Strategic Importance of Higher Education and Research in Positioning Gujarat for Global Competitiveness

A plenary talk at the conference on Global Gujarat & its Diaspora
Hemchandracharya North Gujarat University, Patan, Jan 17-19, 2008
Prof. Amit Sheth
LexisNexis Ohio Eminent Scholar
Wright State University, Dayton OH http://knoesis.org
The World Is Flat
A BRIEF HISTORY OF THE TWENTY-FIRST CENTURY
Thomas L. Friedman
## Shift in Labor from Agriculture and Mfg to Service in Major Economies

<table>
<thead>
<tr>
<th>Nation</th>
<th>World Labor (% of total)</th>
<th>Agriculture %</th>
<th>Goods %</th>
<th>Services %</th>
<th>Services growth (% increase in last 25 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>21.0</td>
<td>50</td>
<td>15</td>
<td>35</td>
<td>191</td>
</tr>
<tr>
<td>India</td>
<td>17.0</td>
<td>60</td>
<td>17</td>
<td>23</td>
<td>28</td>
</tr>
<tr>
<td>U.S.</td>
<td>4.8</td>
<td>3</td>
<td>27</td>
<td>70</td>
<td>21</td>
</tr>
<tr>
<td>Indonesia</td>
<td>3.9</td>
<td>45</td>
<td>16</td>
<td>39</td>
<td>35</td>
</tr>
<tr>
<td>Brazil</td>
<td>3.0</td>
<td>23</td>
<td>24</td>
<td>53</td>
<td>20</td>
</tr>
<tr>
<td>Russia</td>
<td>2.5</td>
<td>12</td>
<td>23</td>
<td>65</td>
<td>38</td>
</tr>
<tr>
<td>Japan</td>
<td>2.4</td>
<td>5</td>
<td>25</td>
<td>70</td>
<td>40</td>
</tr>
<tr>
<td>Nigeria</td>
<td>2.2</td>
<td>70</td>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>2.2</td>
<td>63</td>
<td>11</td>
<td>26</td>
<td>30</td>
</tr>
<tr>
<td>Germany</td>
<td>1.4</td>
<td>3</td>
<td>33</td>
<td>64</td>
<td>44</td>
</tr>
</tbody>
</table>

Source: www.nationmaster.com
### Perspectives on Measurement of Work

<table>
<thead>
<tr>
<th>Notion of Work</th>
<th>1800s</th>
<th>1900s</th>
<th>2000s</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is transformed</td>
<td>Physical System</td>
<td>Information System</td>
<td>Service System</td>
</tr>
<tr>
<td>Example (Measurement)</td>
<td>Steam engine (Mass, Distance, Time)</td>
<td>Search engine (Computational Complexity)</td>
<td>Offshore call center (Time, Cost, Skill level)</td>
</tr>
<tr>
<td>Compliance Laws</td>
<td>Physical</td>
<td>Logical and Mathematical</td>
<td>Legal, Cultural, and Contractual</td>
</tr>
</tbody>
</table>

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Service systems, service scientists, SSME, and innovation
P. Maglio, S. Srinivasan, J. Kreulen, J. Spohrer
CACM July 2006.
Next to Knowledge economy

<table>
<thead>
<tr>
<th>Agriculture</th>
<th>Manufacture</th>
<th>Service</th>
<th>Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land, seeds, labor</td>
<td>Labor, machines, raw material</td>
<td>Skilled people</td>
<td>Highly educated people who can innovate</td>
</tr>
</tbody>
</table>
Science then, then and now

In the beginning, there was thought and observation.
Science then, then and now

For a long time this didn’t change.

• Man thought it would be enough to reason about the existing knowledge to explore everything there is to know.

• Back then, one single person could possess all knowledge in his cultural context.
The achievements are still admirable ...

...as we can see

Reasoning and mostly passive observation were the main techniques in scientific research until recently.
Science then, then and now

A vast amount of information
Science then, then and now

No single person, no group has an overview of what is known.

Known, But not known …→ not known
For example, Biology now is a data driven science. Vast amount of distributed information, large knowledge bases, distributed computing, collaboration and man-machine interaction make new discoveries possible.
My research – tied with Web’s evolution

Web of pages
- text, manually created links
- extensive navigation

Web of databases
- dynamically generated pages
- web query interfaces

Web of services
- data = service = data, mashups
- ubiquitous computing

Web of people
- social networks, user-created content
- GeneRIF, Connotea

Web as an oracle / assistant / partner
- “ask the Web”
- using semantics to leverage text + data + services + people
India and Gujarat are benefiting from Globalization, but as is the case for the West, this is a two way street. And it offers significant challenges.

