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Description	一般論文

# 1L15 Alliance networks of US, Indian and Chinese IT services companies and the divergence of sectoral innovation systems

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## ABSTRACT

Using data about partnership networks of top US, Indian and Chinese IT services companies, the paper reveals important aspects of technological strategies, related to external sources of technologies and knowledge. The analysis is based on social network technique. Indian companies are found to partner with key providers of enterprise applications, while their Chinese counterparts can be characterized by strong hardware-related background, which may limit their opportunities in global IT offshoring. There are also cross-country differences in the average numbers of partners and their types, suggesting divergence of sectoral innovation systems of the analyzed countries.

## Strategic alliances

Alliances are institutional arrangements, which combine resources and governance forms of several partnering organizations, making them mutually interdependent (Inkpen 2001: 402-403). They can take many organizational forms, ranging from equity-based joint ventures, through cooperative R&D agreements, technology licensing, marketing and distribution partnerships, and supply chain relations, to technical partnerships, specialist trainings to develop products for a specific technological platform, and industry consortia, formed to introduce and manage standards (Inkpen 2001: 404). In the technology sector, particularly important are also non-contractual commitments, like knowledge acquisition, or integration of own products, forming bases for long-lasting relationships.

The most wide-spread type of alliances, vertical arrangements among organizations with different competence bases, are popular as required knowledge cannot be developed internally in a satisfactorily short time, and partnerships offer the opportunity to combine resources to generate and diffuse innovations. In the IT industry, the asymmetry in resources stimulates frequent linkages between large companies and small entrepreneurial firms, deriving respective benefits of unique technologies and access to market. Empirical research confirms the use of strategic alliances to meet strategic objectives related to knowledge acquisition, legitimacy or market entry (Eisenhardt, Schoonhoven 1996: 137).

## IT services industry

The paper illustrates the case of technology alliances of Western, Indian and Chinese IT services companies. Companies in this industry undertake implementation and support projects for hardware and software solutions, or contract software development for other IT firms – and could be divided into the following types:

- IT consulting companies - providing advice and delivering projects to corporate customers;
- system integrators - focused on custom development to integrate various technologies for specific customers;
- vertically integrated IT services organizations - offering complex hardware and software solutions;
- IT outsourcers - divided into:
  - contract (offshore) software developers - contracted by other IT firms to carry out task such as product testing or the actual coding;
  - companies specializing in managed services - technical administration of customer's IT infrastructure;
  - Business Process Outsourcing firms – taking over entire business processes, such as customer service or payroll processing.

Smaller software companies can enter the market by offering specialized services to other IT firms as contract developers - the scenario reduces the need for initial investments, and enables the firms to later become self-sufficient at a relatively low cost. Major Indian IT services players followed this development route: 10 years ago, they used to perform low added-value tasks for American software houses, but nowadays, after years of continuous growth, they can successfully compete against their Western counterparts, while maintaining cost advantages of the offshore location. According to estimates of investment bank Morgan Stanley, Indian IT services companies were employing in 2003 99,098 people, accounting for almost 18% of the global industry headcount (Gerhardy, Mahon 2004: 30). Almost all IT firms in India derive significant shares of revenues from exports, but most of them are small or medium size, with only several players reaching the size comparable with global competitors. Local market leaders, Tata Consulting Services, Wipro Technologies, Infosys Technologies and Satyam, are still much smaller than IBM, EDS, or Fujitsu, but more profitable and efficient (comp. Table 1).

