

Why Gujarat needs much better Higher Education & Research to Succeed in Knowledge Economy & what we can do about it?

Presentation to the Gujarat CM at the Round Table on “Regulatory & Policy Reform for Higher Education in Gujarat,” in conjunction with the International Conference on “Reconnecting Gujarati Diaspora with its Homeland: Contribution to its Development with a Focus on Building a Knowledge Society” (Patan-Gandhinagar, Jan 17-19, 2009).

Prof. [Amit Sheth](#)

LexisNexis Ohio Eminent Scholar &
IEEE Fellow; Wright State Univ.

with

Dr. Kamlesh Lulla, Space Scientist
Prof. Sanjay Chaudhary, DA-IICT

Proposition

India and Gujarat are benefiting from Globalization, but as is the case for the West, this is a two way street. Significant challenges to gain sustainable advantage.

For long term success and sustainable progress, we need a healthy mix of **economic advantages** (availability of capital, lower costs), **entrepreneurship, favorable policies, technology, higher education and world class research.**

Only way to continue progress is go up the value chain from manual labor to increasingly specialized knowledge intensive tasks. Much of new capital, with corresponding development, will gravitate towards those who can innovate.

What challenges Gujarat faces? What are possible solutions?

What's the example of largest wealth creation in 21st century?



Market cap of
Google:
\$100 B

GDP of India: \$1000 B

A KNOWLEDGE company.

Goal “to organise the world's information and make it accessible”. It was created by Stanford PhD drop outs. Stanford is an iconic research university .

It uses various information retrieval, artificial intelligence (machine learning, linguistics), systems architecture, distributed computing and database technologies.

What is Google?

What Is Google's Secret Weapon? An Army of Ph.D.'s

- Mostly, Google has concentrated on recruiting those with a background in what you would expect: computer science. Founded by two near-Ph.D.'s who have purposely placed Ph.D.'s throughout the company, Google encourages all employees to act as researchers, by spending 20 percent of their time on new projects of their own choosing.
- Google has two advantages.... a Ph.D.-centered culture, .. assembled the industry's most unorthodox portfolio of human capital since Microsoft began intense recruiting of computer science majors in the 1980's.

By Randall Stross,

<http://query.nytimes.com/gst/fullpage.html?res=9F00E1D81331F935A35755C0A9629C8B63>

Why few cutting edge companies in India?

No research at universities

(Sumir Chadha, Managing Director of Sequoia Capital India)

Of what “research” there is, much of it is copy cat.

**PhDs:
think,
invent,
innovate,
educate others**

**Masters: develop &
manage well defined
work**

**Undergraduate:
worker bees in the global
economy**

**Vocational: limited, targeted,
local job skills**

**Primary & Secondary : survival in
day to day life**

Why PhDs

"**Good** Ph.D. students are extreme in their creativity and self-motivation. Master's students are equally smart but do not have the same drive to create something new."* The master's takes you where others have been; the doctorate, where no one has gone before.**

*Rajeev Motwani, a computer science professor at Stanford.

**Randall Stross

Who will educate? How will we educate?

About 25 percent of the faculty positions in the IITs and 50 percent of the faculty positions in other engineering colleges remain vacant.

Nirma University could not fill many of Professor positions.

70-80% of technical staff at IBM Research-India hold PhD from outside of India.

What kinds of employments do we want?

\$0.1 an hour factory worker or \$20,000-\$80,000 per year PhDs in science and technology working at R&D labs.

Answer is, both.

Talent Gap

India would face 'talent gap'-- the lack of right skills for the job required -- of more than 5 million by 2012, as existing educational institutions do not impart employable skills. 'India's demographic dilemma' brings out the fact **the \$1.1-trillion economy will have a shortfall of 750,000 skilled workers over the next five years.***

Knowledge as Business Capital

Specialized knowledge leads to a new kind of workforce with knowledge workers, such as scientists, able to claim stake in wealth with “intellectual capital”... in the way that industrialists claimed a stake in wealth through “monetary capital.”

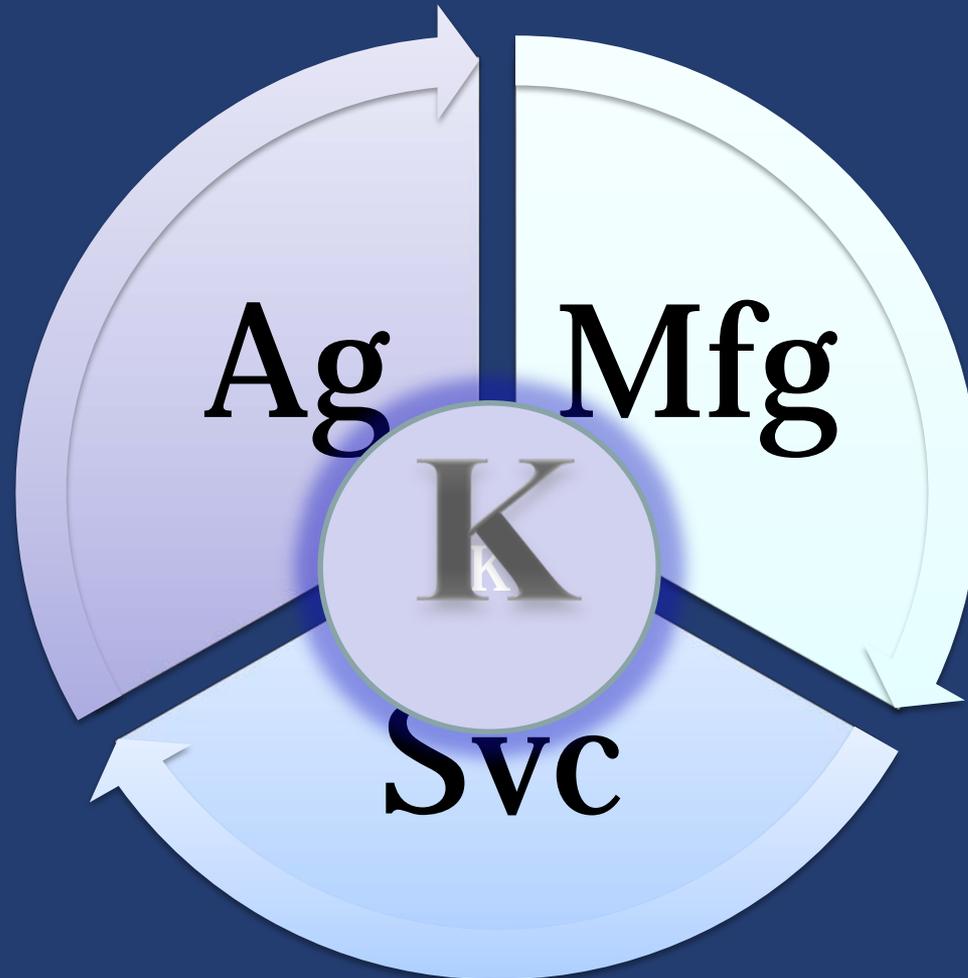
And the *kind of knowledge also counts*. Because the blind continuation of the “hydrocarbon economy” will choke us all to death ... Learning to build an ecologically sustainable future is not only a good idea, it represents the knowledge base for “green innovation” that will underpin market leadership going forward.

