

Offshoring Software Engineering

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The offshoring of software production is growing

Employment	1995	2005
US	1.5 m	2.6 m
India	27,500	513,000

Many countries are participating

Country	Sales (\$ bn)	Exports	Domestic	Sales per employee (\$,000)	Remarks
Brazil	7.7	0.1	7.6	49	P/S=40/60
China	7.4	0.4	7.0	40	
EE5	0.6	0.5	0.1	8	Exports services primarily to W.Europe
India	8.2	6.2	2.0	23	Exports services primarily to US
Ireland	7.7	6.5	1.1	160	Exports primarily localized US TNC product software to W.Europe
Israel	3.7	2.6	1.1	106	P/S=70/30
Japan	85.0	0.07	84.3	159	P/S=25/75
Philippines	0.2	0.15	0.05	12	Exports services primarily to US
Russia	0.2	0.1	0.1	13	P/S=30/70
USA	200.0	NA	NA	192	P/S=40/60

Market shares of India and Israel

Consulting	41.5	< 1	80-120
Applications Development	18.4	16.4	25
System Integration: Hardware and Software Deployment and Support	91.7	< 1	18-25
System Integration: Applications, tools and O/S	62.4	< 1	40
IT education and training	18.5	0	40
Managed services	124.9	1.6	60-120
Total	357.6		

System and tools software	\$93.7	1.1
Application software	\$120.0	1.3
Total	\$213.7	1.2

These engineers work 12 hours a day and 6 days a week

- Cost per engineer per month: \$200 (Indore, October 2006)
 - 20 going to 120 in 12 months is a typical story of the startup outsourcing firm.
- Computer and other equipment costs the same as the US
- Communication is higher: E1 costs \$1,500 p.m. vs \$1,000 p.m. for equivalent in US.
- Power < 5% of costs.