Company	Revenues 2003-2004	IT services revenue	Market share '04	% IT serv revenue	Net income	Profit margin	Headcount	IT serv revenue per capita	Net income per capita
<b>IBM</b>	96,293,000	46,213,000	8%	48%	8,430,000	9%	329,001	140.46	25.62
<b>EDS</b>	21,476,000	19,317,000	3%	90%	-1,698,000	-7.91%	132,000	145.34	-12.86
<b>Fujitsu</b>	44,970,642	*16,860,000	3%	44%	468,906	1%	159,169	126.51	3.00
<b>HP</b>	79,905,000	15,389,000	3%	19%	3,497,000	4%	150,000	102.59	23.31
<b>Accenture</b>	13,673,000	13,673,000	2%	100%	691,000	5%	100,000	136.73	6.91
<b>CSC</b>	14,768,000	14,768,000	2%	100%	519,000	4%	90,000	164.09	5.77
<b>CapGemini</b>	8,501,351	8,501,351	1.4%	100%	-485,135	-5.71%	59,324	143.30	-8.18
<b>Unisys</b>	58,207,000	4,724,700	0.7%	8%	38,600	0%	36,400	129.80	1.06
<b>BearingPoint</b>	3,139,277	3,139,277	0.5%	100%	41,307	1%	15,300	205.18	2.70
<b>Tata CS</b>	1,641,182	1,515,118	0.25%	92%	371,532	23%	29,000	52.25	12.81
<b>Wipro</b>	1,355,115	1,228,963	0.2%	91%	237,673	18%	28,502	43.12	8.34
<b>Infosys</b>	1,096,979	1,065,811	0.17%	97%	286,514	26%	25,634	41.58	11.18
<b>Satyam</b>	604,441	585,609	0.1%	97%	128,063	21%	14,032	41.73	9.13
<b>Huawei</b>	2,617,138	751,643	0.12%	29%	460,182	18%	24,000	31.32	19.17
<b>ZTE</b>	2,108,340	726,245	0.12%	34%	147,239	7%	21,000	34.58	7.01
<b>Hisense</b>	2,670,685	541,837	0.09%	20%	37,136	1%	16,000	33.86	2.32
<b>Haier</b>	9,740,145	402,976	0.07%	4%	175,983	2%	11,394	7.90	3.45
<b>Digital China</b>	1,832,734	376,645	0.06%	21%	16,175	1%	4,500	83.70	3.59

**Table 1. The largest international, Indian and Chinese IT services companies. Financial data in thousands USD.** Data sources: corporate annual reports and Gartner Dataquest 2005. (\*) estimate. 1\$=106¥, 1\$=0.74 €, 1\$ = 43.4 Rps, 1\$ = 8.28 RMB, 1\$ = 7.79 HKD

Important characteristics, marking the transition of Indian firms from niche subcontractors to independent players in the international market, were the networks of partnerships. Contract developers tend to focus on specialist solutions for single clients, while large-scale IT services operations require broader competence bases and access to multiple key technologies.

The largest Chinese IT services companies Huawei, ZTE, Hisense and Haier are vertically integrated groups of businesses, including computing and telecommunication equipment manufacturing, consumer and enterprise software, services for end customers and foreign contractors, as well as embedded software development for electronic devices. Only Digital China is focused on software, but acts mainly as software distributor. The scope of operations reduces the relative importance of IT service divisions in corporate strategies (as opposed to the Indian firms, where the services constitute core competencies).

The analysis of partnership networks shall reveal important aspects of technology strategies, related to external sources of technologies and knowledge. It will also demonstrate focus of corporate strategies in terms of both technology type (hardware or software), as well as strategic orientation (contract developer or independent IT services organization).

## Research methods

The study is based on the social network analysis method. This set of mathematical techniques was adopted by sociologists, relate terminology became popular thanks to Granovetter (1983) and widely used

in diffusion studies. In the recent years, social network analysis is increasingly popular in technology management area, and similar orientation underlies also bibliometric studies of patent or article citations. Depending on specific scenarios, the method may help differentiate single and multiple, or strong and weak ties (denoting importance, closeness or frequency of contacts), and identify reciprocity (cases, when both partners assess their relationship as equally important and thus show similar commitments). Graphical representation of networks can itself answer many research questions (Freeman et al. 1998). Mathematical formulas allow researchers to calculate distances in the network (based on an assumption that in a broad industry network, if no direct links exist between two companies, they still may be indirectly related by their respective partners), distinguish vertices (particularly dense clusters within the network) and central positions (the most frequently "selected" partners). Combination of partnership data with corporate profiles supports the analyzes of geographical distribution of linkages (regional, national or international clusters) and technological specializations.

