The University of Sydney

School of Economics and Political Science

Working Papers

Major Indian ICT firms and their approaches towards achieving quality

Dilip Dutta & Anna Sekhar

ECON2004-6

Discipline of Economics
Faculty of Economics and Business

ISBN 1 86487 668 9 ISSN 1446-3806
July 2004

Major Indian ICT firms and their approaches towards achieving quality

Dilip Dutta & Anna Sekhar

School of Economics and Political Science
The University of Sydney
Email: d.dutta@econ.usyd.edu.au

ABSTRACT

Of the three basic theories of innovation: the *entrepreneur theory*, the *technology-economics theory* and the *strategic theory*, the third one seems to be highly appropriate for the analysis of recent growth of the information and communication technology (ICT) industry in many developing countries including India. The central measure for achieving quality by the various major Indian ICT firms is widely agreed to have been the adoption of *Six Sigma Methodology* and various other approaches like *Total Quality Management* (TQM), *Supply Chain Management* (SCM), *Customer Relationship Management* (CRM), etc. It is apparent that the main objective of the firms chosen has been to increase the pace of innovation activities, irrespective of their different areas of product specialisation. Its success also depends largely on the overall improvement in infrastructure, besides active market interaction. To enable both the above, a brief highlight on the establishment of *interaction and learning sites* (ILSs) in every regional State in India comes to the foreground. The chapter concludes with a mention of the elements observed to be missing among the firms under consideration, and, thereby, delineating the scope for their further improvement.

CONTENTS

1. Introduction

Since the 1980s, there has been a resurgence of interest in the approach to assign a critical linkage role to innovation in the relationship between competition and competitiveness (Mytelka, 1999, p.15). The term *innovation* that engulfs R&D includes a broad spectrum of activities like the introduction of a new product or a new product quality, introduction of a new production method or process, a new organisational or management structure, opening up of new markets, etc. In the recent analysis of innovation literature, three different explanations or basic theories identified are: the *basic entrepreneur theory* (in the context of markets in process of formation), the *basic technology-economics theory* (suitable for established but unexploited markets) and the *basic strategic theory* (appropriate for complex, rapidly changing and nearly saturated markets)[1]. It should, however, be noted that there is overlapping of elements among the three basic theories.

As to various implications[2] of the above three theories at the micro level, the entrepreneur theory and the strategic theory deal with all types of innovation, while technology-economics theory operates mainly with process and product innovations. From the 'management' point of view, the entrepreneur theory deals with a very low degree of management, while the other two theories operate with the

* Our sincere thanks goes to Mr. Balakrishnan (*Infosys*); Andy Wright, Nirav Desai and Lakshminarayan Lan (WIPRO) and Rajesh Jain (*Tech Samac*har) for their help in obtaining valuable information and suggestions. Our thanks also goes to the customer support team of *Reliance Industries* for having taken efforts to send us all the information without any bit of hesitation.

[1] Sundbo (1998, p. 191)

[2] *Ibid*. (pp. 193-94).

management of the innovation process. Because the strategic theory involves the whole organisation in innovation development, it, therefore, operates with the most extensive and interventional management style. In the analysis of growth and development of the contemporary information and communication technology (ICT) sector[3], we believe that the strategic theory gains an upper hand, particularly in the context of its recent rise in many developing countries including India. Studies such as Mytelka (1999), Kumar (2001), etc indicate the advantageous position of developed countries to compete better in innovation activities. Comparatively, firms in developing countries, irrespective of their size, are still in the process of learning various innovation activities from the developed nations. In India, the infancy stage of infrastructure growth has, generally speaking, resulted in low levels of innovation activities, although most of the major Indian ICT firms have been lately involved in carrying out large number of such activities.

In this chapter, we would like to focus on the overall issues such as (i) the extent of innovation activities taking place in the major Indian ICT firms; (ii) scope for further improvement of these ICT firms in particular and the ICT industry in general. For firms involved in innovation process, quality is the prime focus. Major Indian ICT firms have adopted varied approaches towards improving quality of their products and services. The central measure for achieving quality by the various major Indian ICT firms has been the adoption of *Six Sigma Methodology*[4] and the multivariate management approaches like *Total Quality Management* (TQM)[5], *Supply Chain Management* (SCM)[6], and *Customer Relationship Management* (CRM)[7]. Additionally, some firms have either adopted and modified these different approaches or

[3] Information and communication technology (ICT) includes microelectronics, opto-electronics and related technologies used in collecting, storing, processing and transmission of information in the form of voice, data or image (ESCAP, 1999, p. 139).

[4] *Six Sigma Methodology* is an approach to achieve near perfection quality for eliminating defects (driving towards six standard deviations between the mean and the nearest specification limit) in any process– from manufacturing to transactional and from product to service.

[5] This precedes the *Six Sigma Methodology*. Originating in the 1950s, TQM revolves around the objective of *doing things right the first time*. Gaining immense popularity since the 1980s, this management approach focuses primarily on market satisfaction. By viewing the organisation as a collection of processes, TQM has begun gaining increasing recognition as a generic management tool. The key principles of TQM include management commitment, customer focus, constant improvement, employee empowerment, etc.

[6] Portraying itself as a set of individualised processes during the post World War II period, the concept of SCM has shown a systematic growth and development since then. Having additional names like B2B or business-to-business, the SCM today has grown manifold with the growth of the ICT sector, where the two most important elements of an effective supply chain are communication and transmission of data. Examples of supply chain advancement in the field of ICT include *Electronic Data Interchange* (EDI), *Extension Markup Language* (XML), etc.

[7] Being a core customer-focussed strategy, CRM concentrates on maintaining the customer base by tracking all the possible minute information about the customer and developing software systems that comes in handy for the various specific business purposes like marketing, support, sales, etc. In short, CRM presents a customer-centric approach than a product-centric approach to sustain in the market. The adoption of CRM stems from the increasing recognition on the long-term relationship with customers as one of the chief assets of any organisation irrespective of their size. Thus the focus is more on *customer retention* than on new *customer acquisition*. Information technology plays a pivotal role in gathering statistical information on the various needs of customers. There are many methodologies designed to achieve the objective of customer retention. The most popular one being *Retentiongram Model* that enables informed choices to be made with due emphasis on the different strategies for different customer segments.

designed their own to suit the varying needs. It is to be noted that the establishment of *interaction and learning sites* (ILSs) is vital for the betterment of the ICT industry as a whole (Crevoisier, 1999). These ILSs serve as joints where interaction between firms of varied sizes takes place creating transfer and diffusion of knowledge.

