



Engineering: Shortage or Glut?

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Common Belief

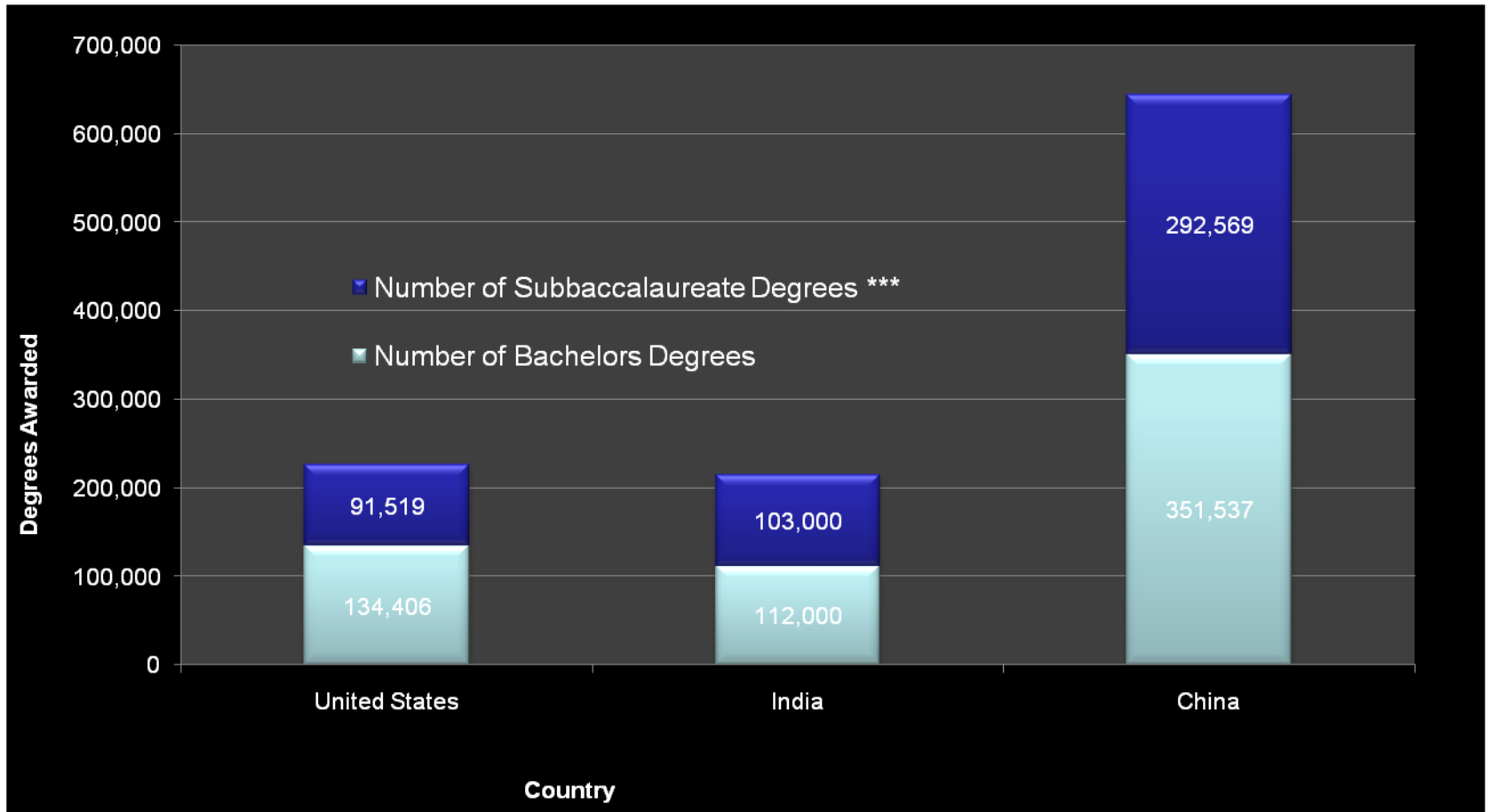
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Competitiveness is a function of the graduation rates of engineers and scientists



Engineering, CS & IT degrees awarded in 2004

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***China data are considered suspect – collection methods and definition of engineers are inconsistent



Questions

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- Are companies going offshore because of a U.S. skills shortage or a deficiency in U.S. workers?
- What are the relative strengths and weaknesses of U.S. engineering graduates vs. India/China?
- Do companies hire 2- or 3-year degree/diploma holders?
- How do U.S. engineering jobs compare with India/China?
- Where is this headed?