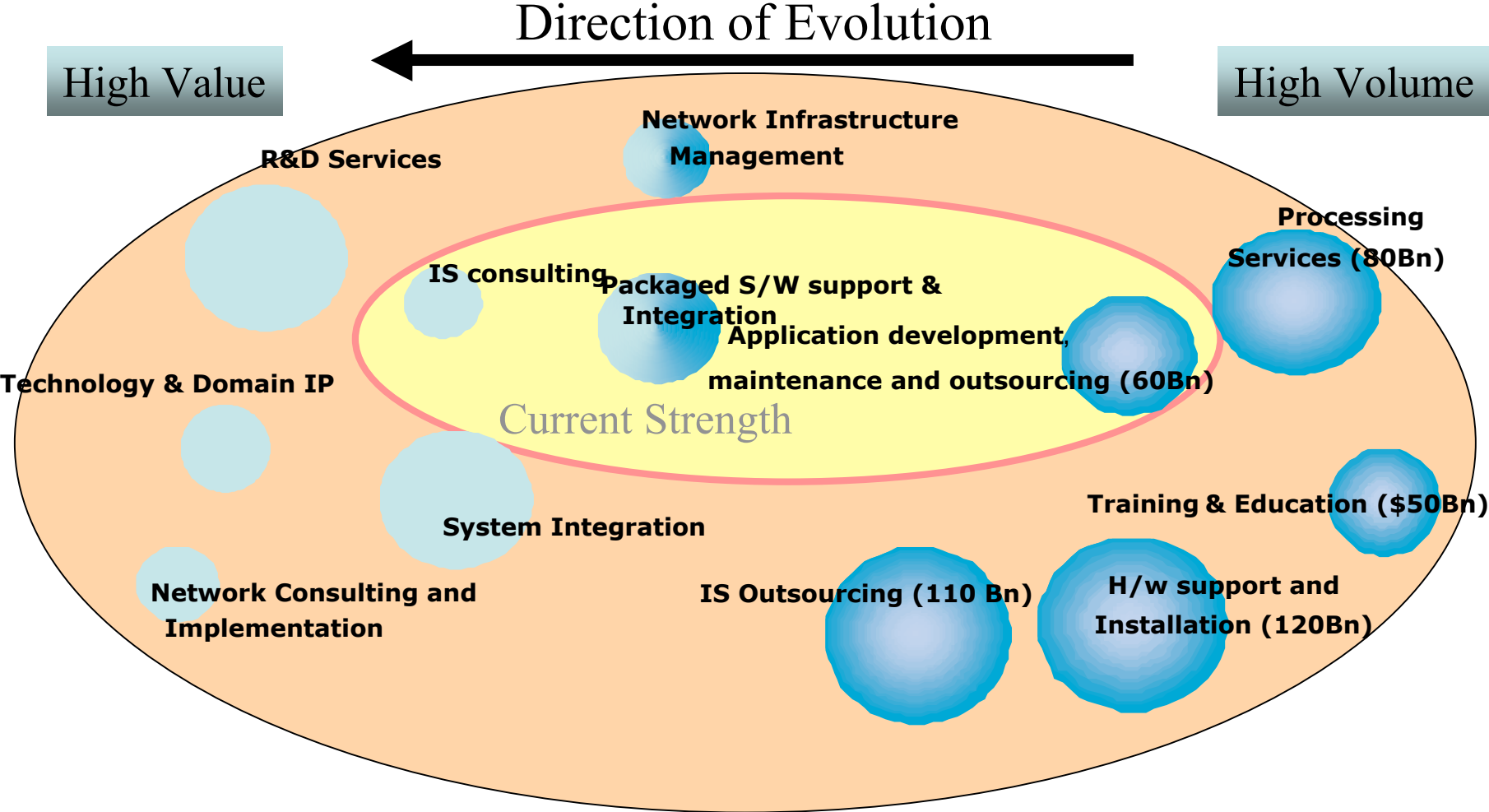
Moving up the value-chain

1960-70	Software maintenance, EDP		Minicomputer	EDP	MNE inhouse product support
1971-80	Custom software for applications	IBM separates software and hardware		Export of programmers, primarily for custom software	No change
1981-90	Software system integration	Growing complexity of IT systems	U-W standard	Custom software for applications	Custom software for domestic markets
1991-2004	Managed services		Internet, database platforms	Managed services, R&D and product development	Product software for global markets; MNE inhouse R&D

MNCs a key factor behind rising sophistication of work

Financial yr->	2001	2002	2003	2004	2005	2006 (E)
CAD and AM (\$B)	3.65	4.40	4.87	5.98	7.67	10.16
Total software exports (\$B)	5.3	6.16	7.1	9.8	13.1	17.1
Share of CAD/AM (%)	68.9	71.4	68.6	61.0	58.5	59.6
Share of foreign firms' revenue (%)	14.5	22	26	31	31	NA