Improvement in quality of products and services from the individual firm's perspective implies better sustenance and control in the market. The Indian ICT industry has witnessed a period of sustained growth during the past decade or so. Being highly competitive, most of the major Indian ICT companies have a record of achieving the highest level 5 of *Software Engineering Institute-Capability Maturity Model* (SEI-CMM)[8].

In the following three sections, we will review the quality-oriented models of the leading Indian ICT firms that specialise in hardware, software and communications infrastructure. In Section 2, we review firms like *WIPRO* and *HCL Technologies* that specialise in both hardware and software. While *Reliance Infocomm* that specialises in IT infrastructure has been included in Section 3, two other firms, *Infosys* and *Satyam Computer Services*, specialising exclusively in software find a place in Section 4. Finally, scope for further improvements in innovation process has been briefly brought out by highlighting a few missing elements in the concluding section.

[8] It is to be noted that both CMM/CMMI and Six Sigma are process improvement frameworks. Both are, therefore, complementary and mutually supportive. Depending on current organizational, project or individual circumstances, Six Sigma could be an enabler to launch CMM®, CMMI-SM, PSP-SM, or TSP-SM. Alternatively, it could be a refinement toolkit/methodology within these initiatives. For instance, it is useful to select highest priority Process Areas within CMMI-SM or to select highest advantage metrics within PSP-SM. For details, see the Website: http://www.sei.cmu.edu/

2. Indian ICT firms specialising in hardware and software

2.1 WIPRO

Having a solid foundation in diversified sectors, WIPRO[9] ranks among the top IT services companies globally and is a market leader in India. Armed with good communications services and good infrastructure, WIPRO is one of the few companies that have taken various initiatives towards achieving market satisfaction. To achieve market satisfaction, a rigorous improvement in quality by eliminating defects and providing the market with reliable and timely solutions has been WIPRO's basic motive. The *quality-factor* or the Q-factor adopted by WIPRO takes the form of working continuously to improve quality, remove defects and increase predictability as well as accuracy. Secondly, it has also formed a well-defined *Software Engineering Process Group (SEPG)* that aims at establishing standards, defining and sustaining processes of change through periodic assessments. Thirdly, along with a dedicated tools group for software engineering and productivity enhancements, there also exist on-line systems for quality control. To attain this Q-factor, WIPRO has about 3500 members working in teams of five and six on over 292 *Six Sigma Methodology* projects and 344 Turbo projects facilitated by 74 Black Belts[10]. In addition to the direct adoption of Q-Factor, the dual role of *SEI-CMM* and *Six Sigma Methodology* stand out in WIPRO.

[9] WIPRO: *Corporate Overview* 2001, *Minds across Borders*, Bangalore, India.

[10] Black Belt projects focus on improving customer satisfaction; reducing defects, cycle time, and costs; optimising both product and process performances; etc. Generally speaking, the success of a firm emanates from the profits earned

Quality management – an overview

As is apparent, *Six Sigma Methodology* gains prominence in WIPRO with a view to maintaining quality and providing increased opportunities to meet with the market needs. The initiative of *Six Sigma Methodology* has turned the direction of the firm towards complying with market behaviour through developing and delivering near perfect products and services. Looking into the ultimate goal of improvement in quality with better technology, WIPRO has been aiming at overall improvement in quality of products through higher levels of investment in developing a knowledge management infrastructure among its workforce. This has meant efficient knowledge exploitation, expansion and diversification as well as building of competent organisation framework and better delivery of customer requirements. Knowledge expansion and diversification also build a strong foundation for technological enhancements that are vital for better compliance of quality standards. *Diagram 1* shows WIPRO's approach to achieve *TQM*.

In view of WIPRO's policy towards constant acquisition of new knowledge through innovation and R&D activities, it uses a relevant model called *People Capability Maturity Model* (PCMM). Like the knowledge management infrastructure, this *PCMM* aims at improving people's capability at all levels of the firm by integrating improvements in both processes and workforce. With over 14,000 people (11,500 in IT), WIPRO's adoption of *SEI-CMM* and *Six Sigma Methodology* to improve quality rests on one important policy-*Applying Thought*. The resulting benefits claimed by WIPRO are the following[11]:

(i) improvement in utilisation of WIPRO Technologies,
(ii) reduction of cycle time in manufacturing PCs – hardware,
(iii) installation of failures of WIPRO PCs reduced significantly,
(iv) 25% of customer breakdown calls closed on telephone at WIPRO Infotech,
(v) accurate cost estimation for fixed price projects in WIPRO Technologies, and
(vi) service partner satisfaction index increased from 44% to 75% at WIPRO Infotech.

WIPRO has the unique distinction of being the first recipient of *SEI-CMM* Level 5- the highest attainable level[12]. Additionally, WIPRO has also come out with a new model called *SEI-CMMi* in October 2000. In brief, it is a unified model addressing software development, system engineering and integrated product development. WIPRO has been maintaining its stand of pursuing excellent quality and building its credibility in the market. With the above, WIPRO ranks as the first IT services provider in the world to achieve the *SEI-CMM* Level 5 which is the highest level of quality certification. It remains well positioned to offer customers business infrastructure and management. With its green and black belts that are to WIPRO's credit, the firm is also a recipient of the *Golden Peacock Award for Innovative Service Quality.*

irrespective of its size. Thus, for the firms to enjoy greater profits, a minimum time recommended for these Black Belt projects ranges anywhere between 3 to 6 months.

[11] WIPRO-*Corporate Overview*, p.23
[12] *Op.cit*

2.2 *HCL Technologies Limited*

HCL Technologies Limited is a global IT services company offering software consulting development, maintenance and training services as well as maintaining the hardware division. With its rich experience in designing and implementing business applications, HCL has gained a reputation for working closely with all its clientele. Its expertise has enabled HCL to deliver robust, secure, easily maintainable applications, providing its customers with many additional benefits including (i) resource management, (ii) competitive market insights, (iii) budgetary services, etc. HCL's expertise that includes *SCM*[13], *EAI*[14], *ERP*[15], and *CRM*[16] have continuously added value to its clients by delivering high quality and cost effective solutions through total quality programmes. Its dynamic and flexible *Quality Management System (QMS)* that has evolved over many years is compliant with *ISO9001* standard and *SEI-CMM*. HCL has also achieved Level 4 and Level 5 of *SEI-CMM*.

Growth towards achievement of quality

Commencing with a meeting between quality coordinators and team members of the software development project all of whom know the market needs to ensure product and process quality during a project, a *software quality assurance engineer (SQA)* monitors the progress of the project and its status periodically and liaises with the customers through pre-defined conference calls. Clearly, for HCL Technologies the journey of quality began with *ISO9000* certification of the *software development centre (SDC)* before quality control scrutiny in *SEI-CMM* Level 4 followed by Level 5, expounding its determination to eliminate defects and manage the constant changes taking place in technology.