From Peter Fingar: *Extreme Competition*
Innovation and the Great 21st Century Business Reformation

Innovation = Research/Creativity + entrepreneurship

- Force multiplier: “burning candles that can light other candles” (Dr. Kalam)
- Innovation & Creativity ... not just software or engineering skills
- From skills and learning to “**learning how to learn**”: in 20th century, a person with useful skill can continue to be gainfully employed for most of his/her life; in 21st century, a person will have to continue to retrain

Knowledge will play increasing role in Economy



Knowledge based services the primary growth driver of traditional components of the economies.
New knowledge-based companies form the fastest growing component of many healthy economies.

Key Enablers

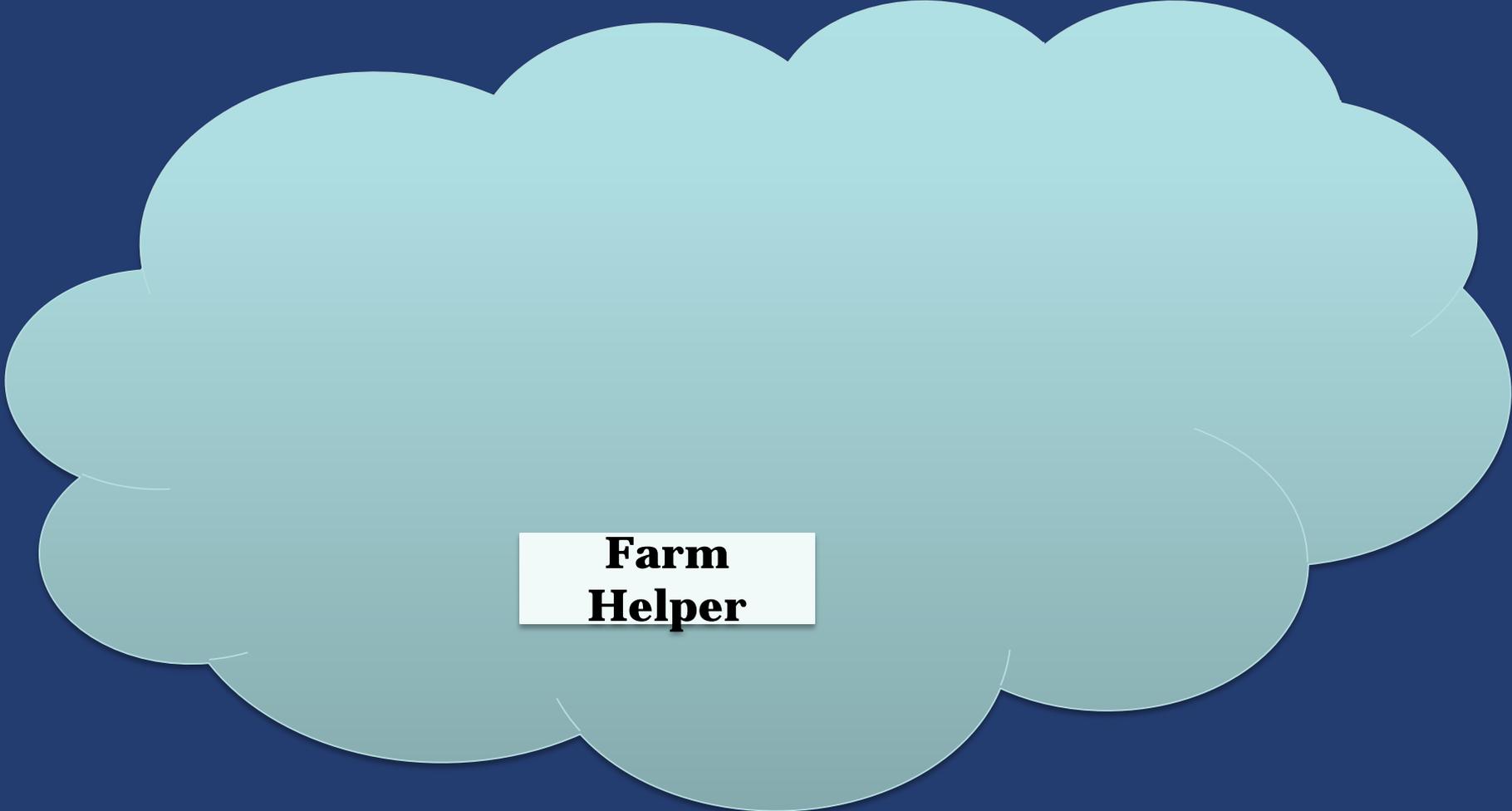
Agriculture	Manufacture	Service	Knowledge
Land, seeds, labor	Labor, machines, raw material	Skilled people	Highly educated people who can innovate

