Law and Business of Computer Software in India

Intellectual property rights systems have two basic justifications. The first is that the creator or inventor has a moral right to his or her creation. This is given especially forceful expression in some countries' copyright laws.

The mainstream economics literature takes a different approach however and views the allocation of patent and other IP rights as a means to an end. IP Rights are socially useful to the extent that they promote a level of innovation which is economic and socially efficient. They are, therefore, means to an end. "To reward those who invest their time and money in technological invention and innovation, and thus to encourage such investment has been the classic function of invention patents since the first patents were awarded in fifteenth century Italy."[1]

In its 1998 decision in *State Street Bank and Trust Co. v. Signature Financial Group, Inc.*[2], the United States Court of Appeals for the Federal Circuit (which now hears all patent appeals in this country) addressed "the judicially-created, so-called 'business method' exception to statutory subject matter"[3]. Throughout most of the history of American patent law, the courts and the U.S. Patent and Trademark Office (USPTO) had usually-but not uniformly-denied patents to inventions that amounted to nothing more than methods for doing business. In *State Street*, the Federal Circuit repudiated this long-standing practice in terms that could not have been blunter:

> "We take this opportunity to lay this ill-conceived exception to rest. . . . Since the 1952 Patent Act, business methods have been, and should have been, subject to the same legal requirements for patentability as applied to any other process or method."[4]

In the same decision, the Federal Circuit also repudiated the notion that computer-based inventions should be subject to special restrictions. Sweeping away three decades of complex and often inconsistent case law, the court held that a computerized process for transforming data is within the realm of patentable subject matter so long as it "produces a useful, concrete and tangible

[1] F.M. Scherer and D. Ross, *Industrial Structure and Economic Performance*, Houghton Mifflin, p. 621.
[2] 149 F. 3d 1368, 1375 [Fed. Cir. 1998].
[3] 149 F. 3d 1368, 1375 [Fed. Cir. 1998], cert. denied, 525 U.S. 1093 [1999].
[4] Ibid at p. 1375.

result".[5] Whereas patent lawyers had previously felt it necessary to hide the computerized aspects of their patent claims in a conventionally patentable machine or process, *State Street* made it possible to bring software into the open.

Because contemporary business, particularly in the financial services area, is almost entirely dependent upon computers for its design and implementation, the interrelationship of the two *State Street* holdings is self-evident. Under previous law, it was widely believed that one could not patent either a pure business method or a pure software operation (that is, one that did not produce effects in the physical world). *State Street* allowed both, reversing the lower court's invalidation of a patent claiming the computerized implementation of a method of providing financial services. The broadest claim in the patent was drawn to "a data processing system for managing a financial services configuration of a portfolio established as a partnership, each partner being one of a plurality of funds", to be implemented by a generic system of hardware and software.[6]

The *State Street* decision is perceived to have sparked a revolution in both law and business. One widely held view is that *State Street* made everything patentable in the business world and that business people are responding by trying to patent everything.[7] That may be something of an overstatement. Although business method patents were relatively uncommon before *State Street*, patent lawyers had found ways to obtain them and, on occasion, had successfully defended them in the courts.[8] Moreover, while *State Street* certainly led to an increase in the volume of business patent applications[9], it has not been quite the flood that has been claimed. In addition, there is every possibility that here, as in other areas, what the Federal Circuit has given by expanding the standards for patentability it will take away by tightening the standards for enforcement.

Nonetheless, one cannot deny the extraordinary influence of the *State Street* decision, both legally and practically. If it did not quite revolutionize the law, it refined and restated it with absolute clarity. If nothing else, the publicity surrounding the *State Street* case in the legal and

[5] Ibid.
[6] Ibid at p. 1371
[7] Michael J. Meurer, "Business method patents and patent floods", *Washington University Journal of Law and Policy, Vol.I,* 2003, pp. 376-99.
[8] Jeffrey R., Kuester and Lawrence E. Thompson, "Risks associated with restricting business method and e-commerce patents", *Georgia State University Law Review* 17: 2001, pp. 657-68.
[9] 149 F. 3d 1368, 1375 [Fed. Cir. 1998].

business worlds has created near-universal awareness of the existence and potential significance of business method patents.

Economists see patent protection as a trade-off between the need to encourage innovation and the necessary evil of allowing a temporary monopoly for the innovator. Of course the monopoly is less heinous than most because a patent is only valid if the invention is unobvious i.e. the particular product or process would not have been discovered without the inventor's input. This point is however to some extent weakened because R&D applied to solving a problem quite often gives rise to competing solutions, all of which can be patentable, or sometimes to identical solutions, when only one will get a patent. There are disagreements between schools of thought on the extent to which innovation necessarily justifies some form of monopoly. There is in fact no clear consensus in the literature about the effects of the patent system, beyond the agreement that it should be judged and if necessary modified or subject to competition rules in the light of its impact on efficiency. The balance of the literature has moved in recent years towards a more favorable appreciation of the need for appropriability of inventions, following a period where the work of Arrow in particular had created a climate of scepticism about the impact of the patent system.[10]

This chapter reviews the state of the law with respect to business of computer software in India and tries to address the following issues[11]:

[10] For details, see, F.M. Scherer and D. Ross, supra note 1.

[11] These issues were actually raised in early 1990's in USA as it was published in *The New York Times* on December 15, 2003 and these issues are equally important for India also in present scenario i.e.:

> In clusters of modern low- and high-rise office buildings set amid acres of lush greenery here, thousands of engineers are hard at work, writing software for the latest telephones, designing next generation microprocessors, and developing wireless broadband technology.
>
> The work of these engineers is generating significant amounts of intellectual property for American companies like Cisco Systems, General Electric, IBM, Intel, Motorola, and Texas Instruments – whose various Indian units have filed more than 1,000 patent applications with the United States Patent and Trademark Office. Some applications, with patents already granted, date to the early 1990s. But most applications from India have been filed in the last two years and still await decisions by the patent examiners in Washington DC.

These are the lead paragraphs of a news story datelined Bangalore, India. It is one of many recent stories about the Indian software industry. They are motivated by the growing interest of American companies to locate some of their software development activities outside the US, and India is the favored place. It is called "offshoring," and it is said to depend on the availability of high levels of talent and facilities in India. It is becoming a trade policy issue, too. What is new about this issue is that it raises questions about who will create new intellectual property and where that work will be done.

a) How much intellectual property has been created by the Indian software industry in the past – and how much do we expect to be created in the near future?
b) How well protected is software intellectual property in India?
c) What role has intellectual property played in the growth and development of the Indian software industry in the past – and how will that role change in the future?

Now, firstly it's pertinent to discuss that what software industry in India is, and is also necessary to trace its size and growth in the recent years.

1) Definition and Description of the Indian Software Industry:

Software is one component of the broader Information and Communication Technology (ICT) sector that also includes computer hardware, telecommunications equipment and services, and electronic components used in ICT products. Some companies, especially big companies, are both software and computer hardware producers (such as Wipro and HCL), and some companies are also engaged in telecommunications businesses (such as Tata and Hughes). In this chapter no reference of any computer hardware business or to its components or peripherals (laptops, desktops, workstations, servers, disk drives, semiconductors, microprocessors, printers, scanners, modems, switches, hubs, routers, or other networking equipment) is given and discussed. I do not refer in this study to any telecommunication products (such as handsets, personal digital assistants, fibre optic cables, or VSATs), or telecommunication services (such as mobile telephony or local, long distance, or international fixed line telephony).

a) Software Services and Products:

Indian software was an $ 87 billion industry in 2008, and it employed more than 2 million professionals.[12] In contrast, the Indian computer hardware industry was $12.00 billion in the same year (this figure does not include telecom equipment or services).[13] Among many ways in which the software industry can be described, we begin by defining the industry in India in terms of what it produces[14]:

a) Software services (also called software development)
    - Revenue in 2008 of $52 billion

[12] NASSCOM, *The IT Industry in India: Strategic Review 2009*, New Delhi, 2009.
[13] Retrieved from http://www.nasscom.in/upload/SR10/ExecutiveSummary.pdf; also see, for development *Dataquest* (India), "Revival," v. XX, no. 13 (July 15), 2003.
[14] Supra note 13; see for comparative study, Stanley Nollen, "Intellectual Property in the Indian Software Industry: *Past Role and Future Need*", retrieved on May 14, 2010 at 09:00 pm from www.iipi.org (passim).

b) Software products (packaged)

- Revenue in 2008 of $8.6 billion

c) Information technology-enabled services (also called business process outsourcing)

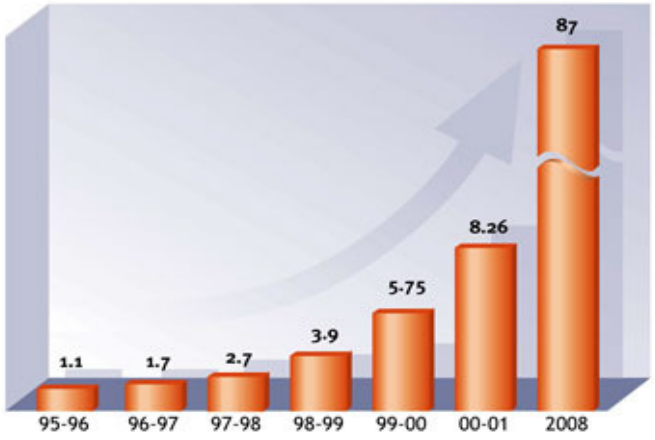
- Revenue in 2008 of $31 billion

Information technology enabled services refer to a range of business services that require software in order to be delivered to the customer – software is a critical input, not the output. These services include inbound call centres (also called "customer care"), web-based sales transactions, employee payroll and benefits administration, credit and debit card and other billing and accounting services, insurance claims processing, database marketing, medical transcription services, and engineering services.

This growth of Indian software industry from 1995-2008 is given as under which shows that how fast it is growing.

India IT Software and Services Industry

(US$ billions)



Source: NASSCOM

b) Software Applications and Activities:

Now focus is based on software services and products, and therefore these Businesses are described more fully. Services and products both are divided into the types of applications or functions they perform. For example, software services are used for enterprise resource planning, e-commerce, and migration of data, to choose just three applications among many. Software services are usually customized (unique to each customer in part), while software products are standardized.

