two constituents are important – resource gestalt and co-specialization. A gestalt represents a number of smaller resources coming together to make a value larger than the individual constituents. This typically occurs when a resource produces greater returns in the presence of other resources than it can alone, e.g., an ERP system that only marginally improves performance under ordinary conditions, but produces sustainable advantages when combined with usage by functionaries across the enterprise. Gestalt resources are co-specialized if one resource has little or no value without the other *(Clemons, 1991),* e.g., ERP implementation and BPR, neither of which has value without the other. A commercially available ERP system like SAP would be a commodity resource, yet it may combine with optimal process re-engineering and configuration to produce an embedded, mutually reinforcing, advantage-producing resource bundle. The same sentiment has been echoed by *(Levinson, 1993),* who has classified resources as Organizational, Business, and Technological, and have proposed that IT performance depends on the integration of resources across these categories.

2.10 Organization-wide changes

By examining complementing resources according to the above categorization, we can identify six potential trends:

1. Breakdown of hierarchical organization structures
2. Emergence of newer forms of communications
3. Organizational consensus
4. CEO commitment
5. Organizational flexibility

6. Strategic IT implementation

The climatic variables most frequently linked with the effectiveness of IT are the removal of islands of information and creation of multiple levels of traceable communication. Resistance to change or resistance to sharing information therefore act as inhibitors for IT effectiveness to be felt in the area *(Zuboff, 1988)*. Modern organizations mostly have open philosophy, allowing employees free access to operational information that traditionally was available only to upper management and the formation of multi-skilled teams that are enabled by this information. This sort of change has been seen extensively in the Oil & Gas sector – with companies like British Petroleum, British Gas, and Chevron taking the lead in restructuring the functional roles and structure of their organizations in line with IT deployments. Consulting companies like L&T Infotech and Wipro Ltd., among others have made this possible through implementation of technologies like Groupware, Workflow automation and Collaborative computing initiatives like wiki's and blogs.

Another reason for IT making or not making an impact is underestimating the magnitude of the required organizational shifts, coupled with resistance to change. Empirical results *(Singh, 1986)* have shown that any implementation affecting core organizational characteristics like structure and culture encounter powerful resistance because they are perceived as personal dis-empowering initiatives. Research *(Short, 1989)* has also shown that consensus in the organization is a key element to pave the road for the success of IT. It has been demonstrated that financial performance of a company is not only a function of IT implementations, but of such implementations in an environment having little dissent – where all the key stakeholders share a common vision and attempt to implement IT strategically.

Another key factor that determines the effectiveness of IT is the commitment of top management – including the CEO. Successful IT requires executive level support – of those who can act as visionaries and strategic thinkers. This level of support would clearly support and articulate the need for IT, and communicate its functionality within the context of the organization's strategy, structure, and systems. Indeed, a number of failed implementations across companies in the Energy and Utilities vertical have failed because of this reason alone. In the absence of such commitment, resources (financial and personnel) may not be made

available for implementation in the right quantities at the right time. Indeed, it is not incorrect to say that till the top management understands IT and propagate it down-the-line, their biases and rigidities may create inadequate or inconsistent / incorrect implementations that are counted towards failure of IT.

(Benjamin, 1993) has termed this rather neatly - IT enabled change affects every function and organizational stakeholder within an organization, and therefore requires changes across the organization at 3 levels –

a. First-order change—i.e., incremental modification of existing patterns of communication and power. This change is the most common and most often stalled as inertial forces work strongly to protect the status quo

b. Second-order change – i.e., drastic re-thinking and re-designing processes, communication patterns, and hierarchy in the process creating new ones altogether.

c. Third-order change – i.e., the ultimate ability to accept the fact that the change has taken place and creation of a mind-set that accepts change and encourages it in an evolutionary process.