We surveyed 78 division representatives of 58 U.S. based companies involved in engineering outsourcing



Where are the shortages?

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- Where is there an adequate to large supply of well-qualified entry level workers?:
 - India -- 75%
 - U.S. -- 59%
 - China -- 54%

No shortages in India, and greater supply in the U.S. than China??



Skills of Indians/Chinese vs. Americans

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- Productivity -- 87% said U.S. workers more productive or equal
- Quality -- 98% said U.S. locations produced higher or equal quality
- Relative advantages:
 - U.S. -- communication skills, understanding of U.S. industry, business acumen, education/training, proximity to work centers
 - China -- cost, willingness to work long hours
 - India -- cost, technical knowledge, English, strong work ethic

***Americans are ahead in productivity, quality & market knowledge,
but Indian and Chinese workers cost less and work harder***



Do bachelor degrees even matter?

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Degree requirements:

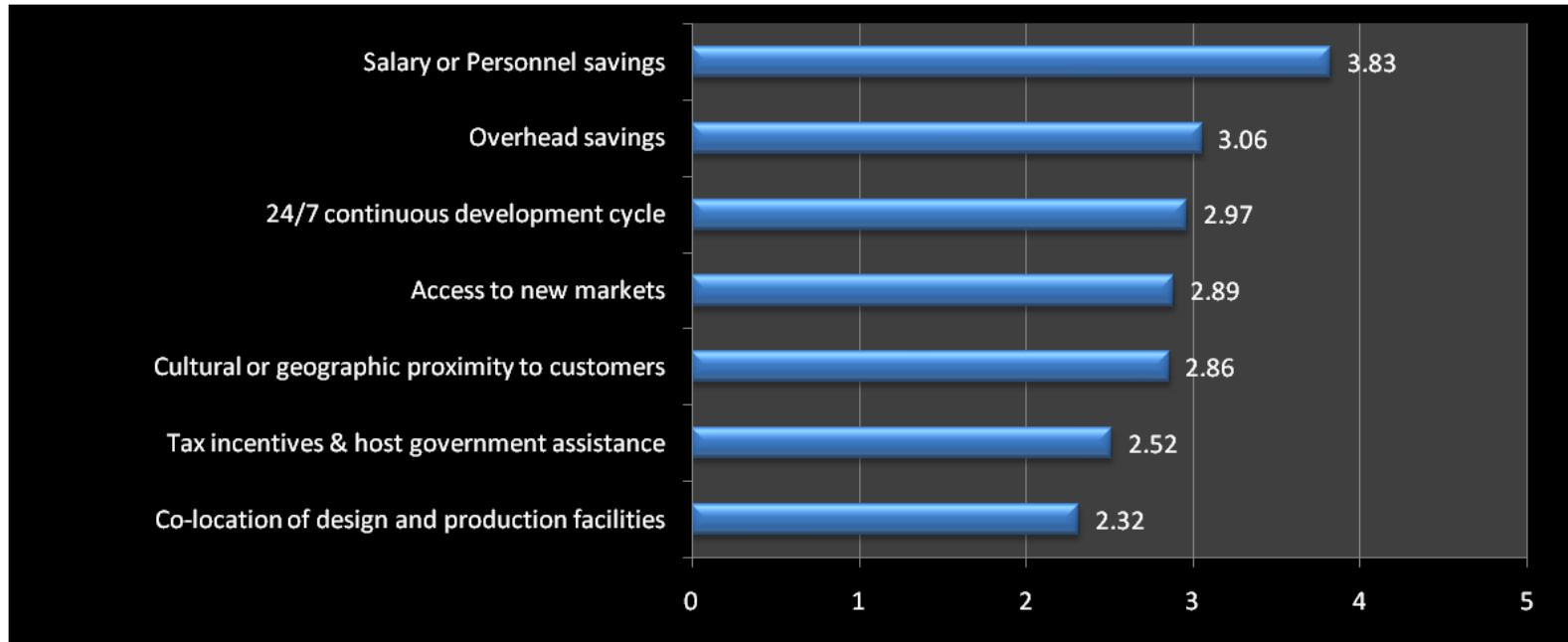
- 44% hired engineers with 2- & 3-year degrees. Additional 17% would hire such applicants if they had additional training or experience