Software products range from commonplace word processing and spread-sheet packages to computer-assisted design packages and industry-specific applications such as bank accounting operations.

Software services are again considered as activities or service lines performed by the software vendor based on a combination of technical labour skills and management skills required and value addition achieved, in order from low to high.

(i) Hierarchy of Software Services:

(a) Data entry; maintenance of existing systems
(b) Custom applications development and applications outsourcing
Production, programming (writing lines of code)
(c) Design
Engineering (existing or new software)
(d) Systems integration; information systems outsourcing, turnkey projects; project management, education and training
(e) Network infrastructure management
(f) Consulting; end-to-end solutions

The first two sets of activities are likely to be performed mostly on-site ("body-shopping" in which the Indian software engineer moves temporarily to the customer's place of business). These activities have in the past accounted for a large majority of all revenue earned. The latter activities are likely to be performed mostly off-shore in India, and they have been much smaller in revenue earned. Consulting activity, for example, was estimated to account for only 25.7% of all software exports in 2008-09[15] (*Dataquest* 2009). However, in 2008-09 for the first time, software export revenue from billings for off-shore work matched revenue from on-site billings.

c) Software Customers and Firm Ownership:

We describe the Indian software industry in terms of its customers and its ownership. The customers are predominantly foreign – about three-quarters of all software was exported in 2008, totalling $47.3 billion – and they are predominantly businesses in more-developed countries. Nearly two-thirds of all Indian software export revenues were earned in North America in 2004-05, and

[15] Retrieved from http://dqindia.ciol.com/content/dqtop20_08/IndustryOverview/2008/108080131.asp (last visited on 12/05/2009 at 11:00 a.m.).

about a quarter in Europe. These two industries i.e. IT and BPO alone can contribute 1% per year to GDP growth for the next five years [16].

Among Indian domestic customers, with sales of $2.42 billion, the private sector is by far the largest set of customers, with nearly three-quarters of all IT spending, while government and public sector enterprises have just over one-quarter (this includes all IT spending, not just software spending).

Taking all Indian software sales together, the single largest industry was banking, finance, and insurance with 22% of all sales. Manufacturing industries accounted for 16% and telecom equipment customers bought 14% of all Indian software in 2001-02[17].

Multinational enterprises own software operations in India, either as wholly-owned subsidiaries or as joint ventures. They develop software for use by their parent companies, for export to customers of their parent companies, or for independent export to third party customers. While not all of the former business need be recorded as software exports, one estimate is that MNEs accounted for 22% of all software services produced in 2008-09, and for 45% of all IT-enabled services[18]. In the Top 20 list of software exporters in 2008-09, there are four majority foreign-owned companies; five among the biggest 30 companies.[19]

2) Growth of the Indian Software Industry:

It can be marked that the beginning of the Indian software industry in 1973 when Tata Consultancy Services (the first Indian software company, founded in 1968) began exporting data services to Burroughs, or more aptly, in 1988 when Texas Instruments made a direct investment in Bangalore and spawned a variety of local suppliers to it. Some industry data are available from the 1988-89, but the figures are small, and most annual time series data are not available until 1994-95.

In the eight years from 1994-95 to 2001-02[20], sales revenue earned by the overall Indian information technology industry multiplied in size by 8 times. The software industry, however,

[16] NASSCOM-McKinsey Report 2005, Extending India's Leadership of the Global IT and BPO Industries, New Delhi.
[17] Data in these paragraphs are from *Dataquest* 2002 and NASSCOM 2002; for details, see also, supra note 12 & 15.
[18] Supra note 16.
[19] Supra note 15.
[20] The combined years refer to the Indian government's fiscal year that begins April 1 and ends March 31

which currently accounts for three-quarters of the entire Indian IT industry, grew 13 times (Table-1). Employment in the Indian software industry grew only 4½ times, however. Software exports grew the fastest, by nearly 15 times in this eight-year span, to reach their 2001-02 figures of $7,680 million. For comparison purposes, Indian software exports in 1988-89, the first year, were $105 million[21].

The annual average rate of growth of Indian software exports over the 1994-95 to 2001-02 was 48%; this was faster than in the prior five years, when average annual growth was about 35 percent. However, in the 2001-02 year, the software export growth rate fell dramatically to 24 percent compared to 57 percent the year before; this was the year in which the dot.com bust occurred in the US (Table-2). These figures are expressed in terms of changes in the US dollar value of Indian software exports. Because the Indian rupee depreciated against the dollar during this period, the annual growth rates expressed in rupee terms are from five to 15 percentage points higher.

Exports accounted for three-quarters of all software revenues in 2001-02. This large proportion has increased since the mid-1990s (Table-3).

The three-quarters figure applies again to the share of all Indian software revenue that is accounted for by software services. The newest of the software industry's segments, which is IT-enabled services, increased its share of the industry's revenue from 14 percent in 1999-00 (the first data point) to 19 percent in 2001-02, two years later. However, the share of software products declined slowly year-on-year from the mid-1990s to its current 2001-02 share of only four percent. Dividing the software industry's revenue in a different way – by offshore versus on-site delivery modes – we see a steady increase toward revenue earned offshore, from 30 percent in 1996-97 to 49% in 2001-02 (Table-4).

3) The Creation of Intellectual Property in the Past:

Intellectual property played a small role in the growth and development of the Indian software industry in the 1990s. It was not part of management decision making and did not matter to company strategy. To explain this apparently counter-intuitive outcome for an industry that is

[21] For details, see, Richard Heeks, *India's Software Industry: State Policy, Liberalisation, and Industrial Development.* New Delhi, Sage Publications, 1996

commonly thought of as a high-technology industry, we consider the conditions for the creation of intellectual property, and its ownership and value to the Indian software company.

In the past, Indian software companies typically did not create very much intellectual property that was especially valuable. Most of the Indian software activity was at the entry level of the global industry's business until very recently. Programming at a client's workplace with on-site delivery required technically educated people, but it did not result in the creation of very much new knowledge. It was not advanced software development. The basis for competing was low-wage skilled workers who produced software services at lower cost and equal or better quality than US firms did.

Although we cannot measure intellectual property directly, we can use several indicators, each one of which is incomplete by itself, to begin to assess the amount of intellectual property creation in the Indian software industry.

a) Input indicators: Research & development spending
Payments made abroad for technology

b) Output indicators: Patents
Copyrights
Technology income earned abroad

Theory tells us that firms produce new knowledge from their existing stock of knowledge, their current R&D expenditure, and knowledge acquired from other sources, such as payments for technology from foreign sources – these are inputs.

Experience tells us that R&D spending is roughly proportional to patents – one of the outputs of intellectual property creation – although the ratio varies by industry and is higher for small firms than big firms. To get a rough idea of knowledge creation from patents, we can simply count them. But to reflect better the technological and commercial value of patents, we can include data on the number of citations that patents receive from subsequent patent awards[22]. Copyrights are an output that applies especially to software. Firms may not seek patents or register copyrights for a

[22] See, for details, Adam B. Jaffe and Manuel Trajtenberg, *Patents, Citations, and Innovations*. Cambridge, MA: MIT Press, 2002; other measures of the value of patents, especially their commercial value, can also be used, such as patent renewal rates and license fee or royalty earnings derived from patents.

variety of reasons. However, firms still own intellectual property whose amount and value might be reflected in income earned from it abroad.[23]

Data for India and the software industry lead us to 10 findings about intellectual property creation (summarized below and in Table-5; sources are cited at the foot of the table).

a) Inputs for Intellectual Property:

i) R&D spending in the Indian software industry to create new technology has occurred infrequently and has been small in magnitude:

"The Indian environment has not been conducive to large scale IP-related work[24]". In the Indian software industry as a whole, less than 1% of revenue is spent on R&D. Among listed Indian software companies in particular, 4.3% had expenses for laboratory or R&D equipment in recent years, amounting to 0.3% of their sales revenue at the median. (Listed companies are traded on any Indian stock exchange and are subject to information disclosure requirements; many foreign-owned companies are not listed.) Among information technology companies operating in India, both Indian and foreign (these include hardware, software, telecom equipment and services, and industrial electronics companies), 63% reported R&D activity; however, only 9.6% of these IT firms reported innovative rather than adaptive R&D (innovative R&D intends to create new products or processes whereas adaptive R&D seeks to adapt foreign product or processes to Indian production or market conditions)[25].

For the US as whole, R&D expenditure is 3.7% of GDP. Large US firms such as IBM spend billions of dollars on R&D (more than five percent of their sales revenue). There are exceptions among companies in India. For example, Hughes Software Systems, a US company operating in India, spends 12% of its revenue on R&D, and Tata Consultancy Services, an Indian company, is another substantial R&D investor.

ii) The payment for technology from abroad through the external market by Indian software firms has been small:

[23] Neither payments made nor income received from intellectual property needs to be measured only across national boundaries in general, but in the case of Indian software, we do not expect either these payments or receipts to occur domestically or to measure intellectual property creation if they do.
[24] Supra note 15 at p. 193
[25] NASSCOM-McKinsey Report 2002, *Strategies to Achieve the Indian IT Industry's Aspiration*, New Delhi, 2002.

In recent years, 6.5% of listed Indian software companies, or 18 firms, paid for technology in this way, and the median size of the payment was 0.4% of sales revenue. From another data source, 34% of Indian and foreign IT firms (including hardware, telecom, and industrial electronics) made lump sum or recurring royalty payments abroad.[26]

Firms might make technology payments abroad in order to make or sell existing products domestically, whether they are made in India or imported into India – without intellectual property implications – rather than to create new products or processes. Not all technology payments abroad necessarily are associated with intellectual property creation, and we cannot distinguish between these two motives.

Technology from abroad that is used to create new and valuable intellectual property can also be obtained by non-equity strategic alliances that firms have with foreign firms where no market transaction in technology exchange takes place.[27] Among a sample of Indian and foreign owned IT firms, 15% had international technology alliances in 1999-2000.

b) Outputs of Intellectual Property: Patents

iii) Indian software firms have had less US patenting activity than foreign firms operating in India. The distribution of patenting activity has been very uneven.

Indian software firms have fewer US software patents than foreign-owned software firms that create software innovations in India (at least in part). Only four percent of the biggest Indian software firms had any US software patents awarded from 1996-2003 whereas 33% of the foreign-owned software firms had patents awarded based on work done in India. The three Indian software firms with software patents got five in this time period; the leading company was Sasken Communication Technologies. The nine foreign-owned software firms with patents got 167 (although not all of them were software patents); the leading company was IBM, which has a major research laboratory in India (although other US software companies also have substantial software development centres in India).