ISO9001 Certification was the first step taken by HCL towards the achievement of quality in software development process. The journey for the improvement of its quality in line with *ISO9000:1994* began in 1995. HCL receives its first certification in the year 1997. After having moved up the quality ladder, SDCs today be also certified *ISO9001:1994n*, with many achieving re-certification. Improvements in quality come by the way of *ISO9000:2000* certification. The underlying idea of ISO certification is to enable all the SDCs to ensure on-time delivery of projects with few or no defects. Quite clearly, HCL has adopted a systematic approach for achieving quality in software development process culminating at *software process maturity*, that comprises of the following five levels:

i. INITIAL: Here the software process is characterised as ad hoc with very few processes defined with success depending entirely on individual effort;

ii. REPEATABLE: Basic project management techniques help to ascertain costs and functionality;

[13] HCL with its SCM solutions expertise and a background in *Enterprise Resource Planning (ERP)* gives very significant expertise in process consulting as well as product configuration besides system configuration. More information about this is available in HCL web site link: http://www.hcltechnologies.com/artdisplay.asp?cat_id=98&art_id=368

[14] *EAI* or *Enterprise Application Integration* lays a strong foundation to technology infrastructure that links business applications into one unified system such that data can be shared throughout the organisation. This *EAI* has an impact on efficiency, productivity, speed and performance.

[15] *ERP* or *Enterprise Resource Planning*, which is also connected to the supply chain *CRM* applications and the like ensures that any organisation adopting the *ERP* would have a competitive edge.

[16] An extended form of *CRM* or *Customer Relationship Management* focuses on rendering customer-oriented application package. With talented project managers, consultants and business analysts in the team, these dedicated groups of members have helped create focussed front office suites for the clients.

iii. DEFINED: Management and engineering processes are documented, standardised and integrated into a standard software process for clarification by the organisation;

iv. MANAGED: Detailed measures of the software process and product quality collected, quantitatively understood and controlled; and

v. OPTIMISING: At this final stage, continuous process improvement enabled by qualitative feedbacks from the process itself and from resulting innovative ideas and technologies.

Like some of its counterparts in the Indian ICT industry, HCL that has achieved *SEI-CMM* Levels 4 and 5 has been working incessantly towards eliminating defects and improving the overall quality of its products and services.

3. Firms specialising in ICT infrastructure

3.1 Reliance Infocomm

Being a part of the Reliance Group of industries, *Reliance Infocomm* is a leading telecommunication infrastructure provider in India through the provision of broadband communication infrastructure. Working towards improving the existing communications infrastructure with the most advanced technology, this process includes transformation from a normal public service telephone network to a high-speed broadband network and from plain voice telephony to virtual network. The latest and the best telecommunication infrastructure achieved by *Reliance Infocomm* are thus:

- Comprehensive network covering all the population of various region from the remotest rural areas to high-tech cities;
- International gateways to cover the rest of the world; and
- 100% digital state of art infrastructure[17]

Keeping pace with the dynamism of the ICT sector, *Reliance Infocomm* has been synonymous with effective R&D supporting *knowledge intensity* firms. Reliance's strategy to sustain improvement in communication infrastructure gains immense support from its *Six Point Agenda*[18]:

- Revolutionise asset productivity
- Build a strong intellectual property rights (IPR)
- Increase pace of new product introduction
- Build new product platforms
- Commercialise new licenses
- Develop future opportunities through discovery research

Knowing the importance of knowledge transfer, interactive learning and knowledge spillovers that are vital to develop opportunities for future research, Reliance's *Product Application and Research Centres (PARC)* have proposed the creation of *virtual network* to promote knowledge sharing with customers and end users. This approach has the benefit of knowing, on a continuous basis, what the customer's ideas are for any product enhancement or modification. Emphasizing quality, *Reliance Infocomm* has carefully designed systems that are available on its corporate intranet to ensure faster decision-making about end products and their quality. Advanced technology systems and analytical instruments at sophisticated quality assurance laboratories are the key elements of Reliance's q*uality drive*. With 29 *ISO 9000* certificates confirming the firm's commitment to improving

[17] This state of the art is said to be capable of serving terabits of data per second.
[18] Reliance Industries: *Annual Report 2000-2001*, pp.48-49

its quality, the importance of constant improvement in quality becomes a possibility through the *TQM* implementation team. Also being a recipient of the *Golden Peacock Award* for innovation management, *Reliance Infocomm* stresses constant improvement through advanced technology, on-line communications and information exchange, quality circles that includes *Six Sigma Methodology*, *Six Point Agenda*, *CRM*, quality chain audits, and quality reviews. All these help *Reliance Infocomm* achieve its goal of *Total Customer Satisfaction* (see *Diagram 2* above).

4. Firms specialising only in software services

4.1 *Infosys*

With the Indian software industry growing rapidly, India gains prominence as one of the mature countries for IT offshore work. While taking advantage of IT and IT-related services, risk and risk management aspects are inherent. Long-term interest in market sustainability as well as better control over the market along with stronger relationships with customer calls for competitive strengths and framing of proper strategies [19]. In this regard, there is a strong perception about Indians being *technically strong* but poor on the management side. This apparent limitation questions the capacity to frame proper strategies and policies[20]. Having been established in the software area of Indian ICT industry for some times, *Infosys* has identified major areas that are threatening the growth of Indian ICT industry and has stressed on the need to develop an appropriate business model. A few essentials of this type of business models have been identified by *Infosys*[21]:

- Firstly, the firms must have the ability to understand clients' business and introduce credible technology that offers credible business solutions. Here the effective and interactive roles of ILSs stand prominence.

- Secondly, there is need to improve infrastructure of the country. *Infosys* emphasizes that global delivery capability for any firms comes in with adequate proper infrastructure that is critical for providing high quality, cost-effective solutions. In India, the central government has been taking adequate measures to improve market infrastructure in the country, especially the communications infrastructure such that there is timely flow of solutions. Related to this is firms' ability to attract high-talents and able professionals so that growth of the firms and the entire industry becomes a strong possibility.
- Thirdly, along with the need for proper information and the establishment of ILSs, another essential for the business models as mentioned by *Infosys* is that of a client-focussed organisational structure which again calls for the applicability of strategy theory. Focussing on improving the market profile through a proper understanding of the market, the business models should, according to *Infosys*, have well-planned image-building efforts so that establishing control in the market becomes a lot easier.