Companies will make do with the best talent they can find and train employees as needed



Why are companies going offshore?

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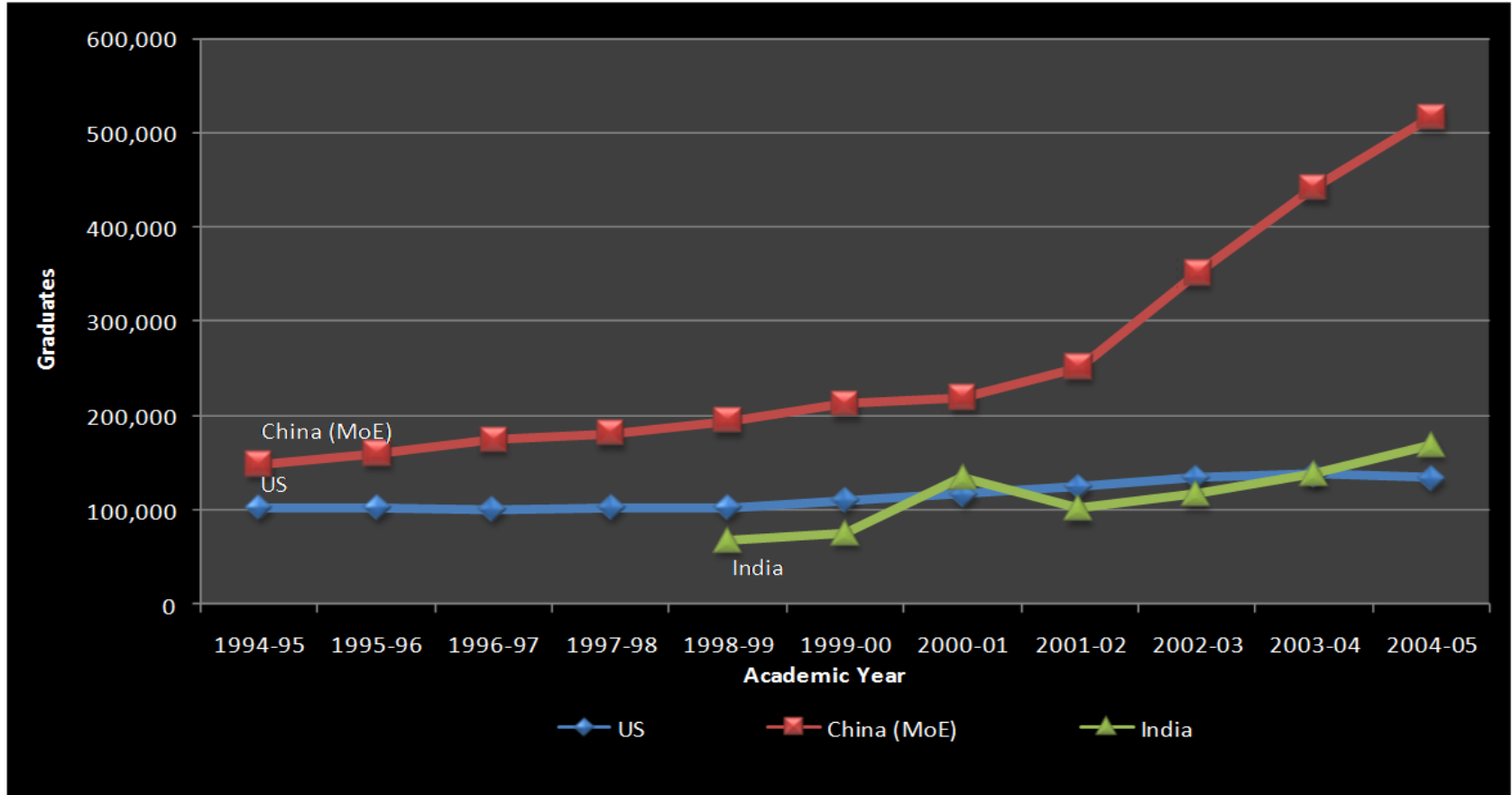
In your offshoring endeavors, how much of an advantage, if any, has your company gained from the following? (1: No Advantage; 2: Slight Advantage; 3: Moderate Advantage; 4: Strong Advantage; 5: Significant Advantage)