[26] Ibid.
[27] Ibid.

Indian software firms filed three software patent applications in the US in the 2001-2003 periods whereas foreign-owned firms filed 93 applications.

iv) Software patenting has been underrepresented in India compared to the rest of the world:

Software patenting activity, both patents awarded and applied for, has been relatively small in India. About 1.7% of all US software patents from all countries worldwide were invented in India in the 2001-03 time period – including both Indian firms and foreign firms operating in India – whereas the Indian software industry accounted for about 3.5% of worldwide information technology spending.[28] In terms of US software patent applications filed but not yet awarded, India was further underrepresented, with less than 1% of the applications filed worldwide in the US. (These conclusions depend on different methods of data analysis and the numerical results may not be strictly comparable.)

v) Software patents by Indian firms and foreign-owned firms operating in India appear so far to be less valuable than average patents in advanced fields:

Among US patents awarded to software firms in India in the 1996-2000 periods, the average number of citations per patent cumulated over the five years was 5.6%. In comparison, US patents in advanced fields averaged 29.3 citations per patent cumulated over a five year period beginning three years after the patent award. (Citations received by patents in a year in advanced fields increase with the patent's age up to roughly 10-12 years of age; nevertheless the data presented are comparable between software firms in India and advanced fields worldwide.)

vi) Software patenting is increasing dramatically:

Software patenting activity in the US has increased substantially in the most recent three year period compared to the previous five-year period. Worldwide, the number of software patents awarded in the US increased at a rate exceeding 40% per year in the most recent three years. The increase was even more dramatic among companies in India, for both Indian firms and foreign firms operating in India, where the number of patents awarded to software firms increased from 10 per year in the 1996-2000 period to 40 per year in the 2001-03 period.

[28] Supra note 12.

c) Outputs of Intellectual Property: Copyrights:

vii) More Indian software firms have registered copyrights in the US than have US patents.

Over the same 1996-2003 time period, 18% of the biggest Indian software firms had registered copyrights in the US, and the total number of copyrights for which they were the authors was 128, of which 116 were actual software copyrights.

viii) Copyrighting activity in the US by Indian software firms has been much less than for foreign-owned software firms:

Fifty-nine percent of foreign-owned software firms that had operations in India were authors of US copyrights over the long 1978-2003 time period, and they had a total of 110,914 copyrights (however, some of these copyrights were not for software, and, unlike the case of patents, we do not know how much of the copyrightable material production by foreign firms took place in India versus other countries including the home country)[29]. In the same time period, Indian software companies had 208 copyrights (the same companies that had copyrights in the later 1996-2003 period).

ix) Copyright registrations for software in India appear to exceed those in the US:

In the most recent few years, about 500 software copyrights (excluding copyrights for printed materials) were registered in India by all firms, including Indian and foreign-owned firms, and large and small firms. (This figure is tentative due to the difficulty of accessing Indian copyright data.)

x) The distribution of US copyrights by Indian software firms has been very uneven, and that of foreign firms has been concentrated in one firm only:

Of 116 US software copyrights registered by 14 Indian firms as authors during the 1996-2003 time period, over half were accounted for by one firm (HCL Technologies) and three quarters were accounted by two firms (adding Network Solutions to the list).[30]

[29] See, for details, Swatantra Prakash and Surya Pratap Mehrotra, "IPR in Market savvy Technology", *Journal of the Indian Law Institute*, Vol.46, 2004, pp. 226-235

[30] Supra note 14.

Among the 16 foreign-owned large software firms with operations in India that have registered copyrights as authors in the US during the 1978-2003 time period, one firm accounts for 97% (IBM). The second firm has 1% of the copyrights (Microsoft).

d) Outputs of Intellectual Property: Fees:

xi) Some Indian firms have earned income from fees received for their technology even if they don't have patents, but the number of them that do so has been small and their earnings have been small:

While only a few Indian software companies have sought patents in the U.S. to date, some companies have earned income from their technology without owning any patents. About 10% of all listed Indian software firms, or 27 firms, earned income from technology fees or royalties paid to them from abroad in recent years. The median technology income figure as a percent of sales revenue was 1.5% for those firms that had technology income.

More listed Indian software firms earned income abroad from technology via fees or royalties than paid for technology abroad in this way.

4) Ownership and Value of Intellectual Property to Indian Software Developers:

To the extent that Indian companies did create intellectual property that contained new knowledge, it was in the past typically created as part of a customized software development contract with a foreign client. It was a one-off engagement to meet the particular needs of the client. This had two implications for the Indian software supplier.

First, the software that the Indian company created was the property of the client for whom it was created and who paid for it. It did not belong to the Indian vendor, and in principal could not be used again without consideration being given to the original client. Therefore the software services, even if valuable to the client, were not of much future business use to the Indian company.

Second, the customized software was unique to the business application for which it was created and therefore did not have much if any value in other business applications. It did not have value for other clients and therefore it was not of much future business value to the Indian software supplier.

Table 1

Indicators of Intellectual Property Creation by Indian and Foreign-Owned Software Companies in India[31]

Measure	*Value*
Inputs	
Laboratory or R & D equipment expense	c) 12 firms or 4.3% of all listed software firms in India had lab or R&D equipment expense. d) The median expense for firms with this expense was 0.4% of sales revenue; the average was 3.8%.
R & D expense	• Less than 1% of the revenue generated by the Indian software industry is spent on R&D. • 63% of Indian and foreign IT firms (computer hardware & software, telecom equipment & services, industrial electronics) operating in India reported R&D expense in 1999/2000 but only 9.6% of these firms reported innovative rather than adaptive R&D.
Technology fee & royalty expense	• 18 firms or 6.5% of all listed software firms had technology fee and royalty expense. • The median expense for firms with this expense was 0.3% of sales revenue; the average was 2.0%. • 34% of all Indian and foreign IT firms made lump-sum or recurring royalty payments abroad

[31] **Sources:** supra note 14 at p. 12; For more details, see, sources given below:
- Capital Markets, Capital Line database of financial statement data from listed companies in India.
- *Dataquest*, July 2003.
- U.S. Patent and Trademark Office website, www.uspto.gov
- U.S. Library of Congress, Copyright Office website, www.copyright.gov
- Survey data from unpublished research conducted by Confederation of Indian Industry and Georgetown University, 1999/2000

Outputs	
Table-5 continued **Patents**	• 3 of the 78 biggest Indian software firms or 4% had US software patents awarded from 1996-2003. • 5 US software patents were awarded to these firms in this time period. • In the 2001-2003 period, the biggest Indian software firms filed 3 software patent applications. • 9 of the 27 biggest foreign-owned software firms operating in India or 33% had US software patents awarded from 1996-2003. • These foreign-owned firms had a total of 167 patents over these years; all of these patents were created in India, but not all were for software. • Among patents that were awarded 3-8 years ago to Indian and foreign software firms operating in India, there were 5.6 citations per patent on the average. • In the 2001-2003 periods, the biggest foreign-owned software firms operating in India filed 93 software patent applications. • The pace of software patenting accelerated from 10 software patents per year in 1996-2000 to 40 per year in 2001-2003 for software created in India by Indian and foreign-owned software companies.
Copyrights	• 14 of the 78 biggest Indian software firms or 18%were authors of copyrights registered in the US from 1996-2003. • These Indian software firms had a total of 128 copyrights over these years, and 116 of them were software copyrights. • Of the 116 US software copyrights registered to Indian firms, 70 were registered in 2001-2003 and 46 were registered in 1996-2000. • 16 of the 27 biggest foreign software firms operating in India or 59% were authors of copyrights registered in the US over the long 1978-2003 time period. • These foreign firms had a total of 110,914 copyrights over this long time span, created in all of their locations worldwide including their home country; not all of these copyrights were for software. The equivalent figure for Indian software firms was 208 copyrights. • About 500 copyrights for software alone have been registered per year recently in India by all firms (Indian and foreign, large and small)
Technology fee & royalty income	• 27 firms or 9.7% of all listed software firms in India had technology fee and royalty income. • Median income for firms with this income was 0.7% of sales revenue; the average was 1.5%.

5) Intellectual Property Protection for Software:

Innovation in software products can be protected as intellectual property, usually either through the use of copyrights or patents. Both patents and copyrights are devices that are intended to protect a firm's or individual's innovation from misuse by others, although they are quite different devices for doing so.

Copyrights, generally, protect the *expression* of an idea. That is, copyright protection extends to a specific work, but cannot be applied to the ideas contained in such work. The application of copyright protection for software products was firmly established internationally via the World Trade Organization's (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs). Under Article 10 of the TRIPs agreement, WTO members are required to treat computer programs, whether in object or in source code, as literary works as defined in the Berne Convention. Copyright protection thus extends automatically to software code once the code has been written and recorded in a medium (i.e., hard drive of a computer). A copyright holder may use his or her right to prevent others from using, making, selling or distributing unauthorized copies of the work.[32]

Unlike in the context of copyright, the TRIPs agreement does not explicitly discuss patent protection for software. The TRIPs agreement does, however, contemplate protection for software under its general discussion of patentable subject matter in Article 27. Article 27 makes patent protection available to any inventions in all fields of technology, provided they meet the minimum threshold requirements of novelty, utility and non-obviousness (otherwise known as "inventive step" in some countries).[33] Like copyright, a patent holder may use his or her right to prevent others from using, making, selling or distributing unauthorized copies of the invention protected.

The protection offered by patents tends to be broader than that of copyright, as copyright protection extends only to a specific expression whereas patent protection extends to the underlying functionality of an invention. Because patents can offer broader protection than copyrights, they are seen as more valuable if they can be obtained. However, patent protection tends to be more

[32] David I. Bainbridge, *Software Licensing,* Birmingham, Central Law Publishing, 1995, pp. 14-15
[33] S.K. Verma, "Enforcement of Intellectual Property Rights: TRIPs Procedure & India", *Journal of the Indian Law Institute,* Vol. 46, 2004, pp. 183-206

expensive to obtain than copyright protection, because patents require a formal application process in every country where protection is desired[34]. This application process often involves not only application fees, but attorney and translation fees as well. In practice, the extent to which software may be patented varies by country, depending upon the formal requirements and limitations placed on the patenting of software by individual countries.