Generally speaking, *Infosys* aims at improving its overall performance to maintain its control over the market. The firm's business model rests on four main elements: *predictability*, *sustainability*, *profitability* and *derisking*. This is why this model is known as the PSPD Model. It primarily evaluates the revenue aspect of the firm. Focussing on long-term relationship with clients, the model invokes the search for competitiveness. By way of explaining the model elements in detail,

[19] *Infosys- Moving up the value chain*, p.5.
[20] *Ibid*.
[21] *Infosys – Managing enterprises in challenging times*, pp.4-5.

predictability and *sustainability* show their interrelation with the revenue feasible by the firm. Along with the element of *profitability*, the last element of *derisking* provides the company with strength and stability to react effectively to changes in the business environment[22]. The major advantages and disadvantages of the PSPD Model[23] are noted below.

Advantages are in terms of achievement of

- higher margins,
- higher predictability of revenue, and
- stronger client relationship.

Disadvantages are in terms of additional needs for

- different sales and marketing skills,
- higher investment in a particular client, and
- acquiring new skills in solution delivery.

Relating to the last point on acquiring new skills in solution delivery, *Infosys* has been working towards delivering high-quality software services to its clients within the budgeted time and cost. To achieve this, the company has built a consulting team to restructure the organisation by delineating different compensation models, different performance metrics, training and knowledge sharing to improve competency levels, and formation of an integral group that closely monitors dynamic technology trends.

Generally speaking, a comprehensive and integrated risk-management framework forms the basis of all risk-taking efforts of the company. Formal reporting and control mechanisms ensure the availability of timely information that facilitates proactive risk management. These mechanisms cascade down to the level of line managers so that identification and mitigation of risks at the transactional level become possible in a decentralised fashion. By focusing on current and future positions of growth, key factors include changes made in line with the organisational framework of a firm, building its knowledge base, launching and enhancing products, changing and acquiring market position, etc.

The adoption of some quality target such as *SEI-CMM* has meant the need for proper identification of risks in right time and measures required to mitigate them at the initial plan phase itself. *Infosys* has been a recipient of *SEI-CMM* Level 5, a level that only few companies have achieved[24]. Studies from various reports of *Infosys* reveal that this firm also plans to bring out a risk management guideline detailing the identification and mitigation of various risks at the initial plan phase itself. A database of such information would focus one's attention on the key improvement areas. With the firm being primarily focused on software services (unlike WIPRO that has also a hardware wing for its IT division), *Infosys* has been enhancing the process of quality in other organisational processes using *Six Sigma Methodology* and *Malcolm Bridge Quality Framework*, the latter being award usually given to American companies.

[22] Quite clearly, the *PSPD* model of *Infosys* and *Six Point Agenda* of *Reliance Infocomm* both highlight the importance of market sustainability through profit maximisation that follows quality improvement. The major difference is that while *Infosys* avoids concepts such as *total customer satisfaction*, *exchange of information with the end user*, and *transfer of ideas* which resemble ILSs concept (Crevoisier, 1999, pp. 61-79), *Reliance Infocomm* uses exactly these precepts to help improve the quality of its products and thence its sustainability.

[23] *Infosys: Risk Management Report*, 2001, p.82

[24] *Ibid*, p. 86.

There is another *Infosys* integrated framework called *InFlux* which also gains prominence[25]. This framework has been of great help in determining the impact of new initiatives and defining IT solutions for these new initiatives. With its business-modelling framework based on digital world concept, *InFlux* has become an integral part of *Infosys* to realise some of the intertwined complicated strategies and corresponding technology-driven initiatives (see *Diagram 3*).

Clearly *Infosys* has progressed from a traditional model of body-shop, cost-plus pricing, *etc*. to an emerging model that comprises of (i) higher levels of engagement, (ii) value-based pricing, (iii) selected alliances with major global pricing, and (iv) international sales and marketing presence. As software services firm, *Infosys* continues to evolve business models that work towards the overall improvement in quality of products. In line with the strategy theory, *Infosys* has been working towards client satisfaction, gaining expertise in various areas of software development like consulting, building in-house expertise, identifying the key growth areas, achieving technology expertise for which R&D and innovation play a vital part. Through creating the knowledge base, *Infosys* has people researching different technology areas and trying to build competency.

From the above, it is clear that the primary motive of this firm is to work towards improvement in quality of the products and services that enter the market in general such that sustenance in the market becomes easier with higher revenue gain.

[25] see http://www.*Infosys*.com/innovation/influx.asp.

4.2 ***Satyam Computer Services Limited***

Being a global consulting and IT services-related firm *Satyam* began with strategy consulting and solution implementing for its IT clients. As a diverse end-to-end IT solutions provider, *Satyam* today offers expertise focussed on helping customers to successfully re-engineer and re-invent their businesses for an ever-changing market place with the final objective of giving clients a competitive edge. With over 9,700 dedicated IT professionals in the *Satyam* team, the IT solutions have resulted in technology-intensive transformations that have complied with the most stringent quality standards. Having a strategic technology and marketing alliance with over 60 leading companies, the need to engender technological expertise brings customers a range of solutions and products that are superior in quality, which enhances productivity and competitiveness.

Satyam's major contributions towards achieving building Quality include the following:

- *Pioneers in Offshore Development: Satyam* has pioneered in Offshore Development Centre Model for software delivery through gathering the skilled workforce (available in plenty in India).
- *Establishment of Development Centres in India: Satyam* originated the concept of setting up development centres to outsource IT initiatives and these are located in various Indian cities.
- *eSCM:* A quality model for ITES/BPO[26] has been attained by working in close coordination with Carnegie Mellon University. *Satyam* has developed a quality model that defines standards for ITES/BPO.

[26] This abbreviation BPO stands for *Business Process Outsourcing*.

- *Rightsourcing Model: Satyam* has also introduced a unique delivery model called *Rightsourcing model* that provides optimum combination of off-site, onsite and onshore delivery.

Quality culture at Satyam

Quality is a continuous process that is emphasised in *Satyam*'s activities. The quality culture is one of effective communication and knowledge sharing avenues across the organisation via the exchange of information, ideas, and solutions. Quality for *Satyam* began with *ISO9001* certification, duly followed by *Tick-IT* [27] and recently surveillance on the quality aspect followed by *BVQI*[28]. Becoming the first quality organisation in the world assessed by *BVQI*, *Satyam* tallies with the requirements of the new *ISO9001:2000* International Standards under the *Tick-IT* scheme. *Satyam* was one of the first 10 companies in the world to attain an organisation wide *SEI-CMM Level 5* assessment in the first attempt; the most sought-after quality standard in the world, instituted by Carnegie Mellon University. About *software process consulting (SPC)* services and software process improvement, the preferred frameworks used by *Satyam* are *SEI-CMM*, *ISO*, and *SPICE*[29]. These models chosen are appropriate to software process improvement in a systematic manner. Overall *Satyam* is flexible, interactive and oriented towards customer's business objectives, priorities and significance. *Satyam* has also received the *Bajaj National Quality Trophy* in 2001. Instituted in 1997 by the Indian Merchants Chamber, this award is similar to the *Malcolm Bridge National Quality Award* given to American companies. This award recognises the understanding of requirements for business excellence and sharing of information on successful performance strategies.