The Indian IT Services Landscape



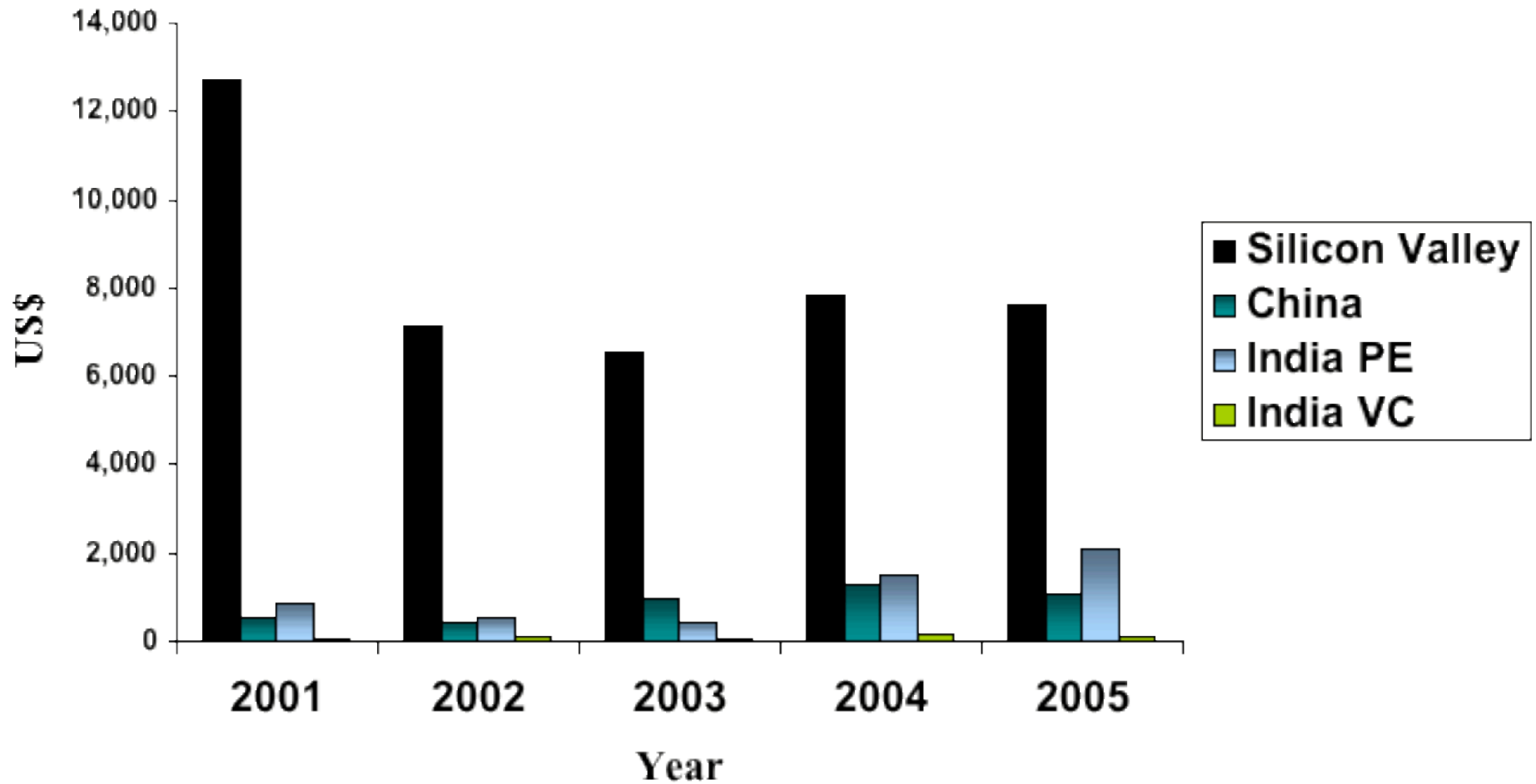
Leveraging current strengths to grow and move up the value chain