The 1981 Supreme Court decision in *Diehr*[35] is widely regarded as the seminal case on the patentability of software in the United States. In *Diehr*[36], the Supreme Court reaffirmed the long held idea that a mathematical formula or algorithm, in the abstract, is unpatentable subject matter. The Supreme Court went on to hold in *Diehr*[37], however, that when a formula or algorithm is employed in a claimed invention, one must view the invention as a whole to determine patentability and not summarily dismiss the invention as unpatentable simply because a formula or algorithm (i.e., software) was used. In other words, an invention that includes software may be protected via the patent laws, provided the invention, as a whole, meets the criteria of patentability.[38]

Following *Diehr*[39], it still was not entirely clear to what extent software itself could be protected via the patent law. The Federal Circuit however cleared up much of this confusion in its 1998 *State Street*[40] and 1999 *AT&T*[41] decisions. In *State Street*, the Federal Circuit found a software program used to manipulate financial data to be patentable subject matter. Here, the court reiterated that "unpatentable mathematical algorithms are . . . merely abstract ideas constituting disembodied concepts or truths that are not 'useful'." The Federal Circuit, however, reasoned that "to be patentable, an algorithm must be applied in a 'useful' way," thus a software program, which employs mathematical algorithms in its operation, may be patentable subject matter if it has "some type of practical application, i.e., 'a useful, concrete and tangible result[42].'"

[34] Ibid.
[35] Diamond v. Diehr, 450 U.S. 175 (1981)
[36] Ibid.
[37] Ibid.
[38] Supra note 14.
[39] Supra note 27.
[40] *State Street Bank & Trust Co. v. Signature Financial Group, Inc*., 149 F.3d 1368 (Fed. Cir. 1998)
[41] Infra note 35.
[42] Supra note 14.

The Federal Circuit further held in *AT&T*[43] that a resulting physical transformation is unnecessary, and that a transformation of data in one form to another will serve to establish the requisite tangible result.

Despite the TRIPs agreement's explicit prohibition on discriminatory treatment as to field of technology, many countries have come to view patent protection for software as a policy choice and as such have placed limits on the patent protection available for software. For instance, the European Patent Convention (EPC) classifies software programs as unpatentable subject matter. This restrictive policy towards software patents however has been tempered by the European Patent Office's (EPO) Technical Board of Appeal. For instance, the Technical Board of Appeal has held that an invention may be patentable even is software is a component in the invention, provided patent protection is not sought simply for the software "as such," thus bringing European protection for software patents closely in line with the U.S. *Diehr*[44] decision discussed above. The state of patent protection for software in Europe however many change in the near future as the European Commission has proposed a Directive on Software Patentability.

However, given how contentious the issue is in Europe, it is difficult to speculate how the Directive will ultimately change the nature of software patentability. While Europe (via the EPC and EPO decisions) has only gone so far as to provide patent protection for software embedded in a larger invention, Japan has chosen to pursue a course much more closely aligned with the U.S. According to Examination Guidelines for Computer Software-Related Inventions issued by the Japanese Patent Office, software-related inventions are patentable if they are "a creation of technical ideas utilizing a law of nature."[45] The guidelines go on to further explain that software amounts to this "creation of technical ideas utilizing a law of nature" when "information processing by software is concretely realized by using hardware resources," or in other words, when software is run on a computer. In practice, this means that most software is patentable subject matter in Japan.[46]

6) Protection of Intellectual Property in India:

[43] *AT&T Corp. v. Excel Communications*, Inc., 172 F.3d 1352 (Fed. Cir. 1999)
[44] Supra note 27.
[45] Japanese Patent Office, "Chapter 1*, Computer Software-Related Inventions", Part VIII - Examination Guidelines for Inventions in Specific Fields,* 2000.
[46] Ibid.

The protection of intellectual property was of little interest to Indian software companies in the past. In part this lack of interest is explained by the small "new knowledge" content of Indian software services – there was not much intellectual property to protect. Indian companies did not own the customized intellectual property they might have created since their work product fell under work for hire standards or ownership was explicitly transferred to the hiring company. But even if India companies created software services that had new knowledge value, they did not seriously take steps to protect it.[47]

The chief intellectual property protection available for software in India is copyright protection. India's copyright law conforms to the requirements set out by the TRIPs agreement and thus software is protected as a literary work in India (for a broader discussion of copyright protection in India, see below). This is not to say that software is well protected in India, as this depends not only on standards established by laws, but also on enforcement of the standards by the judicial system. India has had a bad reputation among foreign business people for intellectual property protection (Mansfield 1994), although that bad reputation has not come unduly from the information technology sector.[48] Over the last ten years, India has implemented a number of legislative measures to bring it into compliance with TRIPs requirements.

Nevertheless, there is great concern about inadequate intellectual property protection in software. This concern is mainly due to piracy of packaged software products.

a) India is one of 11 countries on the US Trade Representative's "Priority Watch List" for 2003 for unfair trade in intellectual property under the Special 301 provision of US trade law. Three other countries (one of which is China) are in still more serious USTR categories.
b) India is reckoned to be the 5th worst offender in terms of dollar losses due to piracy of business software (installation without a license) amounting to $343 million.
c) India had the 11th highest rate of software piracy in 2002: 70% of all software used was pirated.

[47] Supra note 15.
[48] Most of the poor reputation that India had for inadequate intellectual property rights protection stemmed from two sources unrelated to the software industry: (1) India's failure to grant product as well as process patents, which resulted in problems mainly in the pharmaceutical and agricultural chemical industries, and (2) the slowness of the judicial system, despite its fairness.

The piracy rate for China was 92% and in the US it was 23%. The worldwide average business software piracy rate was 39% in 2002 (Business Software Alliance 2003 and International Intellectual Property Alliance 2003)-(table-2).

Table-2

Business Software Piracy Rates and Revenue Losses in India and Other Countries[49]

Country	Piracy Rate (%)		Revenue Lost ($ millions)	
	1997	*2002*	*1997*	*2002*
India	69	70	185	**343**
China	96	92	1,449	2,408
US	27	23	2,780	1,961
World	40	39	11,440	13,075

7) Indian Views of Patents for Software's[50]:

Under Indian law, computer programs are thought of as embodying a pure mental act because they are seen as essentially the application of mathematical algorithms. Thus, computer programs themselves are *per se* unpatentable in India. India, however, does grant patents to inventions which employ software in their operation. These patents may be more aptly thought of as hardware rather than software patents. As discussed earlier, the rise in importance of embedded software (in which software is fixed within hardware and cannot be reprogrammed) may blur the distinction between software and hardware patents, or may make software more frequently patentable as part of a larger product.

[49] Source: Business Software Alliance, 2003

[50] This section on patents and the one on copyrights that follows it are based on the views of two Indian intellectual property rights lawyers, Mr. Pravin Anand and Mr. Saikrishna Rajagopal, and selected journal articles and which is cited in supra note 14 at pp. 16-20 (passim).

The fact that patenting of software is becoming more important worldwide is not lost on Indian policy makers. However the wisdom of extending patent protection to software is a much debated policy option. Whether software should be patentable in India, or whether copyrights are the more suitable form of protection, turns on several characteristics of software. Whether justified or not, doubts about the wisdom of patents for software rely on the following arguments:

a) Software tends to evolve incrementally over time, and it tends to model reality rather than invent new techniques; many competent programmers might be able to invent or reinvent software routines so that *the non-obvious criterion ought to be difficult to demonstrate*.
b) *The software industry is technologically dynamic and rapidly makes existing software obsolete* so that the concept of 20-year protection seems at odds with the behaviour of the industry; in fact, some software becomes obsolete before a patent application can be decided.
c) Whether by impacting the interoperability between different software platforms or by blocking types of user interfaces, patents could operate to reduce the availability of consumer choice and thereby *negatively impact the overall social benefit of software products*.
d) Since copyright is already available for software, patent protection is not necessary as long as copyrights are enforced.

Each of these arguments against software patenting has counter arguments. For instance, point one questions the wisdom of software patenting based on the notion that much software cannot meet the non-obvious criterion. This is not an argument against the availability of software patents, but against the wrongful award of software patents. Indeed, many so-called inventions in other fields of technology cannot meet the non-obvious requirement and thus should not be granted patent protection. Only those inventions that do meet all the criteria for a patent should be afforded patent protection, regardless of the field of technology.

Point two questions the usefulness of patent protection for software since much software becomes obsolete before a patent's 20-year term expires. A patent holder has the choice to continue patent protection for the full 20-year term, or to discontinue paying the patent maintenance fees if the software becomes obsolete and thus release the invention from patent protection. There is no reason to deny patent protection for software to those who want it for the full 20-year term just because many software patent holders would likely discontinue protection before the term expired.

Point three questions the wisdom of software protection for patents on the basis that they may reduce consumer choice and social benefit by standing in the way of access to necessary or at least optimal, advances in software programming.[51] A practical example of this concern is the case of the *Eolas* patent in the US, where the threat of enforcing a broadly crafted patent claim affecting "plug-in" technology sent ripples of concern across scores of software producers and internet businesses. Many claimed that enforcement of the patent would greatly hinder further development of the internet. However, the dire implications of enforcement of the patent forced the USPTO to re-examine the patent, and it has since rejected certain claims in the patent. Thus, the *Eolas* case demonstrates that a patent system can be flexible enough to address concerns over enforceability of software patents.[52]

Lastly, point four argues that software patents are unnecessary because copyrights already provide sufficient protection. Because copyrights protect only a single expression of an idea, competitors can circumvent copyright protection and relatively easily make use of an innovative idea conceived by another company. Indian software company managers express this view. Patent protection provides a broader level of protection, and if applied to software, can encourage innovation in the field more than copyright does.

8) **Indian Views of Copyrights for Software:**

Copyrights protect the expression embodied in software and prevent its literal reproduction. While copyrights are conferred automatically, they can be officially registered to facilitate legal enforcement (e.g., to give more police powers to conduct raids to investigate allegations of infringement). Copyrights do not protect ideas (such as the logic, algorithms, or methods in a software program), which are the domain of patents, or layouts, which are the domain of trademarks. Nevertheless, "a copyright is a hugely strong weapon,"[53] according to Pravin Anand and underutilized.