In other words, its all about cost and markets -- not the education level of Americans



Bachelor in engineering, CS and IT

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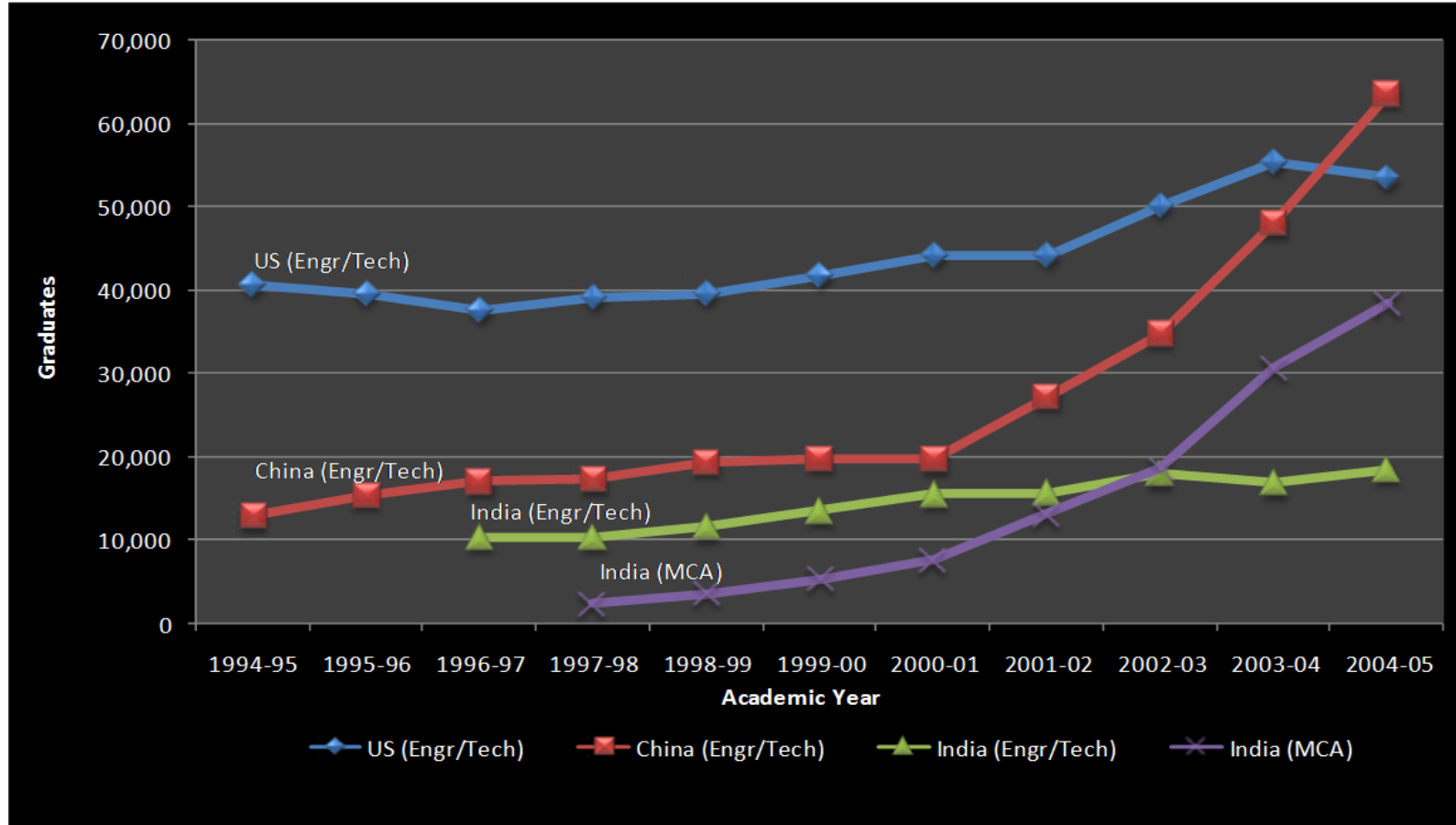