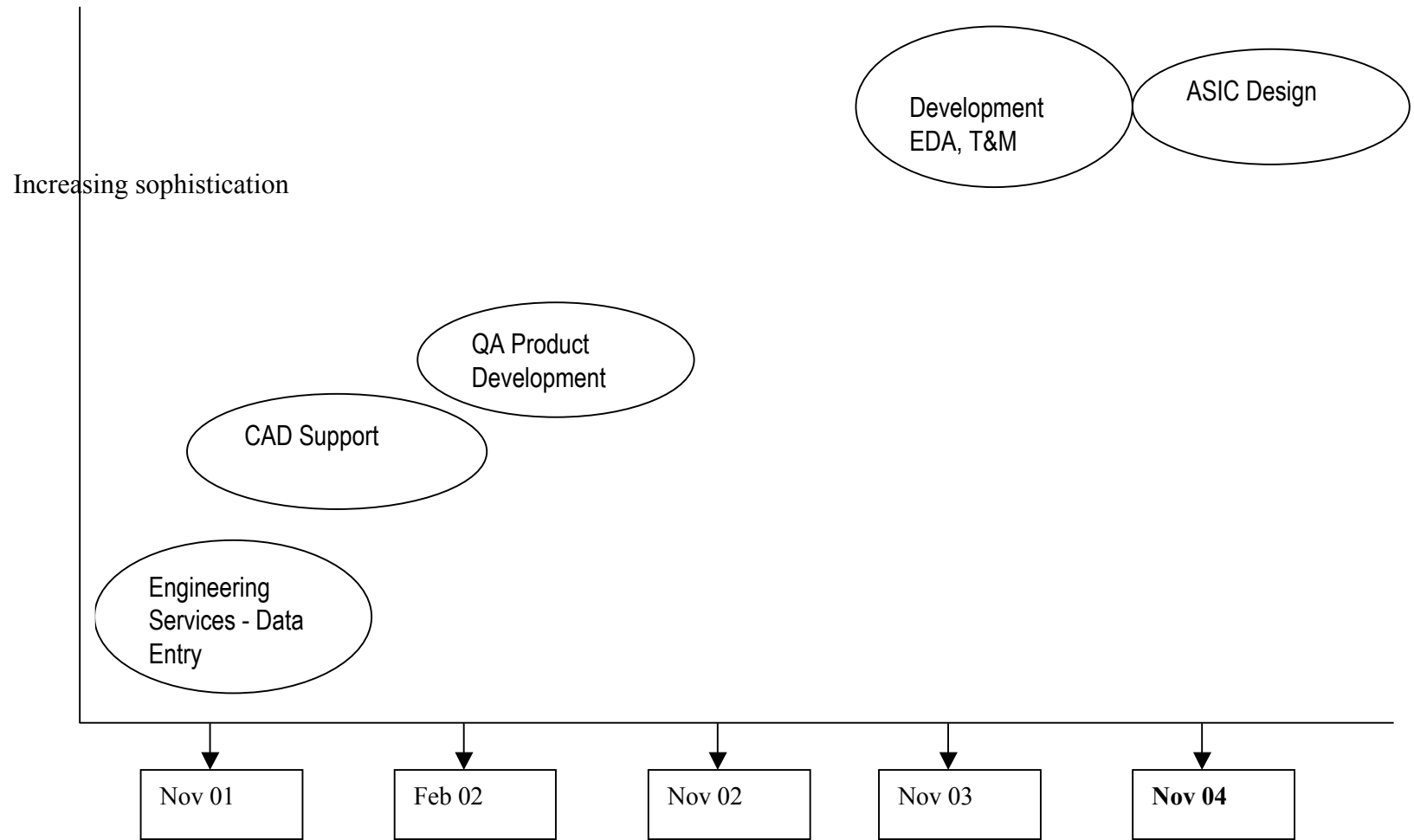
Source: Indian IT Firm

Both startups and established firms are involved

Firm	Work	Initial stage onshore	Offshore Stage 1	Reason for Stage 1	Offshore Stage 2	Reason for Stage 2
Agilent	Embedded Software	Inhouse	Inhouse; Non-integral	Control	Inhouse; Integral	Stabilized coordination in Stage 1
Broadcom	Product Devt	Inhouse	Inhouse; Integral	Scale		
Hellosoft	IP Devt	Offshore operations from the start	Integral			
Ketera	Software Devt	Inhouse	Outsource; Non-integral		Inhouse; Integral	To improve coordination; to solve labor quality issues
Netscaler	Product Extension	Inhouse	Outsource Non-Integral		Inhouse Integral	To undertake more complex product devt.
Tensilica	Product Devt	Inhouse	Outsource; Non-integral	Speedy ramp-up	Inhouse; non-integral	To improve coordination; to solve labor quality issues