The following *Diagram 4* summarises how a number of models and frameworks have been used by *Satyam* to provide guidance for designing and implementing software process improvements and thereby rendering improved quality services.

Concentrating on quality, *Satyam* has also developed *eSourcing Capability Model* (eSCM) in collaboration with Carnegie Mellon University. *eSCM* is the first standard for outsourcing service providers developed by Carnegie Mellon University to help the service providers develop and improve process capability from execution to completion phase, and to establish, manage and improve relationship with clients as well as supporting basic functions of technology, organisational knowledge. Providing 'best services', *eSCM* sets clear guidelines to outsourcing service providers by focussing on organisational attributes for the workforce, and technology and knowledge. *eSCM* is also accompanied by multiple appraisal and evaluation methods that would enable users to maintain and enhance client relationships and deliver services to clients within their current capabilities. With Carnegie Mellon University being the pioneer of the CMMs to assess the quality of a firm, it is also worth noting that the models that come under the banner of *SEI-CMM* family are normally used to assess the quality rating of the firm. Following the ongoing developments on various quality models, the researchers at Carnegie Mellon University along with researchers and engineers at Satyam worked on *eSCM* Model for about a year. Although a number of modules for evaluating quality do exist, *eSCM* Model contains those practises that are not available in other models. *eSCM* based process

[27] *Tick-IT* is a certificate somewhere around level 2/3 of the *Capability Maturity Model* (CMM).
[28] *BVQI* stands for *Bureau Veritas Quality International* that conducts periodic checks and thence stresses on the quality of the products and services.
[29] *SPICE* stands for *Software Process Improvement and Capability dEtermination.*

improvements are implemented by Outsourcing Process Consulting (OPC) services such that

- A firm is able to develop capabilities across the entire sourcing life cycle right from pre-contract phase through contract phase and completion of that particular contract; and
- *eSCM* could help develop capabilities not only for delivering services but also for managing support functions like technology, organisational knowledge and so forth.

To facilitate embarking on the journey of process improvement and becoming a 'Service Provider of Choice', *Satyam* uses the proven Build, Operate and Transition (BOT) engagement model that includes the phases as mentioned below.

The 'Build' phase

- *Process Analysis*: A detailed report includes:
  - extent of compliance of their processes with respect to *eSCM*
  - strengths leveraged towards the achievement of business goals
  - areas requiring improvement in order to meet business goals
- *Strategic Planning*: This is a blueprint for a successful process improvement initiative. Strategic initiative planning developed for achieving and identifying process improvement goals rely on business goals and process analysis report of the organisation.
- *Process Design*: Conducted using a predefined methodology and the involvement of the organisation's personnel is the key to success.

The 'Operate' phase

Under this phase, the focus includes:

- *Process Deployment*: Issues related to change management for smooth deployment, appropriate process automation tools, and identification and collection of appropriate process measures for the organisation; and
- *Process Verification*: Checks for compliance with *eSCM,* and varies according to its stage in the engagement life cycle.

The 'Transition' phase

Using necessary tools and defined methodologies, the deployed and stabilised processes undergo effective transition. Thus, the 'Transition' phase ensures that

- all process improvement measurements and trends are appropriately disseminated;
- deployed tools are transitioned; and
- insights into the capability and performance of key processes are gathered and transitioned.

Using all the inputs above mentioned to plan an entire project and with management tools refined over many improvement projects, a realistic improvement plan is prepared. Along with this risk protection strategy, the *Information Security Management* (ISM) and *Security Level Management* (SLM) also gain prominence. While ISM denotes the protection of information assets through policies, procedures and technologies, the SLM services help to develop and implement solutions for problems pertaining to satisfying clientele base.

Satyam's core values[30] express the designing of teams and the way in which they operate to achieve results. These values are the guiding elements for the organisation as a whole and rely on the internal strengths of the firm. The core values include:

- *Pursuit of Excellence*: Adhering to stringent quality processes that meet with the international standards, these quality processes are constantly monitored to achieve excellence.
- *Customer Satisfaction*: Catering mainly to corporate clients, *Satyam* is focussed on competitiveness and meeting with their needs such that sustenance is easier.
- *Entrepreneurship*: Various programmes help associates create tangible values and constant encouragement given to these associates help them convert their ideas into market values that build the spirit of entrepreneurship.
- *Belief in People*: The true strength lies in its associates.

Bringing various elements of quality achievement together, the overall model adopted by *Satyam* is primarily based on:

- early identification of any problem,
- taking appropriate steps to control that problem,
- bringing about technological improvements,
- ensuring improvement in quality is a continuous process, and
- training professionals to the required level to enable them to comply with required quality standards.

[30] Refer: http://www.satyam.com/aboutsatyam/a_philosophy.html

5. Conclusion

Going by the strategy theory, strategies and policies play an important role in the ultimate advancement of the ICT sector especially in developing countries like India. This chapter has expounded the role of the major Indian ICT firms in improving quality of their products and services in order to enjoy greater control and sustenance in market. *Appendix-I* clearly specifies the name of the firm along with its year of inception, area of specialisation and their approaches towards achieving quality. *Appendix-II* delineates the revenue earned by these firms, while *Appendix-III* reveals their R&D expenditure incurred.

Realising the need to improve their profile in the market, most of the firms in the Indian ICT industry, irrespective of their size, have now begun to understand the importance of improvement in quality of products and services. Top level management of the major Indian ICT firms specialising in different areas of the ICT industry have made their own teams identify and understand clientele needs and have designed various pathways towards *TQM*. However, no longer confined only to the established firms, the transfer of technology and ideas, and diffusion of market knowledge become necessary also for newly emerging firms to consolidate their position in the highly competitive market. Better R&D and innovation activities strengthen the capability of a firm to sustain in the market easily through increased quality control and derisking. All these are clear indicative not only of the increasing applicability of strategy theory, but also of the increasing prominence given to the exchange of ideas across the ICT industry. As we have indicated in Section 1, the establishment of *interaction and learning sites* (ILSs) is vital for dissemination the ideas and innovation results among the ICT firms.

It is clear from the major Indian ICT firms discussed above that some important specific issues still appear overlooked in some of the firms. We term these issues as missing elements which include:

(i) absence of proper marketing element— right product reaching the right kind of consumer;

(ii) absence of localised strategies, policies— the need for market-based strategies such that penetration of technology becomes easier in the local markets;

(iii) absence of prior testing of finished products with consumer, implying the importance to opinions got from the end user about the newly developed product or service; etc.