How can knowledge enhance
all conventional components of
economy?

imagine



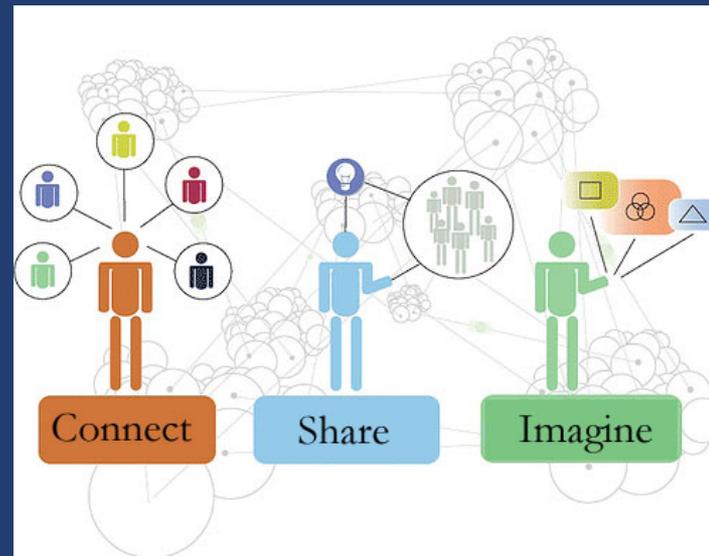
meets



**Farm
Helper**

with this

- Latitude: $38^{\circ} 57'36''$ N
- Longitude: $95^{\circ} 15'12''$ W
- Date: 10-9-2007
- Time: 1345h



Six billion brains

giving the farmer precise guidance on
the solution to his challenge

Status and competition

Where India and Gujarat stands?

What are other countries doing?

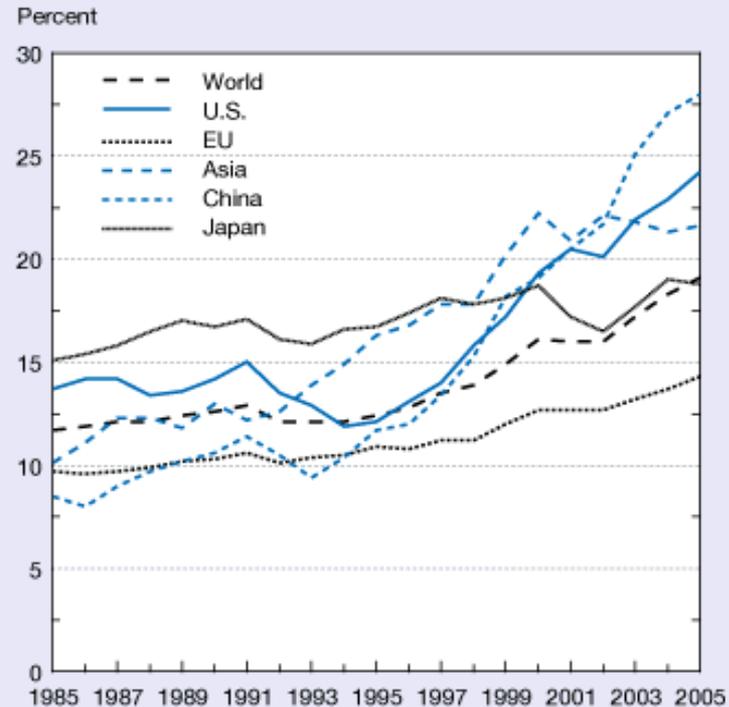
“Taken together, these activities have spawned trends that are reshaping the world's S&T economy, now dominated not only by the United States and the EU, but also by selected Southeast and South Asian economies. The broad changes, generally starting in the mid-1990s and continuing unabated, have the United States holding its own in terms of (generally high) world shares, the EU-25 losing some ground, and the Asia-10 group increasing its world share. In Asia, Japan is losing world share on many indicators, while China is rapidly gaining ground, especially since the mid-1990s.”

Science & Engineering Indicators2008, National Science Board

http://www.nsf.gov/statistics/seind08/slides_thumb.htm#kie

What happened with high technology manufacturing as part of manufacturing will happen to knowledge-intensive services as part of services

Figure O-9
High-technology manufacturing share of total manufacturing, by region/country: 1985–2005



EU = European Union

NOTES: Asia includes India, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan, and Thailand. China includes Hong Kong.

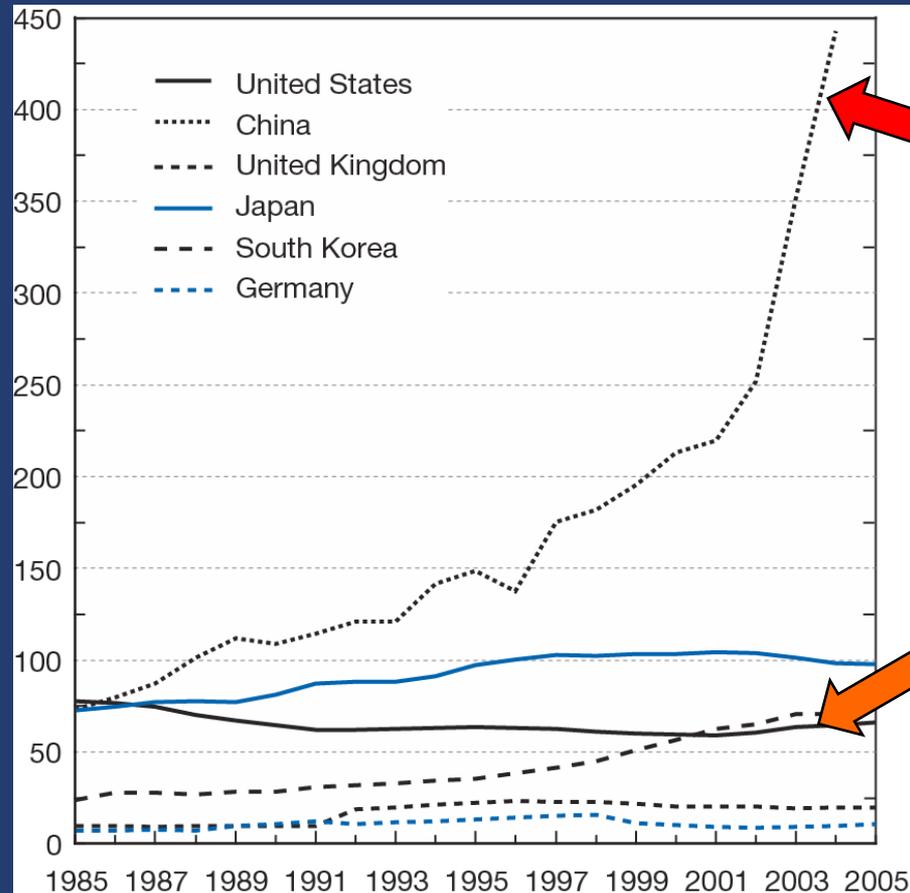
SOURCE: Global Insight, Inc., World Industry Service database, special tabulations.