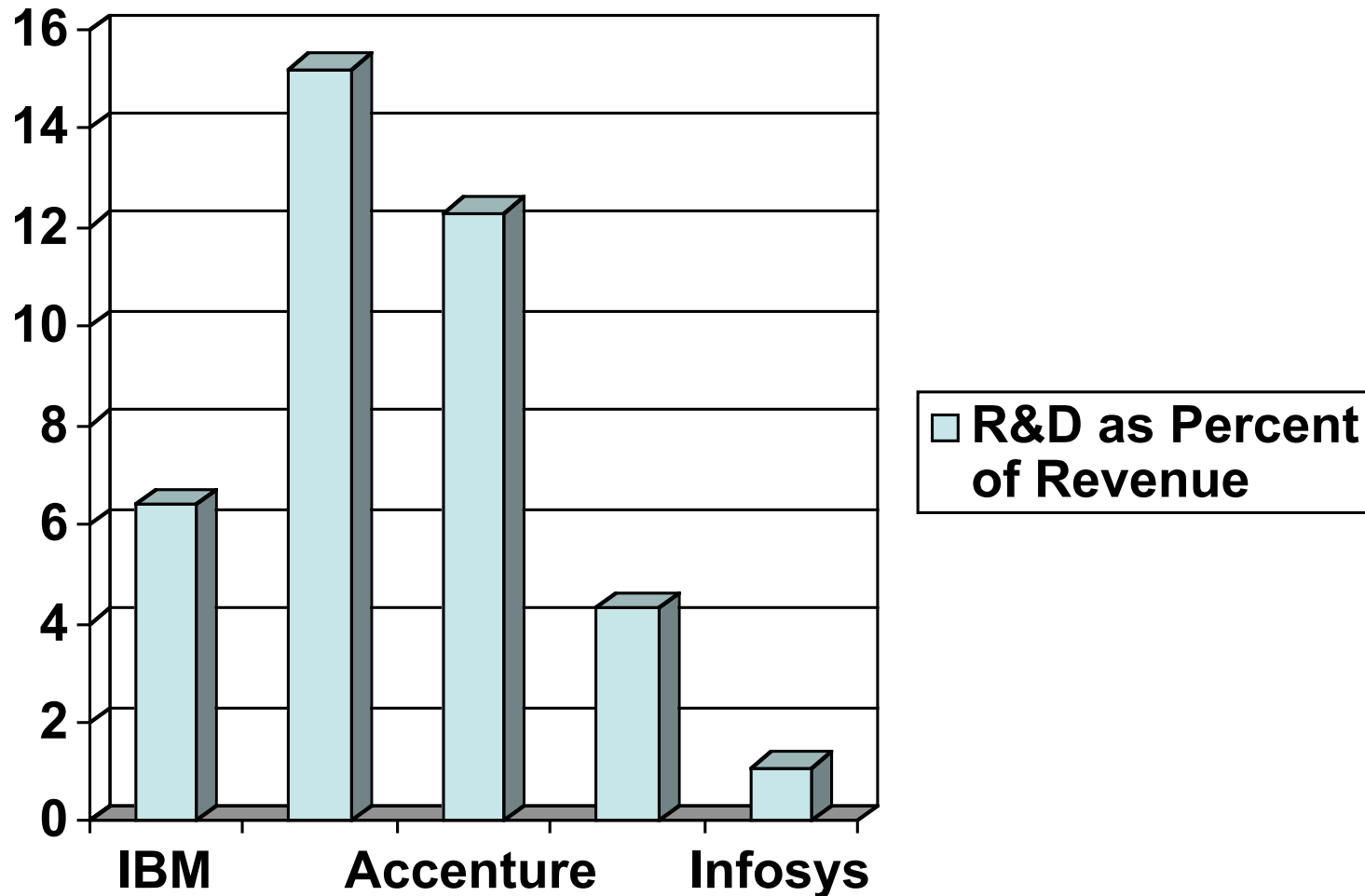
VC is an important driver





Source: Agilent Technologies India

R&D as Percent of Revenue for IBM, MS, Accenture, TCS, and Infosys, 2005



Summary - 1

- Work that is modularized and does not require regular customer contact is most likely to be offshored.
 - Even this can be managed, as the example of Broadcom showed.
- For companies like Citrix's Netscaler division, offshore workers ensured survival during the downturn and rapid growth later.
 - Offshore workers are a complement to US workers.

Summary - 2

- Regardless of how offshoring begins, over time, the cost pressures lead to substitution in addition to complementary effects.
 - Raj Shah, CTO, Katera (June, 2005):“The primary challenge (of offshoring most of the headcount to India) was the lack of informal communication. We miss the informal hallway and coffee station side chats. We miss going to the white-board and brainstorming an idea.” After observing the progress of the Indian operation, he concluded, “The hallway discussion and white-board brainstorming are actually happening now (in our firm), but in India.”

Summary - 3

- Technological change can both speed up and slow down offshoring
 - Remote maintenance of software now possible due to the Internet.
 - New technologies allow for new ways of fulfilling consumer needs
 - Proximity helps.

Example of Google vs TCS

- To capitalize on a good idea requires a large number of good people in a short period of time. Both Google and TCS do it, but ...
- Google has 8000 employees, earns revenues of \$10 bn per year and profits of \$3 bn. Revenue per employee: \$1.25 m; pre-tax profit per employee: \$525,000. Google is 8 years old.
- TCS added 8,000 net new employees in the first six months of 2006; has total annual revenue of \$ 3 bn; revenue per employee: \$50,000; pre-tax profit per employee of \$10,000. TCS is 32 years old.
- The top 8,000 employees at TCS are probably as good as Google's 8,000 in technical capability. In fact, many of Google's employees are Indians trained in India. So, what is the difference due to?

Catching up with Silicon Valley: views of two Fortune 500 IT firms

Experience	Catch-up time (years)	Shortfalls
Fresh engineer	1.5	Team-work skills; Technological skills are 'one-generation' behind US
5 years	3.0	Project management skills; product marketing skills; tech skills are 'two-generations' behind US
10 years	'Never'	Hierarchical approach; overcautious risk-management