The above missing elements further ascertain the need for the establishment of ILSs in every regional state in India through which overall development of the Indian ICT industry can be expected to get accomplished.

6. References

Chakraborthy, C. and Dutta, D. K. (2003), 'Indian Software Industry: growth patterns, constraints and government nitiatives, in Raghabendra Jha (ed.), *Indian Economic Reforms*, Palgrave-Macmillan: N.Y.

Crevoisier, O. (1999), 'Innovation and the City', in Malecki, E. J., and P. Oinas, *Making Connections - Technological Learning and Regional Economic Change*, Ashgate Publishing Company: UK

Department of Telecommunications, Ministry of Information Technology, Government of India, Website: www.mit.gov.in

Dutta, D. K. and Sekhar, A. (2003), 'A review of the quality-oriented models adopted by the major Information and Communication Technology Firms in India', *CSAS Conference Paper*, University of Sydney, New South Wales, Australia

ESCAP (Economic and Social Commission for Asia and the Pacific) (1999), *Economic and Social Survey of Asia and the Pacific 1999*, Part 2, United Nations: New York

Information Technology Act, 2000, Ministry of Information Technology, Government of India, Website: www.mit.gov.in

Infosys, (2002), *Managing Enterprises in Challenging Times,* Bangalore: India, pp.1-141, Website: www.*Infosys*.com

————(2001) *PSPD Model*, Bangalore, India, Website: http://www.*Infosys*.com

————(2001) *Risk Management Report*, Bangalore, India, Website: http://www.*Infosys*.com

———— (2001) *The Indian Software Industry: Moving up the Value Chain*, Bangalore, India, pp.1-25, Website: http://www.*Infosys*.com

Kumar, N. (2001), 'Indian Software Industry Development-National and International Perspective', *Economic and Political Weekly*, Vol.36, No.45 (November 10-16), India

Malecki, E. J., and P. Oinas, *Making Connections - Technological Learning and Regional Economic Change*, Ashgate Publishing Company: UK

Mytelka, K. L. (1999), ' Competition, Innovation and Competitiveness: A Framework For Analysis' in Mytelka, K. L. (1999), 'Competition, Innovation and Competitiveness in Developing Countries', Development Centre Studies, *Development Centre of the Organisation for Economic Co-operation and Development*, OECD Publications: Paris, France, pp.15-33

Mytelka, K. L. (1999), 'Competition, Innovation and Competitiveness in Developing Countries', Development Centre Studies, *Development Centre of the Organisation for Economic Co-operation and Development*, OECD Publications: Paris, France

National Task Force on Information Technology and Software Development, India, Web site: www.it-taskforce.nic.in

Reliance Industries Limited (2000-2001) *Annual Report*, Mumbai: India, pp.48-49

Satyam Computer Services, *Information Security Management*, Website: http://www.satyam.com

————*Service Level Management*, Website: http://www.satyam.com

Sekhar, Ananthalakshmi (2004), *Information and Communication Technology in India: A study of approaches towards achieving quality*, Unpublished PhD thesis, School of Economics and Political Science, University of Sydney, NSW, Australia.

Shibulal, S.D. (2002), 'Back to the Basics: Imperatives for the Technology Services Industry', in *Infosys* (2002), *Managing Enterprises in Challenging Times*, Bangalore, India, pp.4-5, Website: www.*Infosys*.com

Singh, L. (2000), 'Technology Spillovers and India's Industrial Growth', *The Indian Journal of Economics*, Vol. L30, No. 318 (January), Part 3, Millennium Numbers University of Allahabad: India, pp 318-331

Smadja, C. (2002), 'Leading the Globally Competitive Corporation', in *Infosys* (2002), *Managing Enterprises in Challenging Times*, Bangalore, India, pp.6-7, Website: www.*Infosys*.com

Sundbo, J. (1998), *The Theory of Innovation, Entrepreneurs, Technology and Strategies,* Edward Elgar Publications: Cheltenham, U.K

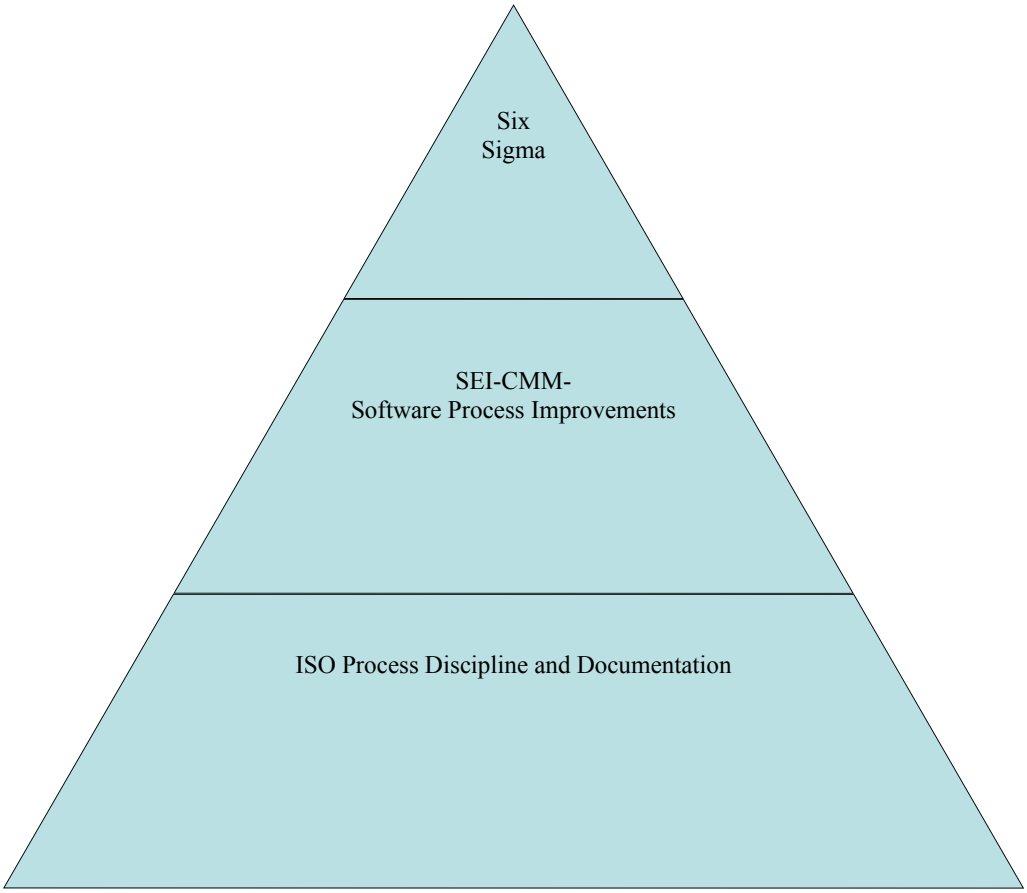
WIPRO: Corporate Review, (2001), *Minds across Borders*, Bangalore, India, Website: www.wipro.com