India and Gujarat need to pay attention to the same issue as does USA

To retain global economic leadership, “Measuring the Moment: Innovation, National Security, and Economic Competitiveness” noted:

“We face strong competition from a state-managed science and technology research program in China. That draws American capital, talent, and research efforts out of the U.S. and over to China. **If we are going to remain competitive, we need to focus our basic research at home and put more resources into funding it.**” [Wortzel]

First university engineering degrees, by selected country: 1985–2005



NOTES: German degrees include only long university degrees required for further study.

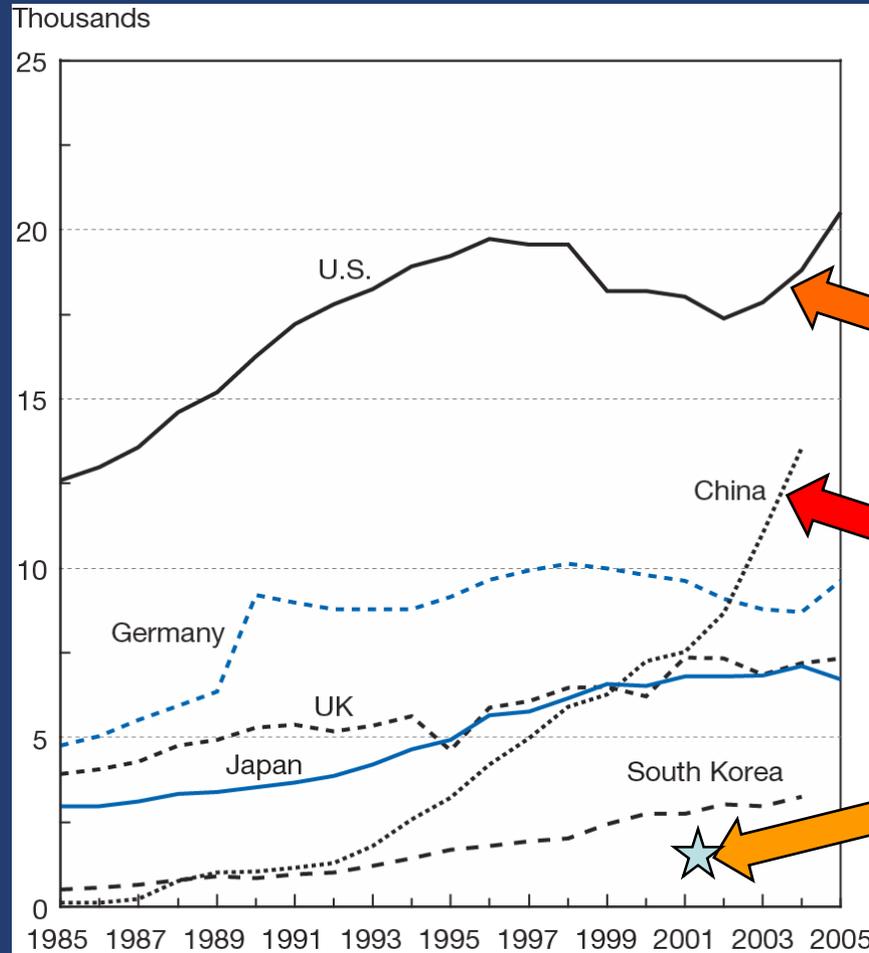
Science & Engineering Indicators 2008, National Science Board

http://www.nsf.gov/statistics/seind08/slides_thumb.htm#kie

Natural sciences and engineering doctoral degrees, by selected country: 1985–2005

Science & Engineering Indicators 2008, National Science Board

http://www.nsf.gov/statistics/seind08/slides_thumb.htm#kie



UK = United Kingdom

NOTE: Natural sciences and engineering include physical, biological, earth, atmospheric, ocean, agricultural, and computer sciences; mathematics; and engineering.

India

India has seen tremendous success

Stereotypical belief that the development of advanced technologies always takes place in developed countries abroad is no longer true

- Ranbaxy takes leading role in collaboration with GlaxoSmithKline
- Flagship products for Oracle, Adobe, and many more major companies get developed in India
- R&D labs of Google, IBM, GE etc do the same class of work as their counterpart in US and home countries

But

Limited supply, raising cost, competition, lack of innovation are talking toll:

- at Adobe, half of its top engineers stationed in India are graduates from IIT; 70-80% of IBM Researchers got PhD from outside India, mainly US
- Spiraling employee costs and the talent shortage
- Ireland, Israel, Philippines, China, etc are giving tough competition
- There has been little incentive or desire to innovate

* **B. Indira, India's IT Sector Needs to Reboot, Asian Sentinel, Oct 17, 2007/**

India's college problem: poor quality of much of India's college education

The job market for Indian college graduates is split sharply in two. With a robust handshake, a placeless accent and a confident walk, you can get a \$300-a-month job with Citibank or Microsoft. With a limp handshake and a thick accent, you might peddle credit cards door to door for \$2 a day.