[51] Stanley Nollen, "Intellectual Property in the Indian Software Industry: *Past Role and Future Need*", retrieved on May 14, 2010 at 09:00 pm from www.iipi.org (passim).
[52] Ibid.
[53] Above views of Pravin Anand were expressed on (interview) October 30, 2003 and are Cited in Stanley Nollen, "Intellectual Property in the Indian Software Industry: *Past Role and Future Need*", at p. 17, retrieved on May 14, 2010 at 09:00 pm from www.iipi.org (passim).

a) Standards:

Indian protection of copyrights for software is strong in some respects and weak in others. A basis for comparison is provided by the World Intellectual Property Organization (WIPO) Copyright Treaty that came into effect in March 2002, to which there were 42 signatories in 2003. India is not a signatory.

(i) India protects reproduction in all forms including temporary reproduction (such as that which occurs in the transmission via the internet) by virtue of its membership in the Berne Convention.

(ii) India provides "make available" protection (the copyright owner has the right to control distribution of copies; you are responsible if you unknowingly make available to others software that you have legally purchased or licensed), which is part of the WIPO Copyright Treaty even though India has not signed this treaty.

(iii) India does not guard against "circumvention of technological measures" that copyright holders use to protect otherwise easily copied software (e.g., registration of software to prevent its use on multiple computers). This is a key part of the WIPO Copyright Treaty and India is expected to provide this protection soon.

The Indian copyright law that was regarded as very strong was weakened by amendments in 2001 that made room for exceptions to copyrights. The effect of the main weakening was that.

(iv) India now allows making copies of software for non-commercial personal use (e.g., using software purchased for business at home).

Other exceptions apparently permit some decompiling of programs and reproduction to observe functionality, which will facilitate "intelligent" copying that is difficult to enforce. However, a high-level task force is preparing recommendations for revisions in the Indian copyright law, with prospects for full WIPO and TRIPs compliance in the future.

b) Enforcement:

The enforcement of copyright standards achieved by a country can be assessed by its compliance with the TRIPs agreement of WTO, which entails both standards and enforcement. Enforcement is the more likely area of non-compliance. Adequate enforcement means effective

action against infringements, expeditious remedies that constitute a deterrent, fair and equitable application, reasonably simple and inexpensive procedures, and reasonably timely decisions.

> ….the framework to implement (copyright laws) is abysmally lacking … there are not enough copyright lawyers. The copyright office does not have a database of copyrights in electronic format.[54]

The enforcement of Indian copyright law is strong in one respect – it provides for injunctions to "stop the wrong" so that a copyright holder gets immediate relief. However, enforcement is deficient in two important respects, and these weaknesses outweigh the sole strength.

(i) Deterrence for infringement is weak:

It is difficult to prove that damages should be awarded, fines are too small, mandatory prison terms specified in the law have never been invoked, and the consequence is that the infringer is scarcely penalized and can move on to copying someone else's software.

(ii) Conviction rates are extremely low, for several reasons.

(a) Magistrates are not technically trained nor experienced in intellectual property or software issues and must handle a wide variety of cases. The tendency is to give the benefit of doubt to the accused.
(b) There are too few judges to hear cases, and long delays occur before the judicial process is concluded – 10-15 years is typical. Of nearly 100 cases filed since 1996, two judgements have been rendered as of 2003 (both convictions).
(c) Prosecution is taken up by government lawyers in cases that involve police action rather than private law firms.
(d) There are too few police officials dedicated to economic offenses, and enforcement is variable state-by-state.

(iii) The time required to complete enforcement actions is much too long and this factor surely is out of compliance with TRIPS expectations.

Weak enforcement of intellectual property rights in India might be explained either by the relatively low level of government engagement in the industry, or the fairly low level of innovative activity in the industry at least through the 1990s.[55]

[54] Supra note 22 at p. 195 (*Dataquest* 2002).

Improvement may be forthcoming. It is likely that a high-level task force now at work will recommend the establishment of special intellectual property courts to be staffed by fully qualified judges.

9) **No Patents and Weak Software Copyright Enforcement: Effects on the Indian Software Industry?**

The lack of patent protection for software in India and inadequate enforcement of software copyrights have not been impediments to the creation of intellectual property by Indian software companies up to the present time. We identify four reasons for the lack of impact up to now.

a) The Unimportance of Patents:

For three different sets of reasons, patents have not been important for Indian software companies. First, Indian software companies that wanted to protect their intellectual property in software would seek patents in the US if at all, but not in India (which does not grant software patents in any case), mainly because their largest market by far was the US, which is where a company wanted to exploit and defend its intellectual property. In small markets, such as the Indian domestic market, the cost of obtaining and defending patents was not worth the benefit. Even in the US, patenting was not attractive.

Second, if sophisticated software services were performed (e.g., software design or systems integration), and if new tools or methodologies were created in doing so, they were created for the client's particular purposes. Customized software was not useful to others. If it did not have value to other firms, there was no issue about protecting it.

Third, the benefit/cost ratio for patents in the US for Indian software firms typically was unfavourable. For most of these companies, the likely benefit to be gained from obtaining a patent was small and the cost was relatively high.[56]

(i) Cost to Obtain Patents:

[55] Krishna P. Jayakar, "Cross-Sectoral Differences in Intellectual Property Enforcement in Developing Countries: The Role of State-Industry Linkages," *The Information Society*, vol. 19, 2003, pp. 155-169.
[56] Lalit K. Deb and Kiran K. Pradhan, "Patent Rights and Public Interest: An Overview", *Indian Socio-Legal Journal,* Vol. XXXV, 2009, pp. 127-134.

Indian software company managers with experience in patent applications estimate a typical money cost to obtain a patent to be $20-30,000. The filing fee is a small part of the cost; most of the cost arises from payments to lawyers (US law firms or Indian law firms with offices in the US) to conduct patent searches. For small Indian firms, and most Indian software firms are small, this cost is too high.[57]

(ii) Single Country Patents:

If a patent is obtained in the US, it is not valid in a second country market, such as a European country, so that if the firm's intellectual property is to be protected in a second market, a second patent is required. If patents were universal or honoured by multiple countries, the benefit/cost ratios would be more favorable.

(iii) Defence of Patents:

Patents, once obtained, are only as good as the firm's ability to defend them. Infringement of a firm's patent is needed to be detected and then prosecuted. Lack of detection reduces the expected benefit, or prosecution of violations raises the expected cost, either of which reduces the Indian software firm's reckoning of the patent's benefit/cost ratio.[58]

(iv) Obsolescing Technology:

A special feature of the IT sector in general and software services and products in particular is that technology changes rapidly. Today's new technology obsolesces in a short time – maybe in less than a year, but surely and typically within three years. Accordingly the value of a patent is typically smaller in this industry than elsewhere simply because the length of its useful life, without regard to its statutory 20 years of life, is short.

(v) Competitors' Threat:

The value of patents in software is further diminished if the knowledge that it represents is incompletely useful to potential competitors. If the patented idea is commercially valuable only in conjunction with complementary inputs, competitors must have those inputs to be threats to the firm that created the technology. For example, proprietary software is likely to require both hardware

[57] Supra note 14.
[58] Supra note 55.

and customer service as part of a package that is valuable to buyers of the software. Customer service is likely to depend in part on tacit knowledge. Competing software vendors might not be able to match this package offered by the innovating software firm, and therefore the innovator's proprietary software does not need patent protection. If the technology contains a substantial tacit knowledge component, even if it is not part of a complementary package, potential competitors might not be able to provide the service to customers as well as the innovator company even if the explicit component that was not patented or copyrighted was known to them. (These arguments would not apply to commodity software, which would not be patentable in the first place.)

(vi) Disclosure versus Secrecy:

To obtain a patent compels public disclosure of the codified idea for which the patent is sought. Disclosure, coupled with the high costs of obtaining patents and the frequently dubious value they confer to the firm, leads to alternatives to patenting. The obvious first alternative is to attempt to keep the new technology secret (unless it is necessarily revealed when used), or to prevent its use by unauthorized persons by means of locks.

(vii) Informal Oligopoly-Oligopsony Protection of Intellectual Property:

The need for patents or copyrights to protect intellectual property might be avoided when the marketplace contains only a few buyers and sellers of the technology. A small number of managers on either side of the transaction might be able to informally agree on the terms and conditions for the use of intellectual property without resort to licensing contracts against patents or copyrights.[59]

b) The Small Value of Copyrights:

Copyrights are available in India and all countries for software, although the strength of copyright law and its enforcement are not equal in India to that of the US. Even if enforcement were vigorous, copyrights have usually not been a part of Indian software protection. There are two reasons, apart from weak enforcement: It is hard to know if or when your copyright is being violated, and it is easy for your copyright to be evaded. Indian software company managers express their reservations, below:

[59] N.S. Siddharthan, "Transaction Costs, Technology Transfer, and In-House R&D: A Study of the Indian Private Corporate Sector," *Journal of Economic Behaviour and Organisation*, vol. 18, 2000, pp. 265-271.

(i) "Copyrights offer little protection. They are not so useful because it is easy to get around them. If I copyright software written in the English language, someone else can produce the same software in the Hindi language, which is a different expression. We do register copyrights, but only for written materials such as manuals, not for software."

(ii) "Copyrights aren't worth much. How do you know when your copyright is being infringed? We do not register copyrights either in the US or India."

(iii) "We have filed for 15 patents in the US, but they are all for software products, not services. Copyrights are of little value for software services."

c) Earning Returns to Intellectual Property:

Indian software company managers who are conscious of their firm's intellectual property usually have not sought to earn a monetary return to it directly. Usually neither recurring royalty nor lump sum payment is charged for a client's use of the firm's proprietary technology. Instead the Indian software firm typically includes its sense of the value of its intellectual property folded into the contract price it negotiates with the client, but not separately specified. The value of new software technology is difficult to determine if a market price has not been established for it, so to fix a royalty rate could be an unsatisfactory negotiation. Of course, if the intellectual property is not patented or copyrighted – and most software is not – then to price it explicitly to a client is all the more difficult to do. The outcome of the lack of separate pricing or earnings returns directly from intellectual property is to diminish its apparent value.

d) Software Piracy:

Despite the past irrelevance of intellectual property rights protection for Indian software companies that developed software services, the widespread piracy of software packaged products in India was important to the Indian software industry's development in one simple but indirect way: the availability illegally of pirated software products spread the use of computers and computing much more widely in the population than could otherwise have occurred.