Websites

http://crm.ittoolbox.com/browse.asp?c=CRMPeerPublishing&r=http%3A%2F%2Fwww%2Eittoolbox%2Ecom%2Fpeer%2FAP%5Fwebsite%2Ehtm
http://crm.ittoolbox.com/browse.asp?c=CRMPeerPublishing&r=%2Fpub%2FCRM%2EFindlay%2FCRM%2EFindlay%2Ehtm
http://www.commerce-database.com/crm.htm
http://www.dbainc.com/
http://www.hcltechnologies.com/artdisplay.asp?art_id=215&Cat_Id=134
http://www.hcltechnologies.com/artdisplay.asp?art_id=216&Cat_id=134
http://www.hcltechnologies.com/artdisplay.asp?cat_id=24
http://www.hcltechnologies.com/artdisplay.asp?cat_id=247
http://www.hcltechnologies.com/artdisplay.asp?cat_id=25
http://www.hcltechnologies.com/artdisplay.asp?cat_id=26
http://www.hcltechnologies.com/artdisplay.asp?cat_id=27
http://www.hcltechnologies.com/artdisplay.asp?cat_id=62
http://www.hcltechnologies.com/artdisplay.asp?cat_id=98&art_id=368
http://www.*Infosys*.com
http://www.*Infosys*.com/innovation/influx.asp
http://www.isixsigma.com/library/content/c031008a.asp
http://www.ril.com
http://www.satyam.com
http://www.satyam.com/aboutsatyam/a_philosophy.html
http://www.satyam.com/aboutsatyam/a_philosophy.html
http://www.satyam.com/aboutsatyam/a_pioneeringeffort.html
http://www.satyam.com/mediaroom/pr3nov01.html
http://www.satyam.com/quality/q_achivements.html
http://www.satyam.com/quality/q_philosophy.html
http://www.satyam.com/solution/s_tqc_serv.html
http://www.sei.cmu.edu/
http://supplychain.ittoolbox.com/
http://www.wipro.com
OPC.Quality@satyam.com