For long term success and sustainable progress, we need a healthy mix of technology, entrepreneurship, higher education and world class research.

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

What challenges Gujarat faces? What are possible solutions?
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.

India was once divided chiefly by caste. Today, new criteria are creating a different divide: skills. Those with marketable skills are sought by a new economy of call centers and software houses; those without are ensnared in old, drudgelike jobs.

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

Unlike birthright, which determines caste, the skills in question are teachable.

But the chance to learn such skills is still a prerogative reserved, for the most part, for the modern equivalent of India’s upper castes — the few thousand students who graduate each year from academies like the Indian Institutes of Management and the Indian Institutes of Technology. Their alumni, mostly engineers, walk the hallways of Wall Street and Silicon Valley and are stewards for some of the largest companies.

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.

Based on New York Times: A College Education Without Job Prospects
It was bound to happen, but it's a remarkable story nonetheless. Thousands of jobs taken by India from the west are being re-exported as wages shoot up.

Based on The Guardian's Randeep Ramesh: India outsources outsourcing
The rise of an economic phenomenon about to engulf the world: outsourcers are outsourcing themselves. Once known for sucking jobs out of call centres and IT departments in the west, Indian technology firms are re-exporting them to wealthier nations as wage inflation and skills shortages at home reverse the process.

Tata is running call centres in Britain. ABN Amro, the Dutch bank recently bought by an RBS consortium for £48bn, will pay Tata Consultancy Services $200m to send work halfway across the globe to Brazil, where software programmers will run computer systems.

Based on The Guardian's Randeep Ramesh: [India outsources outsourcing](http://neeconomist.blogs.com/new_economist/economy_india/index.html)
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.”

Based on New York Times/S. Sengupta, Skills Gap Hurts Technology Boom in India
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

Massive Investment:

– 100 Computer Sc in less than a decade,
– Programs can 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
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)
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%.
Enrolled as a second year, third semester student in the course Communication Engineering. CGPA (7.447/10)

Educational qualifications
Cleared IIT-JEE 2006 with All India Rank-951 among 2,60,000 candidates.
Cleared REGIONAL MATEHMATICS OLYMPIAD2004.
Placed among 1% of all the participants in NATIONAL STANDARD EXAMINATION in PHYSICS-2004.

Learning Java, good skills in C++

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 (expected graduation date: July 2008). Advisor: Professor Jigui Sun

Area of Study: Information Extraction, Knowledge Acquisition, Web Reasoning

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 (pg2)

Publications (10)


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

Continue to add to job seeking education and technical skills that help us provide outsourced services **BUT**

Prepare for longer term, sustainable progress with Higher education and research that enables us to do built leadership and intellectual property that will

- allow Gujarat/India to move up in the value chain,
- be less subject to the work that can be outsourced,
- get better share of what is now the start of the knowledge economy
Prescriptions ...

- 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
- Competitive research grants and study abroad
- Adopt policies that require and value higher achievement (international achievement)
- Start at early stage (invest in VASCSCC, CSCs)
Proposed Initiative

Establish the Gujarat Graduate Research Institute to promote world class research and demonstrate a higher education and research model, which acts as a centerpiece of an intellectual center

- Privately funded but facilitated by State
- CM’s leadership can convince a major foundation to establish it; state can provide facilities/land in the knowledge park and facilitate regulatory approval
- Get visionary 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
Proposed Initiative .. contd

- Start with departments of special relevance to Gujarat’s industry and strategic importance for participation in knowledge economy, such as: biomedicine, pharmaceuticals, health sciences, knowledge services, Web science, nano science and engg, human effectiveness, disaster mgmt and recovery

- Post graduate education and research only but 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

- Couple with an Research Application Institute to support technology and company incubation, technology transfer and commercialization, IP management

- International advisory committee
However it is not so easy

- How long does it take to build a building?
- How does it take to do a PhD? To train that PhD into an effective leader? (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
What can NRGs offer

- 2%: investment
- What can 98% offer?

Lord Bhikhubhai Parekh
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
• Thank you

• Questions?