From http://neweconomist.blogs.com/new_economist/economy_india/index.html

Based on New York Times: A College Education Without Job Prospects

India's college problem and outsourcing

In the shadow of those marquee institutions, most of the 11 million students in India's 18,000 colleges and universities receive starkly inferior training, heavy on obedience and light on useful job skills.

From http://neweconomist.blogs.com/new_economist/economy_india/index.html

Based on New York Times: A College Education Without Job Prospects

Low access to Quality Higher Education

India still produces plenty of engineers, nearly 400,000 a year at last count. But their competence has become the issue.

Nasscom: **one in four engineering graduates is employable.**

The best and most selective universities generate too few graduates, and new private colleges are producing graduates of uneven quality.

Nilekani (Infosys): India could educate its young and open job opportunities for them, or be left with a large, potentially restive pool of unskilled, unemployable youth. “It is a golden opportunity,” he said, “which can be frittered away if we don’t do the right thing.”

From http://neweconomist.blogs.com/new_economist/economy_india/index.html

Based on New York Times: A College Education Without Job Prospects

IITs are not a role model

The IITs were to focus on research and PG education to keep India on the leading edge of knowledge in S&T ..
...to educate PhDs who would lead R&D in India's industries and serve on the faculties. The IITs would thus have created a multiplier effect and a culture of innovation.

But none of the IITs rank in the top 100 institutions in the world in research, and IIT professors and graduates hold few significant patents. MIT's annual research output dwarfs that of all the IITs combined. Nor are the IITs graduating enough PhD students to meet the faculty needs, let alone create a national culture of innovation. They are unable to attract good students for PG work.

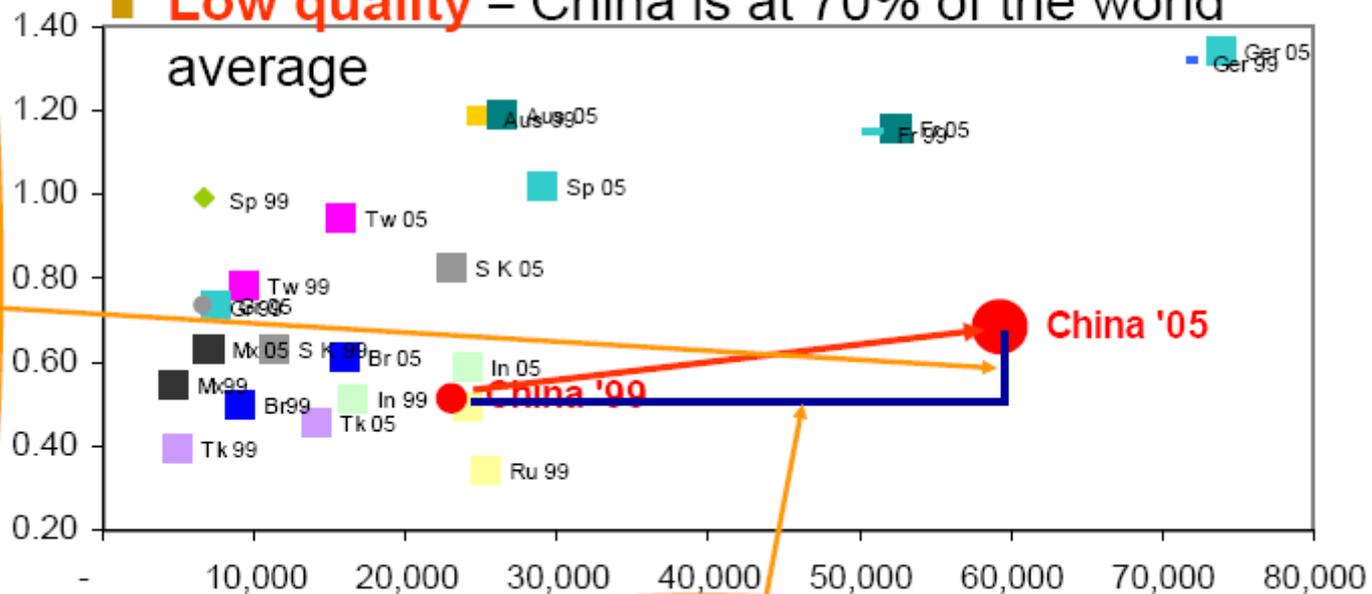
Quality and quantity growth

Sidestep: Global Emerging markets....

■ **High quantity** – exponential growth since 1999

■ **Low quality** – China is at 70% of the world average

Field Weighted Relative Impact



Number of papers

Likely future successful Higher Education model: China

Massive Investment:

- 100 Computer Sc in less than a decade,
- Larger of the programs can each accommodate thousands bachelors, several hundred masters, ~100 PhD students
- A significant percentage of instructors educated in the US and other Western countries;
- Facilities second to none

Resume of a Indian applicant for US Studies (pg1)

Second year, third semester student in
Communication Engineering CGPA (7.447/10)

EDUCATIONAL QUALIFICATIONS

- Cleared IIT-JEE 2006 with All India Rank-951 among 2,60,000 candidates
- Achieved 85.6% marks in Secondary School Examination, 2003
- 85% marks in Senior School Certification Examination, 2005
- Cleared REGIONAL MATEHMATICS OLYMPIAD, 2004
- Placed among 1% of all the participants in NATIONAL STANDARD EXAMINATION in PHYSICS, 2004
- Learning Java, good skills in C++

Resume of a Indian applicant for US Studies (pg2)

TECHNICAL PROJECTS

- Developed a site (using HTML) as a part of Software Development Section, Hobbies Club, IIT Roorkee , forexhibition in Srishti -2006, annual technical exhibition of Hobbies Club, IIT Roorkee.
- Active member of Web Designing and Software Development Section, Hobbies Club, IIT Roorkee.