China numbers are suspect – inconsistent data collection, unrelated degrees.
India/China numbers were revised slightly based on new data



Masters in engineering, CS and IT

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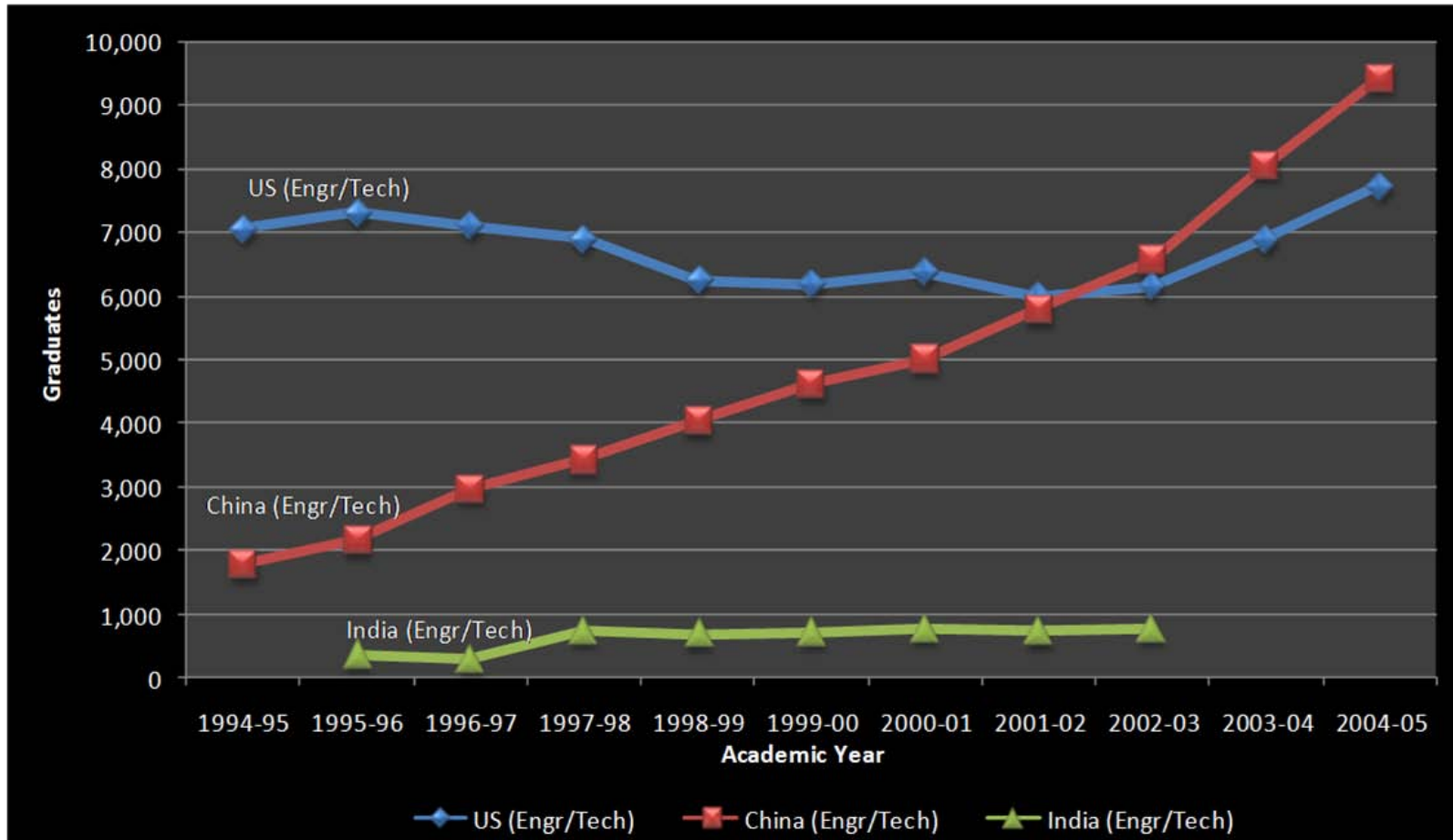


