

It is a privilege to address IIT alumni today.

The Indian Institutes of Technology are more than just a family of universities to me. They are part of my family history.

My father was a founding member of the Kharagpur faculty, so I first came to Kharagpur when the Hijli detention camp was being transformed from penal colony to Institute of technology.

It was a mark of India's new leadership that they created, in Hijli, not a museum of iniquities, but a University dedicated to the improvement of India through technology.

As Nehru said, the IITs represented: "*India's future in the making.*" The Indian Institutes of Technology represent a founding faith in the ability of Indians to transform India.

This faith was rooted in awareness of the past.

Whether Wootz steel, or Nalanda University, or Kulti, home of the first Indian blast furnace, or Asia's largest car factory in Uttarpara, India's past told our leaders that whatever the restraints of empire, the new nation possessed the ability to *make India's future*.

It is fitting therefore that the theme of this conference is 'transforming India'.

After all, since independence, India has been transformed from Cotton economy to BRIC nation.

Today, we know where we have succeeded - constitutionally, in preserving freedom and democracy. Economically, in services, in IT, in Biotechnology.

We know too where we fall short.

In recent decades it was relatively easy to do well.

You could get a license, or get an MBA, some contacts and a contract to supply a defined service to a corporation.

So we had a lot of products and services made in India, but few made BY India.

With a weak global economy creating spare capacity in the “developed” economies, the era of “growth through outsourcing” has ended.

Now growth is stuttering, partly because of global weakness, but also because investment is too low, our manufacturing and infrastructure is weak, our decision-making stagnant.

These are long term problems that cannot be solved by the passing of a law or the removal of a regulation.

We have to find a long term path to growth.

I believe a culture of innovation through technology is central to India’s next transformation: the shift to general prosperity.

It's always harder to build a future through innovation, research and technology than through temporary trading advantage from lower costs, but it is much more permanent.

This is why IITs matter to India's future.

Over the years, the IITs have not *just* been centres for world class scientific education and research.

They have also created the leaders, the change-makers, the creative sparks who have driven India's development over the last sixty years.

In the list of speakers at this conference you can see how IIT alumni are shaping India and the world.

To pick just two examples, Harish Hande's work on sustainable energy and Professor Basu's work in assistive technologies for the disabled show how technological innovation transforms lives far beyond the classroom or laboratory.

Kalpana Kochhar has argued in a paper for the IMF that a key reason for India's unusually structured economic success after liberalisation was the existence of a small, but *highly capable* services and manufacturing workforce.

Dr Kochhar showed India had "*a far greater investment in tertiary education for a country of its... income*" and "*Indian Institutes of*

*Technology...*” created “*capabilities that did not exist in the typical poor country*” allowing India to “*follow a different growth path*”.

This matters a great deal, because we all know India does not even come close to matching China on traditional measures like foreign investment, infrastructure or advanced manufacturing facilities.

I visit China regularly, and see magnificent bridges, rapid-transport systems, fast-built special economic zones.

In India, we have teeming cities, crumbling roads and drawn-out political struggles over a few hundred acres for a factory.

We can wail about this, and should try to change what we can, but we must *also* make the most of any chance to take a “*different path to growth*” .

The key lies in what Kochhar calls “*creation of capability*”.

This is the ability to develop and exploit new ideas that leapfrog the traditional national path to growth, by producing something - whether a product or a service- better than anywhere else in the world.

It’s appropriate that we are joined by Ambassador Powell, because institutions like MIT and Caltech show us how such capability is created.

Technology research creates ecologies of innovation where solutions are found to problems from natural gas extraction, to computing, to materials science and nano-technology.

Examples of the centrality of domestic innovation can be found across Indian business.

Would Tata Motors have had the ability to design the Nano if it had not developed the Research and Development capability to design the Indica first?

Would Wipro have developed its world leading software capability without employees who had learned how to build and programme computers from the inside out?