Resume of a Chinese applicant (pg1)

RESEARCH INTERESTS:

Knowledge acquisition, information extraction, description logic, web reasoning

EDUCATION

Jilin University, Changchun, Jilin P.R. China. M.S.,
Computer Software and Theory (graduation: July 2009)

ADVISOR: Professor Jigui Sun

Resume of a Chinese applicant (pg2)

AREA OF STUDY:

Information Extraction, Knowledge Acquisition, Web Reasoning

TECHNICAL SKILLS EXTENSIVE:

- Java
- C and C++
- Prolog
- Heskell and SQL
- ProtegeStanford NLP package
- RDF
- OWL
- SWRL Jena2
- FaCT++
- KAON2
- Pellet
- XML
- KIM
- MR3
- HTML parser
- XML parser

Resume of a Chinese applicant (pg3)

Experience

- *Intelligent Information Processing Labs* June 2006 to present
- Design and implement a method to extract information from semi-structured and unstructured Web documents based on domain ontologies. Propose a method to select the outstanding patterns from the extracted patterns learned through tags and texts. Implement a tool which can do lexical analysis and morphological analysis. Design a method to merge the extracted knowledge by searching the KB. Implement an intelligent search engine based on domain ontologies for users to query the knowledge about stocks.
- *Intelligent Plan and Automated Reasoning Labs* September 2005 to May 2006

Resume of a Chinese applicant (pg4)

Publications (10)

- Authors , “Domain ontology learning and consistency checking based on TSC approach and Racer”. *Proc. of the Intl Conf on Web Reasoning and Rule Systems (RR 2007)*, LNCS 2007.
- Authors, “A general method of mining Chinese Web documents based on GA&SA and position-factors”. *2007 Intl Workshop on High Performance Data Mining and Application in Conjunction with PAKDD07*, Springer Verlag, 2007.
- “WDM: A new efficient visualization method of classifying web documents based on SOM,” *Proc. 3rd Intl. Conf. on Computational Intelligence and Security (CIS 2006)*, IEEE CS, 2006.
- Xi Bai, Jigui Sun and Haiyan Che. “WebKER: towards wrapper learning-based knowledge extraction,” *Submitted to ISWC 2007 poster and demo track*.
- Authors, “KEROB: extracting and querying knowledge hidden in blogs,” *Submitted to IDEAL 2007*.

Academic Experience

Attending Asia Autumn School for Semantic Web 2007, Busan, Korea, 2007.

Attending Workshop HPDMA 2007 on Conference PAKDD 2007 as an author, Nanjing, China, 2007.

Attending Conference CIS 2006 as an author, Guangzhou, China, 2006.

Attending Native Conference SIKIT 2006 as an author, Beijing, China, 2006.

Researchers per million

India: 157

China: 633

USA: 4,526

India has invested far less in science, in higher education and in research.

Indian investment in science – less than 2%.
Other competition 4-6%.

Learning from successful Higher Education models: US

BS/BE (4) + MS (2) + PhD (4-6)

Many research universities

(Relatively) Robust federal and state funding

Faculty spend significant time in research, close involvement of students, technology transfer

Well understood benefits & characteristics

- MS: advanced learning: technology and skills
- PhD: leadership, learning how to learn, ability to innovate and develop IP

Likely future successful Higher Education model: China

Robust research funding modeled on West

Policy that strongly encourages
international competitiveness

(e.g. professors get promotion based on
publications in ISI indexed journals)

China's transformative Hi-ed policy

Goal: influencing the global economy- maintain high growth by using educational transformation as the primary mechanism for skill upgrading and raising total productivity.

Objectives:

- quintupling enrolment -more Ph.D. engineers and scientists in China by 2010 than in the US
- access to higher education for rural households
- a shift from quantity to quality

China's transformative Hied policy

- Differentiations: (a) focused on elite universities, and new academic contracts differ sharply from earlier ones (b) *unlike India's focus on primary & secondary education, China has focused on upgrading higher education.*
- Results: Higher Ed growing at approx. 30% per year since 1999, and the number of graduates at all levels of higher education has quadrupled in the last six years. Skilled labour supply in China now equals around 40% of that in all OECD countries. Major implications for global trade both directly in ideas, and in idea-driven products.

If we want to compete with China...

- *A shift from quantity to quality: High priority is placed on international rankings, taken as publications in international journals, citations, and international cooperation. These measures of attainment are directly linked to institutions' funding.* It is not uncommon for an annual target of three international publications to be set for faculty members, and failure means termination of employment.

Higher Education in Gujarat Today: example of Information & Communication Technology

- DA-IICT
- Nirma University
- IIT

Too few institutions, with too few professors: PhDs get 2-3 times more in Industry so good educators are not found. Education is mostly outdated, class room and text book centric

In all of Gujarat, only DAIICT has research-oriented faculty with PhDs, engaging a handful of students in research!!

Lets's aim

- India currently has 2 universities in 300s among top 500 universities in the world. China has 23.
- Can we target one university in Gujarat in top 500 in the world in next 5 years?
- Can we target one university in Gujarat in top 100 in the world in next 10 years?

What is needed to drive the growth?

Policy, Capital and Educated/skilled workforce

Capital is the least of the challenge and I think currently we have policy makers who can step up to the challenge. But education and workforce development requires strategic thinking and investment— something we have not done.

Suggestions

Prepare for longer term, sustainable progress with Higher education and research on the model of world class research university.

Start a **National Research University** using key ideas from the National Knowledge Commission and additional expert inputs (an apolitical think tank?).