China numbers are suspect – inconsistent data collection, unrelated degrees.



PhD's in engineering, CS and IT

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R&D in India – on-the-ground reality

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India is the rapidly becoming the next global center of research, design and innovation:

- Pharmaceutical
 - Drug discovery, specialty pharmaceuticals, biologics, high value, bulk manufacturing, advanced intermediate manufacturing
- Aerospace
 - In-flight entertainment, airline seat design, collision control/navigation control systems, fuel inverting controls, first-class cabin design
- Consumer Appliances/Semiconductors, etc.
 - Design of next-generation washing machines, dryers, refrigerators, digital TV, cell phones, automobiles, tractors, locomotive motors

India is racing ahead in R&D, despite its weak education system and graduation rates



R&D in China– on-the-ground reality

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China is using its manufacturing might to build R&D capability

- Massive investments in infrastructure
- Massive investments in technology parks
- Massive amounts of investment capital in key industries
- Massive subsidies for R&D
- Pressure on multi-nationals to move R&D to China
- *Dependant on returnees for management/R&D*

Yet, China is “limping forward” – MNC investment in R&D in China is largely directed at Chinese Market. China excels in imitation – not innovation

Lesson: You can't mandate or buy innovation



India's challenge and achievement

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- 50% of engineering graduates are not employable
- Famed IIT's graduate less than 5000 engineers
- Country has weak infrastructure and weak education system

Yet:

- Tip of the iceberg: In 2007, top 5 IT companies hired 120,000 engineers. Accenture and IBM India added 14,000 each.
- India is racing ahead in becoming a global R&D hub

How? India has adopted the best practices of its Guru (the U.S.) and perfected these



Workforce development in India -1

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■ Workforce Recruitment

- Résumés don't reflect potential and degrees are not a proxy for skill and competency. Hiring is based on ability and competence
- “Bulk” hiring from universities
- Open door interviews/storefronts
- Lower-tier schools, non-metro areas, women, retirees, ex-servicemen, older workers, disadvantaged groups

■ New Employee Training

- “Army boot camp” like training for new recruits in technical as well as soft-skills
- 2-7 month training programs for “freshers”
- Infosys' new center can train 13,500. TCS aiming for 30,000 at a time
- Complemented by extensive mentoring and on-the-job training



Workforce development in India -2

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- Ongoing Skill Development
 - 40-150 hours mandatory formal training every year for every employee
 - Supplemented by extensive mentoring/informal training
 - Extensive online training programs which employee are rewarded for completing
 - “Leaders as Teachers” – senior executives deliver training. Cadence requires every manager to spend 1-2 weeks a year. Satyam mandates 30 hrs.
 - “Communities of learning”, seminars, expert talks, online technical forums

- Managerial development – 3 years from “fresher” to manager
 - Extensive managerial development programs usually in conjunction with leading business schools.
 - Career progression planned and predictable
 - Senior Management invests significant time in coaching/mentoring
 - Promotion from within policies