Would Mahindra and Mahindra been able to develop the Scorpio SUV without leaders like Dr Pawan Goenka, a graduate of IIT Kanpur with global experience?

With the heritage of the IITs, India's history of innovation, and the strength of our intellectual diaspora, it is within India's reach to be a global giant in innovation and technology research.

This will drive Indian growth in the long term.

However, we must be frank.

For all the successes in this hall, for all the IIT graduates doing inspiring work, for all the engineers working overseas, India is far from where she needs to be.

Here in Bengal, we have everything - natural resources, location, population, intellectual capital, needed for success - but we lack the hunger to put these things together for the common good.

If we are to change this, the “*creation of capabilities*” must *both* be improved at the very top *and* spread more broadly.

At the top, India has three of the world’s top four hundred Universities.

All are IITs.

China has nine. Add to that five in Hong Kong, and you see a research and innovation gap emerging, alongside infrastructure and manufacturing gaps.

So we must press ahead with the World Class Innovation Universities the centre has proposed.

But our universities must change too.

World class institutions need the best faculty, and to teach students with the methods of the world’s best universities. That means financing levels must increase, and investment in facilities must jump up.

Let me put it simply. You can't expect MIT results on nursery school budgets. If we want Universities to transform India, we need to transform Universities, from the fee and loan system to teaching styles.

We also need our "innovation universities" to truly look outwards. That means our new innovation universities must be better integrated into the economy and into their communities.

This year, I had the chance to visit IIT Bhubaneswar, the newest addition to the IIT family - IIT Varanasi has existed for a long time!

IIT Bhubaneswar has created a partnership with steel and minerals companies to develop new material combinations that will help support Odisha's mines and address the imperative of carbon reduction.

My own WMG is joining this mission.

We are bringing together global steel and local mining companies, IIT faculty and WMG researchers to create experimental and computational approaches that will improve the material uses of Odisha's precious natural resources.

Nor is the value of innovative university research restricted to the private sector.

They also include our biggest social challenges.

Chief among these is the need to expand technical and vocational education to the Indian masses.

The World Bank tells us that India needs one point two million additional teachers just to meet the needs of the RTE act.

Yet less than ten per cent of applicants currently pass the Teacher eligibility tests. So how can we educate the next generation of children at the level we need?

Only through technological innovation. As A V Banerjee has argued, we must “*scale up the number of people that can be reached by a good teacher by using... technological means*”

In that light, the Aakash tablet becomes not a prestige project, but instead a spur to possibility and competition, pulling in investment and research to solve a common problem.

Similarly, the difficulty of manufacturing tablets in India underlines the need for universities to help develop India’s manufacturing sector, another huge challenge, especially important to job creation.

To do this we need more top class private universities, we need greater industrial investment in research *and* we need a rapid expansion of vocational education partnerships.

Whether in virtual car design, low carbon energy, nano-materials or data security and processing, the next generation of Indian



businesses need research and technical training facilities to put their employees at the cutting edge.

High-skill employers have a direct interest in liberating the talents of their workforce, from shop floor to research lab.

Universities are well placed to help deliver this, both in the workplace and on campus.

Finally, whether through student loan repayment or direct research funding, employers can provide the stable income educational bodies in India desperately needs to expand.

All this brings me back to the value of leadership.

The history of the IITs tell us the essential role of leadership in creating capability through innovation.

From industrial giants such as Tata to new giants like Wipro, to the social entrepreneurs and green growth advocates of SELCO, the common threads of education and innovation combine to create success.

As a graduate, I'm extremely proud of the IITs contribution to the changes in India since Independence.

If a very few IITs have been the key to the creation of so much capability, how much have we all lost in the crores of applicants who did not get such a chance?

We must now meet the challenge of expanding India's world class institutions **and** using our foundation of technical innovation to share that capability widely.

If we do this we will stay true to the visionaries who founded the first IITs in the midst of tumult, and will guide the nation through the greater transformations to come.

That is a prize worth fighting for.