That widespread piracy occurred can be understood from both economic and cultural standpoints. Packaged software product prices were high for people in low-income countries like India. It was not possible for software products companies to charge two prices in two markets, a low price in the low-income countries and a high price in the high-income countries, even if the two markets had different price elasticities that would make it profitable to do so, because arbitrage

across markets was easy, transportation costs were near-zero, and the product was long-lasting and durable (not perishable). Culturally, the extent to which software piracy occurred depended on the national regard for intellectual property.[60] Rather than viewing the copying of software (and some other creative works) as unethical, Indians though it was necessary and justified because it was essential and price out of reach, and because of a cultural view that stressed common interest rather than private interest.

10) The Changing Basis for Competitiveness in Indian Software:

Despite the record of the past, there is no doubt that the creation and protection of intellectual property is becoming important for Indian software companies and will increase in importance over time. The reason stems from the often-repeated global evolution of industries, in which the location of production shifts geographically over time and the product and service composition of the industry changes.

Typically as an industry grows and develops the basis for competing changes. Firms' competitive advantage might change from cost to quality and from product quality to service quality. Production technology might change from labour-intensive to capital-intensive or from unskilled labour-using to skilled labour-using. New competitors from other countries might arise if they acquire the critical factors of production or access to foreign markets, or if their governments succeed in promoting the industry.[61]

The Indian software services industry, which was first among outsourcing locations for software services sought by multinational enterprises in North America, faces an industry evolution. By the end of the 1990s, perhaps marked by the end of Y2K work, the Indian first-mover advantage was over. Competitive advantage was shifting. Other countries have several of the same factors that India had, or they were developing them.[62] The Indian software industry was at a critical turning point. The move toward off-shore outsourcing work (which reached half of all Indian software billings in 2001-02) introduced client communication as an additional requirement for business

[60] K. Gopinath, and M.K. Ravishankar,"Intellectual Property Rights in Computer Software: Issues at Stake for Developing Countries," *Information Technology for Development*, vol. 7, 1996, pp. 195-209.
[61] Stanley Nollen, "Intellectual Property in the Indian Software Industry: *Past Role and Future Need*", retrieved on May 14, 2010 at 09:00 pm from www.iipi.org (passim)
[62] See Ashish Arora, V.S. Arunachalam, Jai Asundi and Ronald Fernandes,"The Indian Software Services Industry," *Research Policy*, vol. 30, 2001, pp. 1267-1287.

success, and it coincided with the introduction of software design and engineering work into the client relationship. It marked the first small contribution that new knowledge could make to the Indian software company's client engagement. (See table 3 below)

> The low-cost, high-tech delivery model, followed so far by most players in the industry, will no longer ensure success. … Players need to fundamentally rethink their business models and Develop new sets of capabilities to emerge successful in the long run.[63]

Table-3

Knowledge Content of Software Business Segments

Amount and Type of Knowledge Created by Each Software Business Segment

(lighter vs. darker shading indicates lesser vs. greater relationship)

KNOWLEDGE CONTENT

HIGH: Paradigm-shifting, Idea creating						
Trajectory-determining, advanced software						
Co-equal partnership with client, innovation starts						
Off-shore, some contribution, communication role						
LOW: On-site, body-shopping, cost-based competition						

[63] Kirin Karnik, President of NASSCOM, in *NASSCOM-McKinsey Report 2002* (Supra note 22).

Programming	Design, engineering	Systems integration	Consulting	Software products	IT-enabled services

SOFTWARE BUSINESS SEGMENTS BY VALUE-ADDITION →

11) Success Factors for Indian Software: Past and Future:

Among many possible explanations for India's export success in software services, the main focus is based on a few of the leading reasons, which show that for some of them the Indian advantage is eroding.[64]

a) Skilled Labour:

India has an abundant quantity of technically well-educated young people with engineering qualifications in an industry that depends on skilled labour rather than physical or financial capital, and these people are paid low wages by dollar standards. About 70-80 percent of the cost of producing software services is accounted for by labour; software engineers in India produce half or more of the output value of their counterparts in America but their wages are a tenth or less compared to American wages, so the unit cost of Indian software services is much lower than it is for American competitors.[65]

However, wages for Indian software engineers are rising rapidly as demand for them increases rapidly. By 2005, the forecasted new demand for qualified employees on the part of Indian software firms could absorb the entire new output of qualified graduates in engineering, even if no other industries employed any new engineering graduates.[66]

[64] For details, see, Murali Patibandla and Bent Petersen, "Role of Transnational Corporations in the Evolution of a High-Tech Industry: The Case of India's Software Industry," *World Development*, vol. 30, no. 9, 2002, pp. 1561-1577; see, also, Devesh Kapur and Ravi Ramamurty, "India's Emerging Competitive Advantage in Services," *Academy of Management Executive*, vol. 15, no. 5 ((May), 2001, pp. 20-33.

[65] Supra note 40.

[66] Anand Patwardhan and N.S. Rathi, "Labor Market Implications of the Growth of the Indian Software Industry: An Exploratory Study," presented at "Learning from the Indian Development Experience," work-shop organized by George Mason University and the Indian Institute of Science, Bangalore (March 2-5), 2003.

This will obviously be excess demand disequilibrium, and either the wages of software engineers will raise even more rapidly or lesser-qualified graduates will be employed, unless Indian software firms change their businesses to demand less new engineering labour.

b) Clustering:

The Indian software industry started in Bangalore, in which a cluster of firms grew up in geographic proximity. Other clusters developed later (in Mumbai, Delhi-Gurgaon, Hyderabad, and Chennai). This pattern of industrial development followed the successful American model. One of the claimed advantages of clusters, or agglomeration, is that they facilitate the sharing of tacit knowledge. Know-how that is gained from experience cannot easily be codified or transmitted in writing, but can only be learned from face-to-face communication and visual observation. Tacit knowledge diffuses across firms in a geographic cluster, increasing the capabilities of each of them. However, Indian software managers acknowledge limitations to the transfer of tacit knowledge within a cluster. Professional ethics forbid discussing a client's contract with others who are not engaged in that contract, even within the software vendor itself. Tacit knowledge transfer should be limited to general practices.

On the other hand, Indian software managers point out two other advantages of clusters: source of labour, and source of credibility. The Bangalore cluster started in part because of the presence of well-regarded scientific organizations, both universities and government research institutes, which were sources of supply of suitable labour. When large numbers of software firms establish themselves in the same cluster, they also become a source of employment for other firms. Once the cluster is established and acquires a reputation, as sort of geographic brand equity, then new and unknown firms acquires a measure of credibility merely by their location.

However, the labour supply advantage of the cluster might diminish along with the impending Indian national demand-supply imbalance, and the cluster credibility factor might lose strength if the brand equity attached to India substitutes for identification with a particular cluster.

c) Government Policies:

The government of India played multiple roles in the growth and development of the Indian software industry. In the very early years, the severe restrictions on inward foreign direct investment and the very high import tariffs on equipment surely had an adverse effect on the

industry's growth (although the *swadeshi* or self-reliance policies surely also resulted in the largely home-grown nature of the industry). Later, economic reforms – some domestic deregulation in 1985 and major liberalizations of trade and investment policies in 1991coincided with the dramatic growth of the software industry, a young industry that developed just as the "license raj" restrictions were lifted. At the least, government was not in the way when the industry was ready for growth.

Perhaps the main government contribution to the development of the Indian software industry was an indirect one. Public policy approach created the educational and research infrastructure that resulted in the critically important skilled labour advantage. For example, the several publicly funded and highly regarded Indian Institutes of Technology and the Indian Institute of Science, among other public colleges, produced sizable numbers of very well educated graduates who were available for employment by software companies. In addition, the central government supported research in institutions such as the Indian Space Research Organization and in several atomic energy laboratories, and in so doing created a pool of highly technically educated people who were available later to software companies. The government did not support R&D in software directly, but enabled the private sector to achieve its human capital advantage.

Another set of government actions in the 1990s was targeted specifically to the software industry. Notable among these was the creation of software technology parks that offered reliable electric power and adequate international telecommunications links, two of the infrastructure weaknesses that mattered to the software industry. In addition, the central government made earnings from exports of software free of income tax, which provided a powerful incentive for Indian companies to develop their export capabilities. However, this tax break is being phased out, and by 2007 it will be gone; this source of Indian export advantage will not apply in the future.

Indian software companies have not benefited from government-supplied R&D incentives such as the Bayh-Dole Act in the US.[67] As recently as 2002, there was no equivalent legislation in

[67] The Bayh-Dole Act, enacted in 1980, allows universities and other non-profit organizations to retain title to inventions created with federal funding, subject to several conditions including the expectation of patent filings and government (non-exclusive) licensing rights (Cornell Research Foundation 2001).

India.[68] But now the situation is changed and recently the Indian Patent Office has issued guidelines of such nature in 2008.

d) English Language:

All educated Indians are English speakers; their university education is in English. The main export customers in North America were English speakers, and even in other countries, software (like air traffic control) is dominated by the English language. Leading competitor countries for outsourced software development, such as Ireland, Israel, and Philippines, are also populated by English-speaking educated people. One potentially very strong competitor country is China, and to the extent that the use of the English language among educated Chinese increases, the Indian advantage diminishes.

e) Non-Resident Indians (NRIs):

Indians living and working in the US, many of whom were also technically educated and employed in businesses, constituted a bridge between the market for software in the US and the suppliers in India. The NRIs (a) provided knowledge of the US market that Indian companies did not have, (b) they helped to overcome adverse country of origin effects attached to India in the early years of the industry, (c) they were a source of knowledge about western managerial practices if they returned to India after the 1991 reforms, and (d) they could make financial investments to stimulate the start-up of new and small companies in India. Some of the advantages that NRIs provided, especially US market knowledge, remain important for the future of Indian software companies. The other advantages are less important for the future. For example, the Indian software industry no longer suffers a negative country of origin effect – if anything it is now a positive effect.

f) Indian National Culture:

There is apparently a good fit between Indian national cultures and the requirements of successful software development. India is individualistic. Indian national culture supports openness, candor, and free exchange of ideas. It is ritualistic but adaptive, not absolute. These traits all match up well with software development that requires individual initiative along with interaction and free

[68] A.D. Damodaran, "Public Funded R&D and Patent Rights Related Issues," 2001, retrieved on 23/03/2004 at 02:30 p.m. from www.patentmatics.com/pub2002/pub29.htm.

expression, and a willingness to change from the past. The culture-software fit is less good for other potential software competitor countries, such as China.