Workforce development in India - 3

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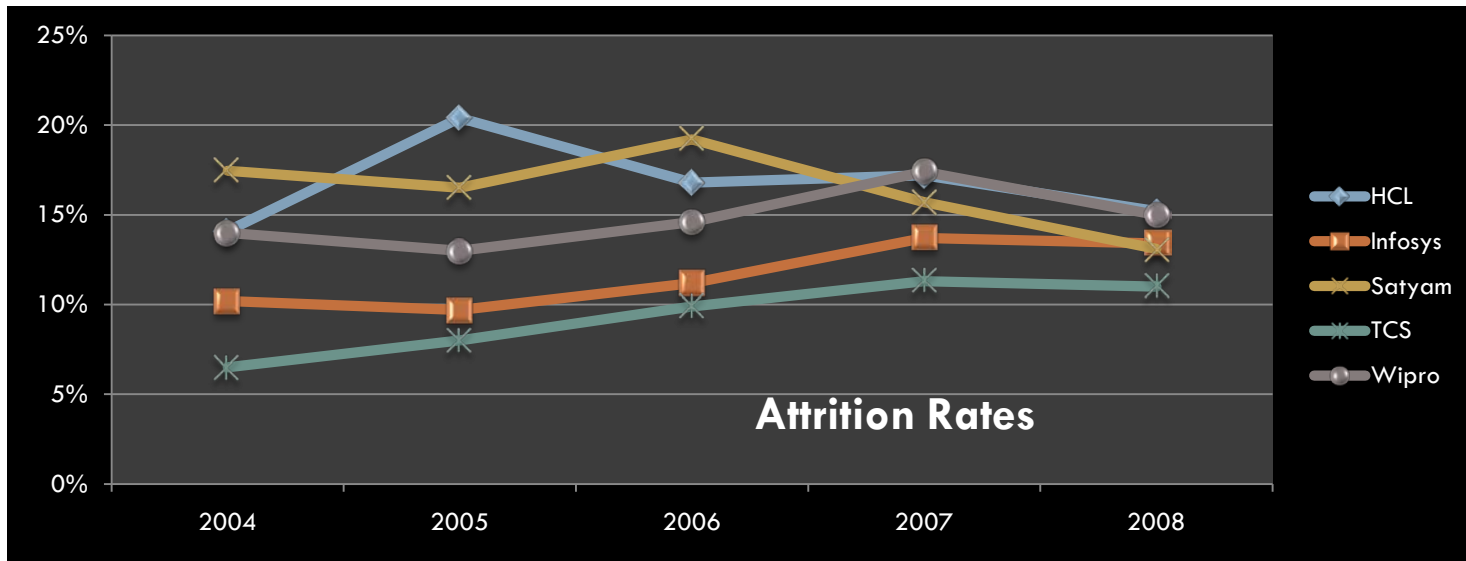
- Performance management/appraisal
 - ERP-like systems manage employee development through their careers
 - Sophisticated, frequent review processes like 360 degree feedback
 - Tied to training, salary and career progression
 - HCL has “Employee first, customers second” program to empower employees
 - Employees often appraise managers and senior leaders; results available on line
- Upgrading education
 - Training academics, funding curriculum development
 - Leading companies have helped develop customized degree programs
 - Strong university to industry linkages



Indian outsourcers growth and turnover

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Company	2004	2005	2006	2007	2011	2011P	CAGR
Accenture (India only)	9,953	16,014	23,186	36,852	41,500		43%
HCL	16,358	24,090	32,626	42,017	51,038	62,435	33%
Infosys (including subsidiaries)	25,634	36,750	52,715	72,241	91,187	102,838	37%
Satyam (excluding subsidiaries)	14,032	19,164	26,511	35,670	45,969	53,878	35%
TCS (including subsidiaries)	33,774	45,714	66,480	89,419	111,407	133,837	35%
Wipro	28,502	41,857	53,742	67,818	82,122	98,092	30%



Accenture global attrition rate 2011 – 18%, U.S. It services industry norms – 15-30%



America: Shortage or Glut?

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**Reality: It's all about age, workforce education,
and skills**