The further analysis is based on three samples of IT services companies: 7 largest Western firms, 4 top Indian and 5 Chinese firms (in both countries, companies occupying next ranking positions were significantly smaller in terms of revenues and headcount). IBM and Fujitsu were excluded from the analyzes, as partnership metrics comparable with other firms were not available. The data about partnerships was collected in March-August 2005 from the publicly available corporate sources:

websites, annual reports and press releases of the concerned companies. We were intentionally looking only for alliances which the concerned companies were explicitly presenting as strategic in their own marketing materials - this approach helped eliminate possible biases, resulting from subjective classification of more and less important partners, or proliferation of ties if all possible (also non-strategic or ad-hoc) linkages are registered. The network data was processed in line with methodological recommendations of Everton (2004) using dedicated software UCINET and NetDraw.

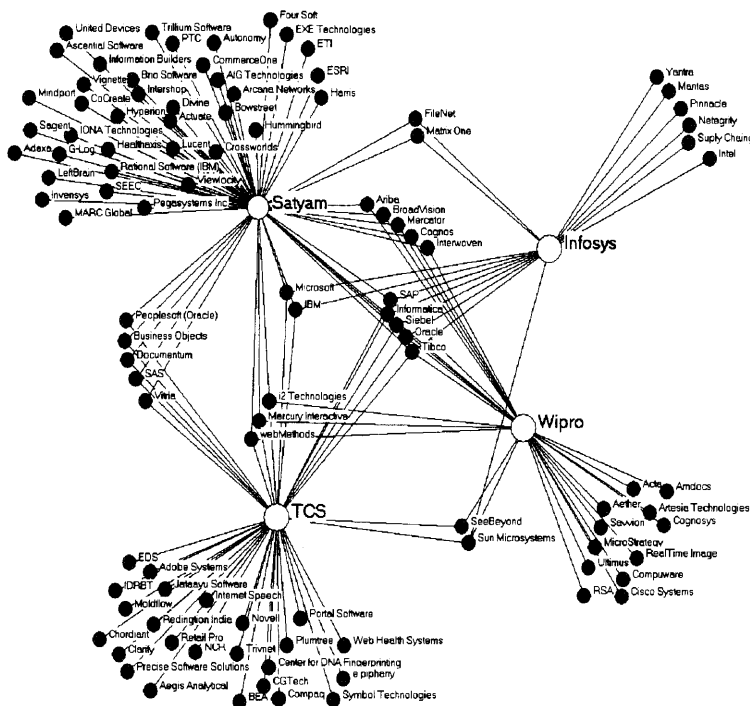
### Research findings

The findings reveal significant differences between the largest Western, Indian and Chinese IT services companies. Indian firms tend to have more partners (larger *vertex degrees* - numbers of links from specific network nodes: Table 3), partnering mostly with software developers, particularly key players in the area of enterprise applications. Chinese companies are in turn more focused on hardware manufacturing, with limited number of software partners (Table 4), thus not having access to the newest technologies in this area. Success in IT offshoring calls for specialist competences, experience with key technologies and linkages with top software partners - the revealed differences in innovation networks influence therefore also profitability and international image of Indian

and Chinese firms.

Company	R&D expenditure (,000 \$)	R&D as % of revenues	No. of academic papers (1995-2004)	No. of US patents	No. of partners
EDS	NA	NA	42	10	13
HP	3,506,000	4.39%	253	13,206	6
Accenture	NA	NA	28	105	27
CSC	NA	NA	24	5	15
CapGemini	NA	NA	1	0	9
Unisys	294,300	0.51%	68	1,724	59
BearingPoint	NA	NA	1	2	51
Tata CS	6,293	0.42%	39	2	41
Wipro Tech.	5,346	0.40%	13	1	27
Infosys Tech.	10,262	0.94%	44	0	16
Satyam	670	0.11%	27	2	60
Huawei	383,919	15%	10	15	11
ZTE	160,810	8%	22	3	8
Hisense	96,841	4%	6	0	14
Haier	464,976	5%	1	30	13
Digital China	75,867	4%	0	0	62