There is at least one Indian national culture trait that appears inimical to successful software development, and that is high power distance – acceptance of large status differences and respect for hierarchy. Of course, the more educated, the younger, and the more oriented to international business, the less national culture traits bind people. And China, a main potential competitor, also has high power distance.

12) Changing Indian Software Company Strategies:

As some of the bases for competitive advantage in Indian software diminish – especially low labour cost and government support for industry – other countries are becoming stronger threats. The countries that Indian software managers themselves mention most often are Philippines, Israel, Ireland, Russia, and China. A recent McKinsey study identified China and Philippines as India's potential competitors in the short run[69]. Managers of Indian software companies need to change their business strategies to retain export competitiveness.

Indian software companies are changing their business strategies by changing their business segments, in two ways. First, they are seeking to move away from programming onsite, and instead moving:

(i) Toward higher value-added and more sophisticated and complex offshore software services such as systems integration and consulting.

Second, they are seeking to:

(ii) Develop packaged software products.

Software products are more risky than customized software services because they might not succeed in the marketplace. Both of these shifts in business segments call for new and different capabilities compared to lower-end software services. Most important, they both require:

a) More creative and business-centered relationships with clients, with more insight into customers' needs, and more global marketing knowledge, which has been possessed by foreign firms more than Indian firms (the recent shift in the data toward offshore and away from onsite delivery of services reflects this strategic change)

[69] NASSCOM-McKinsey Report 2002, *Strategies to Achieve the Indian IT Industry's Aspiration*, New Delhi, 2002.

b) Program management skills and general management skills of coordination and control, as well as technical skills
c) Up-front financial investment, especially to develop packaged products, which many Indian companies in the past had not been able to make
d) Superior technology, which requires advanced R&D
e) Brand equity, so that customers are willing to buy with assurance of long-term support.

13) Competitive Basis for Software Business Segments:

A closer and more detailed look at the bases for competing in each of the several segments of the software industry shows the change in capabilities that will be required of Indian software firms if they are to shift toward higher value-added software services and packaged products (Table-4).

(i) Inputs:

Low labour cost, the result of low wages and high productivity, is critically important for competitive success in entry level software services such as programming, but much less so in high-end software services such as systems integration and consulting, for which labour qualifications are more important. Management and marketing capabilities exhibit the opposite pattern as labour cost: they are low in importance for programming and high in importance for systems integration and consulting. Domain knowledge – knowledge of the customer's needs particular to his or her industry and country – becomes important with high-end software services, similar to management capability.

(ii) Technology:

The level of advancement of technology used to compete in software is low for programming and medium for other software services. This implies little R&D spending is necessary for the former but some is helpful for the latter. Foreign technology is of medium importance for most software services, but becomes critical for software consulting.

(iii) Infrastructure:

Neither financial nor legal nor physical infrastructure is of high importance to software services competitiveness, nor is clustering, in the view of Indian software managers.

> The capabilities required for success with software products are the most different from those for entry level software services. Note also – quite the opposite – that the fastest-growing Indian software industry business, which is IT-enabled services, resembles entry-level software services in its competitive requirements.[70]

(iv) Government:

Government policies are regarded as quite important to software business success, both targeted incentives and general trade and investment liberalizations. The sole exception is the smaller importance of government trade and investment policies for systems integration and consulting businesses.

(v) Market Competitiveness:

Ease of entry into low-level software services has contributed to the competitiveness of the industry and its international success, but this feature of the industry is less important for higher-level software services and products. The presence of foreign competitors exhibits the opposite trend: not important for entry-level software services but critical to competitiveness of the marketplace for higher-end software services and products.

Table-4

The Basis for Competing in Software Business Segments

Importance of Each Competitive Factor for Success of the Industry

H=high, M=medium, L=low

	Software Services		

[70] Supra note 14.

Basis for Competing	Programming	Design, Engineering	Systems Integration	Consulting	Software products	IT-Enabled Service
INPUTS						
labour cost	H	M	L	L	L	H
labour-qualifications	M	M	M	H	H	L
Management capability	L	M	H	H	H	M
Domain knowledge	L	M	H	H	H	M
TECHNOLOGY						
Technology level, R&D	L	M	M	M	H	L
Foreign technology	M	M	M	H	H	M
Clustering	L	M	M	M	M	L
INFRASTRUCTURE						
Financial institutions	L	L	L	M	M	M
Legal – IP rights	L	M	M	M	H	L
Physical infrastructure	L	M	M	L	L	M
GOVERNMENT	H	H	H	H	H	H
Government incentives	H	H	M	L	H	H
Trade policy	M	M	L	L	M	M
FDI policy						
MARKET COMPETITIVENESS						

Ease of entry, exit Foreign competitors Suppliers, distributors	H L L	H L L	M M H	L H	L H M	H L L
NATIONAL CULTURE Individualism Openness	L M	M M	M H	L H	H H	L L
Non-resident Indians	L	M	H	H	H	M
English language	H	M	H	H	M	H
Time zones	H	L	L	L	L	H

Source: www.iipi.org (Stanley Nollen)

Explanations of terms:

Labour cost depends on labour productivity (output per hour) and labour wages

Labour qualifications: type and level of formal education as a measure of labour skill

Management capability: general management coordination and control, and marketing management

Domain knowledge: how well the needs of the customer are known, both industry and country domains

Technology level: how advanced the technology is, implying R&D for more advanced

Foreign technology: use of imported scientific tools and payment of technical fees abroad

Clustering or agglomeration: nearby geographical location of software firms; e.g., Bangalore

Financial institutions: banks, capital markets

Legal infrastructure: IP rights means protection of intellectual property

Physical infrastructure: roads, rails, ports, power, water, telecom

Government incentives: tax relief, subsidies

Trade policy: import tariffs, currency convertibility

FDI policy: ease of setting up foreign operations

Ease of entry, exit: easier entry means the market is more competitive

Foreign competitors: more, stronger foreign competitors means the market is more competitive
Suppliers, distributors: more good suppliers means the market is more competitive
Openness: free exchange of ideas, abundant interaction
Non-resident Indians: People of Indian origin who live and work outside India

The main differences can be summarized on the basis of competing factors as it is shown in Table-5 below:

Table-5
Most important competitive factors for*:*

Low-level software services	High-level software services	Software products
labour cost	labour qualifications Management capabilities Domain knowledge Foreign technology	labour qualifications Management capabilities Domain knowledge Advanced technology
Government incentives Liberalized trade policy Easy entry into the market	Government incentives Foreign competitors	Government incentives Liberalized trade policy Foreign competitors

	Non-resident Indians	Non-resident Indians
English language Time zone differences	English language	

The critical competitive success factors for software products are similar to those for high-level software services except for the additional importance of advanced technology and intellectual property rights protection.

Whether or not Indian software companies will succeed in their transition from entry-level on-site software services providers to high value-added end-to-end business solutions providers and consultants is by no means assured yet. Their new competitors include strong foreign multinational firms such as IBM and Accenture, which are the world's leaders in systems integration. In the development of packaged software

14) Intellectual Property in the New Software Strategies:

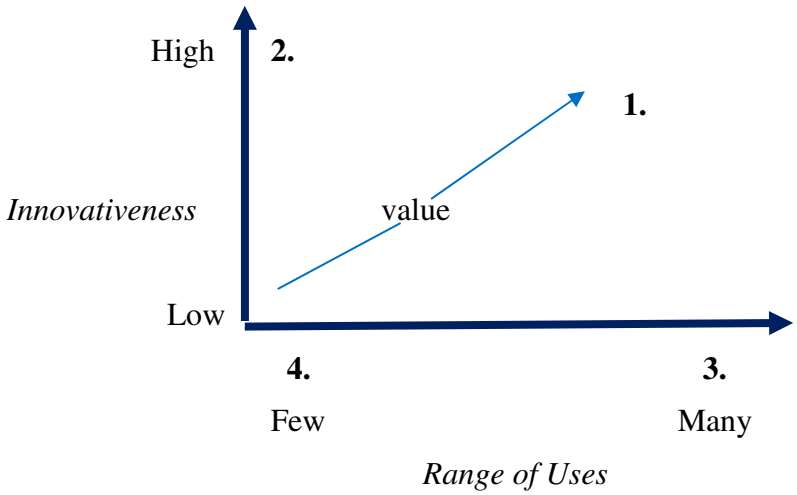
The intended shift by Indian software companies toward higher-level software services and packaged software products, if it actually occurs, implies that the companies will need to create new intellectual property of higher value than pre-existing software services or products.

The value of software to the company that produces it depends on its innovativeness and on the number of times that components of it can be re-used for the same or different customers.

More innovative software is likely to be more attractive to the customer, either by reducing costs of existing activities or by enabling new activities to be undertaken, and accordingly to command a higher price. More innovative software is also likely to yield higher margins for the software supplier because of fewer competitors and fewer substitutes compared with generic software. Software with more re-uses is likely to be more valuable to the software supplier because of economies of scope – initial development costs need not be incurred again for additional customers. As is often expected of innovations with wide applications, innovative and re-usable software carries the potential of higher revenue and higher profit for Indian software firms compared to lower-level customized software services.

Table-6

Value Proposition for Software



1. High innovativeness and many uses (high reusability) imply valuable software.
2. High innovativeness and single or few uses imply unique, customized software.
3. Low innovativeness and many uses imply generic, commodity software.
4. Low innovativeness and few uses imply low-value software.

a) Creating Value in Software:

A business issue that faces Indian software companies is how to increase both the innovativeness and uses for new software products and services. The resolution of this issue implies a newly important role for intellectual property.

Software development projects that Indian companies do for foreign customers typically include a portion of genuinely customized work that is unique and proprietary to the customer. It is not useful to anyone else. However, some portion may be reusable. The work might produce tools that are applicable to other customers' needs, and these tools consist of explicit knowledge.

The work might also have some element of knowledge that is primarily tacit – for example, how the software engineer solves the customer's problem. The reusable portion of a typical customized software services contract might be 30-40 percent.