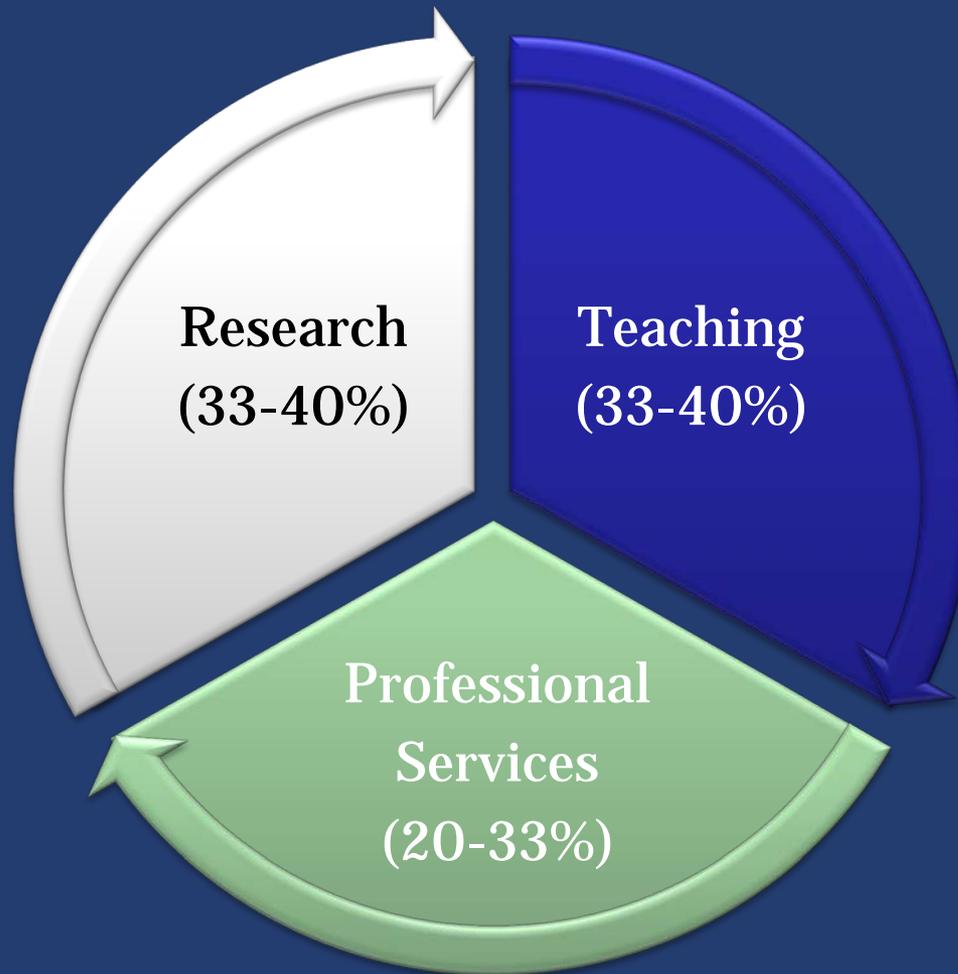
Proposed Initiative (Cont'd)

- Start with departments of special relevance to Gujarat's industry and strategic importance for participation in knowledge economy
- Post graduate education and research with special focus on faculty of other institutions seeking PhD during first 5 years
- Develop a model for competitive research (work with federal govt; seeded by state) - fund graduate students and faculty research

Proposed Initiative (Cont'd)

- Privately funded but facilitated by State; CM's leadership can convince a major foundation to establish it
- Get visionary and internationally recognized leaders as directors and chairs who can achieve results; World class faculty focusing on graduate education and international quality research; academic freedom with mandate to achieve impact, competitive compensation
- Couple with a Research Application Institute to support technology and company incubation, technology transfer and commercialization, IP management
- International advisory board

Academic Excellence in Research Universities



Example of a Student: Meena Nagarajan



Internships and Collaborations

HP Labs Systems and Storage Team
IBM Almaden Research Semantic SuperComputing group
School of Information, UC Berkeley

Professional Achievements (including funding)

WSDL-S W3C submission (co-author)
IBM UIMA Innovation Award 2007: Primary contributor (proposal based on my work) to winning proposal "UIMA-Based Infrastructure for Summarizing Casual, Unstructured Text"
Microsoft's Beyond Search - Semantic Computing and Internet Economics Award 2008: Primary contributor (proposal based on my work) to the winning proposal "Chatter, Intent and Good Karma for Targeted Advertising in Social Networks"

Program Committee Member

CIKM 2007, IEEE ICSC 2008, Ontology Matching Workshop (ISWC 2007)

Publications – 2 journal, 5 conf., 3 workshops, 1 book chap., W3C

M. Nagarajan, K. Verma, A. Sheth, J. Miller, "Ontology Driven Data Mediation in Web Services", Journal of Web Services Research Vol. 4(4), 2007

Prescriptions ...1

- Most important is the **leadership** by political leaders, policy makers
- Attract top **talent** (most professor level appointments are not filled)
- Give **independence**, make it worth while
- Make it **competitive** – education and research are not high what Gujarati considers to be success; make research and graduate training part of faculty job requirements

Prescriptions ...2

- Leverage collaborations with top international places and experts; promote **collaborations** between industry and academic research
- Recognize importance of multidisciplinary research and course work
- Competitive research grants and study abroad
- Adopt policies that require and value higher achievement (international achievement)
- Start at early stage (invest in VASCSC, CSCs)

Making PhD more appealing

- Show role models – what can you achieve in life if you had PhD
- Make it engaging and challenging – by doing international level, highly competitive research under the guidance of world class researchers/academics
- Make it easier – support through research funds (nearly 100% of full time PhD students in US, Europe, Australia, and China are funded (stipend + no tuition))

Making the profession of educator more appealing

- Academic Freedom – bedrock principle in developed countries; tenure is a key (but must be 100% merit based process)
- Prestige – if the institution they are working for is prestigious
- Remuneration – can't be less than 75% of what industry pays
- Resources – competitive funding ; those successful must be able to travel internationally



Academic Freedom and Independence

President-elect Obama (when discussing his commitment to research and science):

...the truth is that promoting science isn't just about providing resources--it's about protecting free and open inquiry. It's about ensuring that facts and evidence are never twisted or obscured by politics or ideology. It's about listening to what our scientists have to say, even when it's inconvenient--especially when it's inconvenient.