Diagram 1

Six Sigma methodologies for achieving Total Quality Management

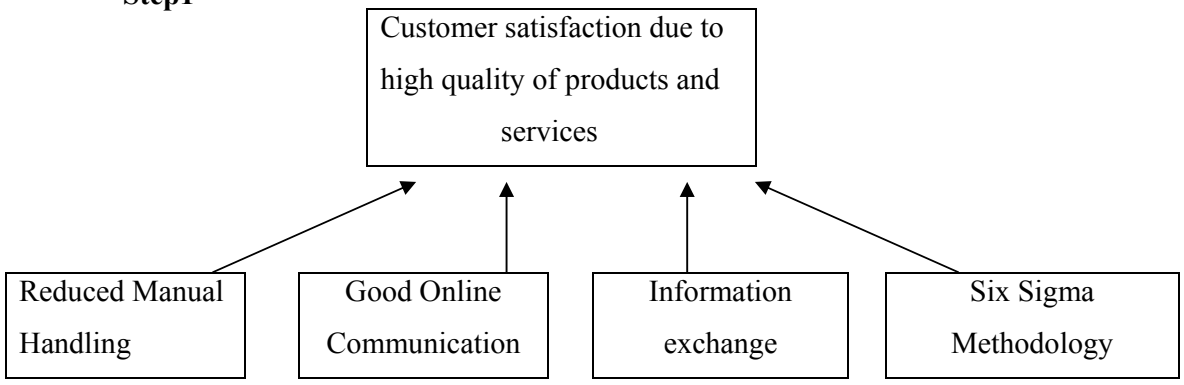


Source: Wipro: *Corporate Overview*, 2001, p.15

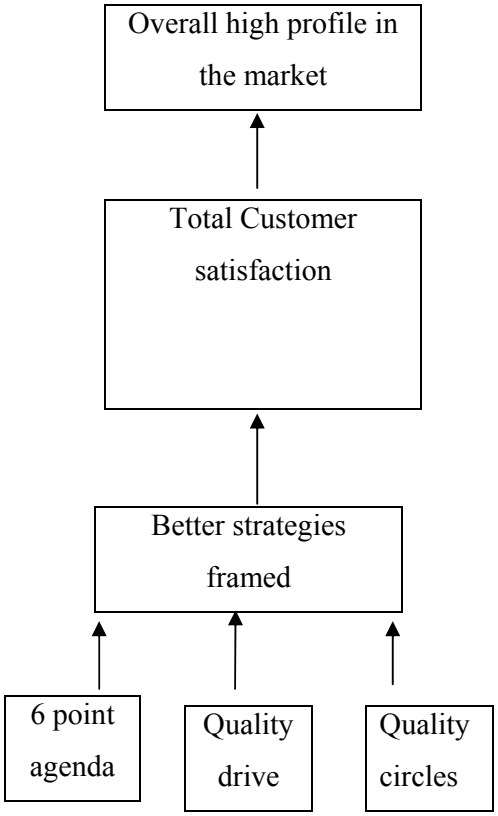
Diagram 2

Total Customer Satisfaction* through improved *Quality

Step1



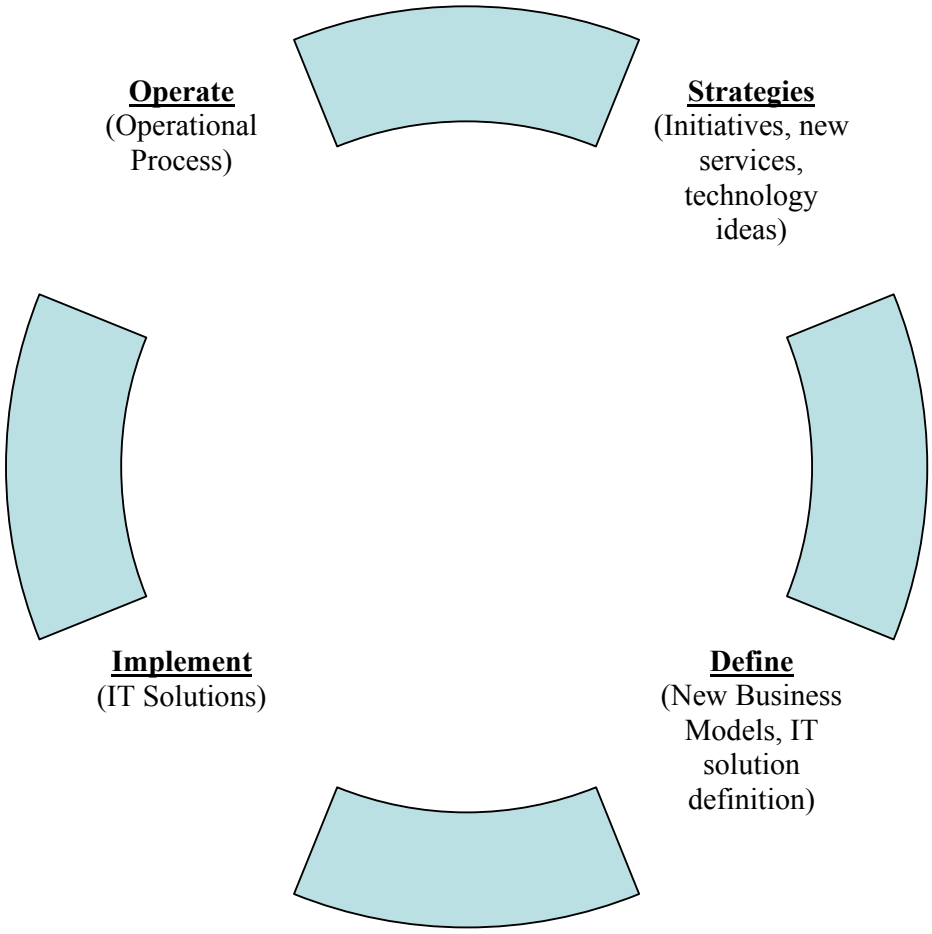
Step 2



Source: Reliance Industries Limited: Annual Report, 2001, pp.48-49

Diagram 3

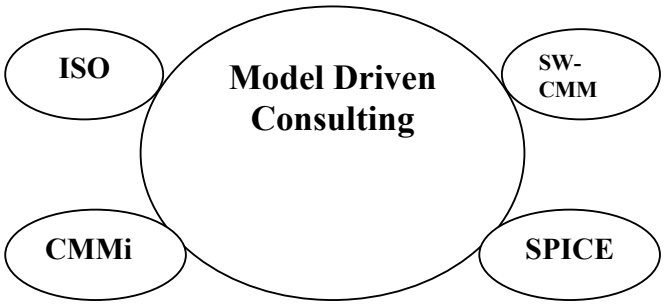
InFlux* Business Modelling by *Infosys



Source: http://www.*Infosys*.com/innovation/influx.asp

Diagram 4

Model Driven Consulting[31]



[31] For more details on the diagram, please see http://www.satyam.com/solutions/s_tqc_serv.html

APPENDIX–I

ICT firms and their approaches towards achieving quality

Firms	Year of inception	Specialisation area	Quality approach/model	Year of quality measures & achievement
WIPRO	IT- Division in 1984	Hardware, Software	6 Sigma, SEI-CMM, CRM, TQM	**1997**- Six Sigma **1999**- PCMM Level 2 **2002**- PCMM Level 5
Infosys	Established in 1975	Software & related services	PSPD model, 6Sigma, SEI-CMM, Influx	**1995** – QMS[32] **1997** – ISO9001:1994 certification **2000** – CMM level 4 **Sept 2000** –ISO9001:1994 Re-certification **2001** – CMM level 5 **Sept2001** – ISO9001:2000 extension audit
Reliance Infocomm	Established in 2000-2001	Hardware-IT infrastructure	Quality Circles, 6 Point agenda, Quality Drive, Process, TQM	**2001** – Quality-oriented approach with Six Sigma, Six Point agenda, Quality circle, Quality drive
HCL Technologies	Established in 1984	Software & related services	5Levels of S/W Process Maturity, CRM, EAI, SCM, ERP, SQA, SEI-CMM	**1993** – ISO9001/TickIT certification **1997** – CMM level 4 **1999** – CMM level 5 **2002** – Golden peacock Award for Corporate excellence
Satyam Computer Services	Started in 1987	Software & related services	eSourcing Capability Model, Engagement Model, SEI-CMM, SW-CMM	**1995** – ISO9001certification **1999** – CMM level5 **Mar 2001**- 1^{s}ISO9001:2000 company as certified by BVQI **Nov2001**- Satyam & Carnegie Mellon Univ. launch world's 1st IT-enabled services **Mar2002**- certified under BS7799 International Information Security standards **Sept2002**- Golden Peacock Award for excellence in corporate governance

[32] QMS stands for *Quality Management System*.

APPENDIX–II

Profits or revenue earned by the firms after the use of quality measures

(All figures are in crores[33] of Indian Rupees unless indicated otherwise)[34]

Firms	1997	1998	1999	2000	2001	2002	2003
WIPRO	N.A	5638840*	7262349*	8181627*	667.90	866.10	813.20
HCL Technologies	38.04	49.21	98.52	199.90	426.79	401.95	312.47
Reliance industries[35]	1323	1653	1703.69	2403	2646	3243	4104
Infosys Technologies	3727	60.36	132.92	285.95	628.81	807.96	957.93
Satyam Computer Services	N.A	7250.23**	1921.05**	13486.35**	19288.50**	49012.85**	45988.02

(Note: * = figures in thousands of Rupees
** = figures in lakhs[36] of Rupees)

[33] 1 Crore = 10 Million
[34] Source of reference is the same as under Appendix-III
[35] Data shown in Reliance Industries includes the statistical information for *Reliance Infocomm*
[36] One lakh Rupees is equal to one hundred thousand dollars

APPENDIX–III

Spending on research and development by the major Indian hardware & software firms[37]

(in crores of Indian Rupees)

Firms	1995	1996	1997	1998	1999	2000	2001	2002
HCL[38] Technologies	-	-	-	-	-	-	-	-
WIPRO	-	-	25.43	23.80	8.73	9.38	15.0	-
BEL[39]	47.91	48.58	46.14	49.24	-	77.03	89.27	-
RIL[40]	-	24.56	17.69	38.96	41.3	49.65	49.67	90.14
Infosys Technologies	1.94	3.18	7.43	5.34	9.81	8.23	17.11	14.86

Source: http://www.bel-india.com/fin_annu1.htm
www.wipro.com
http://www.ril.com/eportal/download/DownloadMenu.jsp

[37] I would like to thank Mr. Balakrishnan of Infosys India, for helping me out with the relevant statistical information about Infosys

[38] The term stands for "Hindustan Computer Limited"

[39] The acronym stands for "Bharat Electronic Limited".

[40] This is the short form of the firm "Reliance Industries Limited", one of the largest in India, which has extensive investments in research and developments and further technological enhancements from the firm level and from the point of view of the entire industry.