Both the explicit, reusable tools and the tacit knowledge potentially contain new intellectual property. To ensure that they do – that they have value to other customers – the software company needs to make investments in research and development, or in organizational learning more broadly.

A software tool that was created as part of one customer's project, needs to be adapted and completed for uses with other customers. The tacit "how to" knowledge needs to be converted into codified knowledge so that others in the company can benefit from it in their future work. The mechanisms might include expert systems, project post-mortems, and case studies. The "IP-led Services Player" was one of the long-term strategies formulated by the NASSCOM-McKinsey Report (2002)[71], and it stressed an R&D orientation and consistent investment in emerging technologies. The additional investment to complete and generalize the common portion of a customized software contract typically might be 30-40 percent of the original contract effort.

The recent establishment or expansion of overseas development centres by several major foreign information technology companies (for example, IBM, General Electric, Microsoft), and the prominence given to them by their parent companies signifies a favorable R&D climate in India, especially as a source of talent, and suggests high probability for success on the part of Indian software companies if the resources can be committed. Indeed, some Indian software companies have themselves established dedicated overseas development centres for foreign companies, such as HCL has done for Toshiba in Japan[72].

b) Creating a New Business Model:

To develop new software tools that are reusable by the software outsourcer as part of customized software development contracts requires a new business model. One model is that the Indian software developer accepts a reduced price for the project from the customer in return for which the Indian company is able to use some of the tools developed for this project for other customers or products. Although the customer ordinarily would own all of the software for which it pays, it gives up some of its ownership rights in return for a lower project price. In other words, the Indian software developer invests it own resources in reusable tools and acquires (partial) ownership in return. To implement this type of business arrangement raises several questions centered on the value of intellectual property and the rights to use it. How can the boundaries between customer-specific proprietary software services and reusable software tools be drawn? How great will be the value to the software vendor of the potentially reusable software tool? How

[71] NASSCOM-McKinsey Report 2002, *Strategies to Achieve the Indian IT Industry's Aspiration*, New Delhi, 2002.
[72] Ibid.

much investment in R&D by the software vendor will be required to equip the potentially re-usable tools for other applications? Accordingly, what will be the price for transfer of intellectual property from the customized software client to the software services supplier? How will the IP rights of the original client be protected? The changes in the strategies and business models envisioned above will also raise questions for the internal organization of Indian software companies. How will the R&D and organizational learning be paid for? How will internal customers in the software company (e.g., another business unit) be treated compared to external customers in the utilization and pricing of software? How will conflicts of interest be avoided?

c) Moving Toward Higher Value-Added Businesses:

The development of more innovative and re-usable software tools and the codification of tacit knowledge about methods of solving clients' problems in particular, assist the Indian software company's emerging strategy of moving from lower-level programming toward higher-level systems integration, consulting, and end-to-end solutions. Greater management capabilities as well as copyrighted or patented technical achievements will enable Indian software companies to compete more effectively against the incumbent global firms.

15) Summary and Conclusions:

In this chapter the growth and development of the Indian software industry in the last decade has been tried to be documented and described the role of intellectual property in the industry's development in the past, assess the status intellectual property rights protection for software in India, and also tried to explain the fundamental changes in the strategies that some Indian software companies are undertaking to be competitive in the future, and also speculated on the new and different role for intellectual property and its protection in the Indian software industry in the future.

a) Industry Size and Growth:

(i) Size:

The Indian software industry was a $12.5 billion industry in sales revenue in 2002-03, accounting for more than three percent of Indian gross domestic product. It is mostly a customized software services (not packaged products) business, and mostly an export business with only a small domestic market. It is mostly an Indian business, not a foreign-owned business: among the top 20

software firms operating in India, seven are foreign-owned, and among the top 100 just 22 are foreign-owned. The foreign-owned companies accounted for an estimated 22% of all software services produced in 2001-02.

(ii) Growth:

The growth of the Indian software industry has been exceedingly fast and sustained over the last decade. The compound annual growth rate averaged 42% per year. In the last two years during the turndown in the dot.com business, the growth rate has been slower but still very fast at roughly 28% per year. The growth rate of Indian software exports has been faster than the growth rate for the industry overall.

b) Intellectual Property Creation in the Past:

Intellectual property was not important to the growth and development of the Indian software industry in the past. It did not figure in company strategy or managers' decisions. Indian software companies did not create very much new and valuable intellectual property. Technology inputs that might create intellectual property were small. Indian software firms spent very little on research and development in-house – less than one percent of their revenue – and much of that was adaptive rather than innovative R&D. They purchased very little technology from foreign sources, and only a few firms had international non-equity strategic alliances for technology.

(i) Patents:

Intellectual property outputs were small. Among the Indian firms in the top 100 software firms in India, only three percent had any patents awarded in the US in the 1996-2003 periods while one-third of the foreign-owned software firms had US patents awarded in this period. Software patenting activity in its totality has been underrepresented in India compared to the rest of the world. In addition, the US patents awarded to software firms in India appear to be less valuable than average patents in advanced fields; they are cited less frequently. Nevertheless, software patenting activity is increasing dramatically, more so in India than elsewhere. The average number of patents awarded to software firms in India, both national and international, increased from 10 per year in 1996-2000 to 40 per year in 2001-03 (some of the patents awarded to software firms are not strictly software patents if the firm also has embedded software or hardware business).

(ii) Copyrights:

Copyrights are a more frequent though less effective method than patents for protecting intellectual property in software. In the 1996-2003 time period, 18% of the top Indian software firms had registered software copyrights in the US. More foreign-owned software firms in India registered copyrights in the US than Indian firms. As in the case of patents, US software copyrights were very unevenly distributed; only a few firms achieved them. As with patents, US software copyright registrations are increasing dramatically, from about eight per year by Indian firms in the 1996-2000 period to about 23 per year in the 2001-03 period (these are strictly software copyrights, not copyrights for manuals, training materials, or other written documents). In India, the number of software copyrights registered in recent years by all firms appears to exceed the number registered in the US.

Without regard to patents or copyrights, 10% of all publicly traded Indian software firms earned fees from the sale of their technology to foreign customers.

(iii) Why Intellectual Property Outputs Were Small:

The small amount of new and valuable intellectual property creation credited to the Indian software industry is due in part to the fact that most of the software services work that Indian firms did was at the entry level of the software services value-addition hierarchy. This work required technically educated labour, but not advanced skills.

c) Intellectual Property Protection in the Past:

India has had a bad reputation for the protection of intellectual property because of reasons unrelated to software (e.g., lack of product patents in pharmaceuticals, and a slow judicial system), but also because of high piracy rates of software packaged products. But this did not discourage the growth and development of the Indian software services industry – instead it may have hastened it. It was not important to protect intellectual property in software in India because there was not much to protect. However, this will not be true in the future.

(i) Patent protection:

India does not award patents for software because under Indian law, software tends to fall into established unpatentable subject matter (i.e., business method, algorithm or pure mental act). However, software that has a technical effect and is part of a physical system is patentable. Discussions at high levels in India about pure software patenting are taking place. The issues include the extent to which social benefit would be impeded by software patents, the usefulness of 20-year patents in an industry with rapid rates of technological obsolescence, and the extent to which software patent applications can meet the non-obvious criterion. A change in Indian software patent policy may occur in the future, but not immediately.

(ii) The unimportance of patents:

Whatever the status of patent protection for software in India, it hasn't been important to the software industry. In the first place, patents were sought in the US where the market was, not in India. Second, most Indian software services were customized for the client. It was the client's property, not the Indian software company's property. Even if it were, it would have limited general use because it was customized to the client's needs. Third, the benefit/cost ratio for patenting in the US was unfavourable. The dollar cost of filing for a patent was high and the cost of defending a patent would be high. The benefit was thought to be small because technology obsolesces rapidly and the competitive threat from the use by other firms of an inventor's proprietary technology was small anyway. Therefore secrecy was an option to patenting, and the oligopoly-oligopsony nature of the industry facilitated informal technology sharing agreements.

(iii) Copyright protection:

Indian protection of software copyrights meets international standards in some respects but not others. In particular, Indian law does not prevent a properly registered software package from being copied for use on multiple computers, and does allow multiple copies of software to be made for non-commercial uses. High level discussions now taking place may reverse these two differences from international standards and bring India into full TRIPs and WIPO compliance. A more serious weakness in software copyright protection is its enforcement. Deterrence for copyright infringement is weak because proof is difficult and penalties are small. Conviction rates are low because the judiciary is understaffed and under-qualified, and delays are too frequent and too long.

Here also improvement might occur in the future in the form of proposals for the creation of special intellectual property courts.

(iv) The small value of copyrights:

The value of copyrights has been doubted by Indian software companies. Aside from weak enforcement, it was easy to evade copyrights and hard to know when infringement occurred. On the other hand, Indian lawyers believe that software copyrights have great potential value. Here we encounter a vicious cycle: without copyrights or patents there is no well-functioning market for pricing intellectual property, and without a price it is hard to ascribe value to it.

d) Indian Software and Intellectual Property in the Future:

The business model for the Indian software industry in the past will change in the future. To be the low-cost vendor of entry level customized software services will not be the main basis for competing by Indian software companies. The historical Indian advantage of labour that is abundant, low-wage, low-cost, technically educated, and English-speaking is being eroded. Indian wages are rising as demand catches up with supply, and other countries, especially Ireland and Israel in Europe, and China and the Philippines in Asia, are developing their own competitive labour pools. Other start-up boosts, such as income tax relief on export earnings from the government and marketing assistance from non-resident Indians in the US, will be less important in the future.

(i) Shifts in company strategies:

The Indian software industry is seeking to move downstream along the value chain toward more complex tasks of design, systems integration, and consulting that require more customer contact, more domain knowledge, more innovation, and more project management. There is also an attempt on the part of some companies to develop mass-marketed packaged software products, although so far these efforts have met with only modest success. The basis for competing in these segments is advanced technology, highly skilled labour technical labour, and managerial and marketing skill.

(ii) The role of intellectual property in the future:

These new competitive requirements mean, among other things, that the Indian software industry must create new and valuable intellectual property in the future. Intellectual property is more valuable if it is more innovative, which yields bigger margins, and if it is reusable or has a wide range of uses, which yields more licensing revenue without increasing cost proportionately. The implications for intellectual property are clear: Indian software firms must create new, advanced intellectual property, and they must protect it.