Table 2. Selected metrics for the analyzed companies. Data sources: corporate annual reports, Compendex, USPTO, Ministry of Information Industry of China(2003)



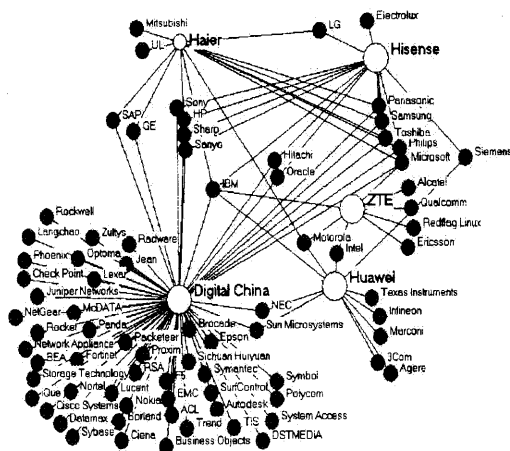
Graph 1. Partnership network of Indian IT services firms(2003)

	Western	Indian	Chinese
IT services firms	7	4	5
Partners	113	104	78
Average vertex degrees	25.71	36	21.6
St dev in vertex degrees	21.19	18.99	22.7
Partners having alliances with >50% IT services firms	8 (7.08%)	11 (10.58%)	8 (10.25%)

Table 3. Comparison of networks(2003)

	Indian	Chinese
Local partners	6 (5.77%)	5 (6.41%)
Partners with local offices	48 (46.15%)	55 (70.51%)
Hardware partners	3 (2.88%)	49 (62.82%)
Software partners	98 (94.23%)	22 (28.20%)
Hardware-software partners	3 (2.88%)	7 (8.97%)

Table 4. Location and specialization of



**Graph 2. Partnership network of Chinese IT services firms(2003)**

Western	Microsoft, SAP (100%) BEA, Cisco Systems, Oracle, Peoplesoft, Siebel, Sun Microsystems (>50%)
Indian	Informatica, Oracle, SAP, Siebel, Tibco (100%) IBM, i2 Technologies, Mercury Interactive, Microsoft, Sun Microsystems, webmethods (>50%)
Chinese	IBM (100%) Microsoft, Motorola, Panasonic, Philips, Samsung, Sanyo, Toshiba (>50%)

**Table 5. Most popular partners and % of IT services companies cooperating with them(2003)**

Another interesting tendency is a very small number of local partners – only Tata CS and Digital China actively form alliances with companies from the same country. This prevents the formation of regional industry clusters: the largest IT services companies look rather for foreign technology providers, and smaller independent software companies could not enjoy sufficient business support in own countries.

Findings in Table 2 show additionally, that Chinese firms pay more attention to R&D investments than their Indian counterparts. It may be attributed to differences in business models – Indian outsourcing orientation leads to the focus on meeting needs of foreign clients and process innovations rather than developing basic product technologies.

## Discussion

Indian and Chinese IT services industries differ significantly in their focus and abilities to build competences through technology alliances. China's firms seem not to benefit from knowledge transfer opportunities, having only few linkages to key software technology providers. As the shares of IT services revenue in table 1 demonstrate, the domain is not very important for the top Chinese firms as opposed to the Indian specialists - large telecom equipment manufacturers like Huawei and ZTE expand merely beyond their original business, but could not achieve economies of scale and experience. Limited number of partnerships with key enterprise applications vendors restricts the appeal of Chinese IT services companies to potential foreign clients, endangering international competitive advantage and restricting activities to contracted software development (e.g. for embedded software).

At the same time, the Indian firms are increasingly active in more profitable services for enterprise customers, involving implementation and support for branded technology solutions. Unlike Chinese players, they experience relatively weak demand in the home country, thus orienting strategies towards international outsourcing. Nevertheless, involvement in global – not only national – IT services market will become increasingly important also for Chinese firms. Strategic positions in the market will certainly be related to technology-related competences and innovativeness, not only cost advantages – and this should motivate the largest Chinese IT firms to upgrade their skills and partnership networks, following the footsteps of the Indian counterparts.

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