*What will political & bureaucratic interference bring:
See Airbus and Gazprom!*

Critical ingredient

If the policy makers and bureaucrats allow complete **autonomy**, it is possible for 1000s crores to be invested in starting new higher education institutions that can have Gujarat rival the state in the south who have done much better so far.

- World class researchers should play leadership role— eg, choice of a Nobel laureate as Energy Secretary by President Obama
- Faculty recruitment and student admission should not have any politics or criteria beyond merit.

However it is not so easy

- How long does it take to construct a building?
- How long does it take to earn a PhD?
- How long does it take to train PhD's to be effective leaders? (6 to 20 years!)
- Changing culture and value system may take even longer

But not doing anything is not an option

Changing economy is also supposed to take much longer and yet that is happening much faster in the flat world

Gujarat Marching in the Right Direction

- One or two national level university – DAIICT which has research culture, all its Profs. are PhDs- some from prestigious institutions, offering PhD, IIT is being built
- Significant new plans for Hi-Ed institutions:
 - Knowledge Park
 - Knowledge City
 - Ahmadabad University

Observations

Most plans/announcements consist of

A promoter, a couple of advisors with academic administration experience in Gujarat, land acquisition, funds committed and the subject areas of education.

What about world class research and education excellence (e.g., Raj Reddy for IIIT Hyderabad)?

A comment about some of the Education projects

- Find a role model and a thought leader... “guru bina gyan kaha se..?”
- People define the outcome, not investments:
Promoter and Advisors: do we see international academic/research leaders involved in these projects?
- Collaboration for branding is hollow – it is hard to build a brand on borrowed brand!

What do we need to do?

- **Students:** Explain the benefits of research-based hiEd— show role models; provide resources: PhD studies should be financially supported
- **Faculty:** balanced approach to research, class room teaching and professional services; cannot do research while teaching 4 or more courses at a time; honor and reward accomplishments; must however show results at international level; compensation cannot be substantially below industry
- **Curriculum and resources:** no scope for rote learning; world class labs; international travel and collaboration, **multidisciplinary**

What do we need to do? ...contd

- **Institution:** autonomy, flexibility, agility; world class leadership
- **Sponsors:** strategic investment and collaboration – more than money making
- **Government:** ability to give complete “academic freedom”, set objectives and monitor progress, change incentives for bureaucrats, facilitate when needed, claim success!

NKC: address: **Over regulated but under governed**

Key opportunities & challenges

Post IT market with IT as a key enabler

- Energy, especially clean energy
- Life Sciences including Pharmaceuticals, Biotech & Health
- Logistics, shipping and transportation; Aerospace
- Knowledge Services (my wish) incl , Web science, nano science and eng, human effectiveness, disaster mgmt and recovery

What can NRGs offer

- 2%: investment
- What can 98% offer? (Lord Bhikhubhai Parekh)

Few good men (and women, of course)

What can Gujarat Diaspora do

Much of what Gujarati diaspora can offer is available just asking because of the connection with “matru bhoomi” and the desire to give back

- ask for advice/consultation, time and service
- Get their input on policy making
- develop visiting scholar exchange programs
- collaboration with research universities

Additional readings

- Altbach: Higher education in India [*To compete successfully in the knowledge-based economy of the 21st century, India needs enough universities that can support sophisticated research.*]
- Roy: A Comparative Study of Higher Education Expansion Policy in China & India: Theory & Practice [esp. see slide 29: Strategies for Quality Improvement & Achievement (2 of 5)]
- Higher Education in Developing Countries (World Bank report)
- Higher Education and Economic Development: India, China, and the 21st Century
- Kapur and Crowley: Beyond the ABCs: Higher Education and Developing Countries - Working Paper 139 [esp. see Section 7 on Research Agenda]
- Academic ranking of world universities [only two universities from India make into top 500]
- The Knowledge Economy: Is United States Losing its Competitive Edge, the Task Force on the Future of American Innovation, February 2005
- Education and Earning
- Does Education Matter? Where are good jobs created?
- *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*
Committee on Prospering in the Global Economy of the 21st Century: An Agenda for American Science and Technology, National Academy of Sciences, National Academy of Engineering, Institute of Medicine, 2007.
- **More Quality Ph.Ds, National Knowledge Commission, December 2008**
- **Towards a Knowledge Society – Three Years of the National Knowledge Commission, October 2008.**

See associated white paper for a quick summary of ideas captured
in this presentation

Thank you

Questions?



About the speaker

Amit Sheth (<http://knoesis.wright.edu/amit/>) is an Educator, Researcher and Entrepreneur. He is the LexisNexis Ohio Eminent Scholar, a fellow of the Institute of Electrical and Electronics Engineers, and the director of the Knowledge enabled Information & Services Sciences ([Kno.e.sis](#)) Center in the Computer Science and Engineering department of the Wright State University, Dayton, Ohio. Earlier he was at the University of Georgia where he started the LSDIS lab in 1994 and he served in R&D groups at Bellcore, Unisys, and Honeywell. He received his BE from BITS, Pilani and his MS and PhD from the Ohio State University.

Prof. Sheth's research has led to two commercial companies which he founded and led as President/CEO, several Enterprise and Web based products and many deployed applications. His is one of the best cited authors in Computer Science (250 publications, over 14,000 citations, h-index of 57), has given over 200 invited talks and colloquia including 30+ keynotes, (co)-organized/chaired over 45 conferences/workshops, and served on over 125 program committees. He is on several journal editorial boards, and serves as Editor-in-Chief of two international journals and as series editor of two Springer book series. He is deeply interested in Gujarat's success through better higher education and research.