2.11 Resource Gestalt

If we look at larger, integrated organizations – like those in the Energy and Utilities sectors, we find that these organizations are very dependent on their suppliers – of which they have large numbers. IT has the potential to transform the relationship with these suppliers as well as generate certain other gestalts. We can take the example of Indian Oil Corporation, which, in 2007 has won the Ptak Prize (awarded by the (International Supply Chain Education Alliance) with Honeywell Process Solutions for enabling IOC in the selection of optimal crudes, their allocation amongst its various refineries and in arriving at the optimal distribution plan with least placement cost to the consuming centers and facilitating decision in respect of major investments. The system by itself may not have been very useful. However, coupled with supplier trust, it is able to leverage the supplier relationship effectively. This is precisely an

example of the tacit, complex coordination and communications skills that competitors may find difficult to replicate *(Hall, 1993)*.

No successful IT implementation can succeed without adequate training. Again, technical training has become a commodity – albeit there are differentiating factors. Most of these factors often do not come to light till the training is underway. However, the biggest benefits are visible accrue not due to purely technical training, but by merging specifics of IT deployments in the context of the organization. This could be achieved through a combination of on-the-job training methods such as rotation and mentoring or formal training which emphasize on the specifics of the implementation in context of the organization. Either of these in the long run will nurture embedded IT skills that are so essential for future IT initiatives to succeed. This is supported by the business process re-engineering *(Hammer, 1993)* doctrine – merely throwing IT at an existing business problem does not cause it to be reengineered. In fact, IT, if incorrectly deployed, can thwart re-engineering altogether by reinforcing existing thinking and behavior patterns.

Perhaps the most important element of the way stakeholders in the organizations are changed is through the capacity of IT to enable people to work collaboratively in teams. If IT does encourage the breakup of hierarchical structures, what remain would be essentially teams that collaborate. Most modern day communication forms – e-mail, voice-mail, videoconferencing and instant messaging as well as newer concepts like unified messaging make it more feasible for teams to work asynchronously across geographies. If we add the impact of network based technologies like Groupware, VoIP and the collaboration features available in just about every office automation suite nowadays, the performance of a company may become increasingly affected by its capacity to manage the interaction of teams.

2.12 Six Transforming Trends

The consulting companies and their clients have to deal with a host of major challenges in the current context. These changes are occurring both in the context of pure technology change as well as environment change. Some of these trends are outlined below:

1. A change in markets — moving from local and regional to the continental and global.

2. A de-centralized breakdown in organization structures — from management oriented hierarchies, to flatter structures focusing on collaboration, delegation and teamwork coupled with a move towards creation of global virtual teams.

3. A global move in the economy from production to IT enabled services.

4. Increased customer and partner focus – across the entire value chain

5. Information empowerment with far greater access to information enabled by IT

6. Increasing penetration of IT in all aspects of life – both professional and personal, the advent of reliance on information networks like the Internet coupled with a host of new emerging threats specific to this new environment – like identity theft.

The relative effectiveness of these trends depends in a large part on the business model in use by the firm. Viewed in the context of competitive strategies, one can contrast the old and the new strategies – the old ones including mass production – where both product markets and production processes were relatively stable, and efficiency was achieved through repetition, de-skilling and work fragmentation. The new one – on the other hand are more suited towards markets that are dynamic in nature, with equally responsive production processes. The emphasis, here, is on continuous product innovation and creation of small quantities of ever-evolving products with continuous innovation the key to corporate survival. This doctrine has been adopted by leading industries like consumer electronics, infotainment and IT. One of the best known examples of mass customization is Dell Corporation – that views customers as making increasingly unique and unpredictable product demands to differentiate their products from others. In such a context predicting customer preferences market demand becomes much more difficult. Such companies are normally operated by small, nodular processes, which when put together allow them to vary products rapidly – though in extremely cost effective ways. The modularization for example, may lie in the individuals, teams or manufacturing devices – whereas decisions about production may be made centrally. For example, Dell worldwide is linked over an ERP system. Orders are taken centrally for a country whereas production may be done globally and sourcing may be done from multiple locations worldwide.

(Buchanan, 1992) points out that such changes in organizations normally face multiple challenges – in fact, the more radical the change, the more open it is to organizational disruption and failure. The changes can be measured in two ways – the degree to which the change affects the firm's strategy and survival and demands modifications throughout the enterprise. The second relates to the magnitude of new ways of doing familiar tasks across the enterprise. This normally occurs since the activities and interests of a large number of stakeholders may be threatened.

2.13 Strategic IT

From what I have said above, it can be seen that any changes that occur in the organization need to be monitored and controlled – or at the very least prevented from spiraling out of control! The application of IT both tactically and strategically coupled with planning are crucial for an enterprise. These, when applied together marry strategic directions of the business to the technologies that can best leverage those strategic directions. They also drive IT strategy and planning to support the core competency of the business. It is essential, therefore, that organizations before using these methods, should have developed a vision of where they are and where they want to be. They should also have formulated some strategies for product positioning and target markets. Most importantly, however, the vision and goals should be supported by appropriate organizational structure and detailed business processes that must be addressed to serve the objective.

One of the most important fundamental doctrines that consulting companies have had – indeed one that caused some of them to come into existence is that significant value is achieved by applying these principles to the strategic areas defined by the company and considering the perceived value from the perspective of the customer. The fundamental focus should be on moving from customer satisfaction to delighting the customer.

In this context, consulting companies focus on the glue holding their client together – processes. Automating old processes by simply applying IT may ignore infrastructure benefits and more importantly – process limitations. Murphy's Law comes to mind once again – "Automation applied to an inefficient process magnifies the inefficiency." Infrastructure, organization structure and processes that were created in a very different environment should

be evaluated as prime candidates for re-engineering before IT is applied. This, even as defined by *(Hammer & Champy, 1996),* goes beyond minor modification of the process – the entire process needs to be re-designed. This exercise is fueled by the fact that the environment in which these companies operate is continually evolving – and leaning more and more towards IT. To survive and remain competitive, organizations must keep pace with this change and undergo such transitions.

2.14 Putting the pieces together

Based upon the basic premise that transformation is necessary with reference to the environment, consulting companies like TCS, IBM Global Services etc. broke the transformation task into a number of specific areas like the creation of systems architectures, application development, networking, communication systems and systems management. One has to keep in mind that this is not an exhaustive list of areas. Further, each of these areas can be divided into a number of sub-areas. For example, communications can be divided in the current context into areas like mail and messaging, corporate instant messaging, content management and collaboration tools on an intranet etc. Each of these sub-areas can then be divided into product specific specializations. For example, both Sun Microsystems and Microsoft offer mail and messaging solutions. However, the infrastructure, hardware requirements, operating systems and products themselves require diametrically different skill sets to implement and manage. Most consulting companies have therefore developed specialization areas that have human capital resources dedicated to these products and technologies.

When coupled with global standards-based certifications like SEI's CMM or ISO (which all these companies have obtained), these provide a reasonable assumption that the detailed technical specifications can be integrated into a comprehensive design that will deliver the aligned IT strategy that the client thought of, and will deliver true value to the customer. The objective of these specifications is to address the question, "How to do it?" rather than "What to do?" or "Why to do it?" that have already been addressed by the customer in defining their strategy. Common examples of the above in today's context are rapid prototyping techniques that encapsulate the business process and quickly demonstrate the value of the application to the organization by effectively exploiting available IT infrastructure and using it to collate data

from (often) multiple sources of information and databases and presenting summarized information that is required to make critical business decisions.

A key fact to notice here is that the role of IT in the transformation of the organization is dependent on its perceived importance to the organization as viewed by top management. One of the ways this is manifested is in the manner in which IT participates in board level decisions. It is precisely this that has led to the formation of the role of a Chief Information Officer (CIO) in firms – to integrate IT into the formal strategy framework. This integration ensures that IT implementations will result in among other things – management buy-in – which, besides easing the implementation itself would also bring further the business value in terms of growth, profits, and competitive and strategic advantage to the table faster. If we look at the history of an E&P company like BPCL, historically, the IT function was considered a support function. This has now been re-positioned to where it plays a critical role in the strategy formulation and execution.