

Sam Pitroda
Chairman

06 May, 2008

Dear Mr. Prime Minister,

Engineering education is among the key enablers of growth for transforming India's economy. The quality of teaching and research in this sphere will play a critical role in the emergence of our country as a global knowledge leader. It will also provide vital inputs for enhancing productivity across sectors. In the past two decades, we have seen an eight-fold increase in the number of institutions imparting engineering education at the undergraduate level. Yet, there are some fundamental issues that need to be addressed.

A glaring regional imbalance has emerged in the availability of engineering education. Two-thirds of the engineering institutions are located in four southern states, plus Maharashtra, even though they account for less than one-third of the population. There is much less access for the youth in under-provided states, particularly because only 15 per cent of the total seats are available for those who come from outside the state. It would be worthwhile to study whether there are any cultural or region-specific factors that influence the choice of engineering as a career in some states and not elsewhere. This could help make the spread of such colleges more even nationwide.

Several recent studies have flagged the problem of unemployability of engineering graduates, largely because curriculum and syllabi are not quite compatible with industry requirements. Further, the standards of a very large proportion of institutions at the bottom of the pyramid have also been found to be abysmal. Even good institutions are plagued by deficiency of quality students at post-graduate and research level. The problems are complex and deep rooted. The situation calls for a new paradigm in regulation, accreditation, governance and faculty development.

As part of its consultative process, NKC constituted a Working Group of experts from academia and industry under the chairmanship of Prof. M.S. Ananth, Director IIT Chennai. The names of the members are listed in the annexe to this letter. The Group has also considered the inputs provided by the earlier committees on this subject chaired by R.A. Mashelkar (1998), U.R. Rao (2003) and P. Rama Rao (2004). The study conducted by Professors Banerjee and Muley of IIT Bombay (2007) has also been taken into account. Based on inputs from the Working Group and consultations with other stakeholders, NKC proposes the following set of initiatives:

1. Reforming the Regulatory Framework

As stated in our earlier recommendations relating to Higher Education, there is a need to establish an Independent Regulatory Authority for Higher Education (IRAHE) to cover all streams. The role of the Standing Committee on Engineering Education under IRAHE would be to exercise due diligence at the point it approves entry for an institution to grant degrees/diplomas. The members of the Committee should comprise eminent educationists, education administrators and management specialists drawn from industry. The Committee would follow transparent and uniform processes, under the overall supervision of IRAHE. The Committee shall also determine the criteria and the processes of accreditation and license multiple agencies

for the same. A mechanism for ranking of institutions to enable students to take informed decisions at the time of admissions by stipulating grading norms and nominating independent rating agencies also needs to be established. These initiatives will enable the All India Council for Technical Education (AICTE) to focus on important issues such as curriculum development, pedagogy, faculty development etc.

2. Improving Governance of Institutions

In order to encourage greater flexibility and autonomy, there is a need to progressively do away with the system of affiliation of engineering institutions/colleges to universities. Where feasible, they should be given full autonomy. To attain greater transparency and accountability, it should be made compulsory for all engineering institutions to display information about their buildings, labs, faculty, intake of students, performance of students, recognition status and placements, on their websites. As emphasised by us repeatedly, appointments of Heads of Institutions must be made through the process of a Search Committee that has an independent Chair and is at an arm's length from the government. The direct involvement of administrative ministries in the process can result in unfortunate situations.

3. Attracting and Retaining Faculty

The most serious challenge in engineering education is the dearth of well-qualified faculty. Several measures must be undertaken in this direction:

- Institutions should be encouraged to create adjunct positions and invite professionals from industry and research institutions to participate in the teaching process.
- The criterion of holding a PhD for teaching undergraduate students may be relaxed to Master's degrees which are specifically designed with more course work in lieu of thesis. Special efforts should be made at the undergraduate level to identify and motivate those who have the potential as well as the inclination towards teaching.
- Incentives like better salary, modern infrastructure, better living and working environment, possibility of secondment to industry during vacations should be made available.
- Shortage of faculty could also be overcome by innovative use of Information & Communication Technology and Open Educational Resources (OER) by leveraging the content available from the best universities across the world.
- Several initiatives need to be undertaken to improve training and professional development of the faculty. A two-week teacher induction training course should be made compulsory. A one-day regional workshop on teaching/learning processes should be arranged as a part of the academic calendar. Course development should be made an integral part of the training programmes conducted by Academic Staff Colleges. Better opportunities may be created for continuing education using the distance mode.

4. Curriculum Reform

The current curriculum should be modified to provide greater flexibility, interdisciplinary perspective and choice of electives. The focus in the teaching/learning process should be on integrating skills such as problem solving and logical reasoning, process orientation, learning ability, English communication and programming fundamentals. Industry participation to discuss real life case studies should be encouraged. Laboratory courses must be revamped to develop a healthy attitude

towards experimental work. Environment must be created to encourage students to participate in co-curricular activities.

5. Integrating Sciences and Engineering Education

We have entered a period in history where the distinction between sciences and engineering has all but disappeared. Sciences are at the heart of engineering. To that extent there is no distinction between the two. In order to reduce the perceived gap between sciences and engineering we need to create mechanisms that allow mobility between the two streams. One option could be to start four year undergraduate programmes in sciences, initially in institutes of excellence where facilities for science programmes already exist. This would enable pursuing doctoral programmes in science and technology, without a Master's degree.

6. Encouraging Research

Several initiatives are necessary to promote research in engineering disciplines:

- Vibrant and well funded PhD programmes with opportunities for international exposure should be rolled out to attract students who currently go abroad for PhDs.
- The new academic and research institutions being established should be so located that they can optimise mutual collaboration. Likewise, existing academic institutions with active research programmes should be supported to set up high-tech industrial research parks in the vicinity of their campuses.
- Universities must become the hub of research once again to capture synergies between teaching and research. This will require changes in resource allocation, reward systems and mindsets.

7. Industry-academia interaction

In order to attain greater alignment of engineering education with employment opportunities, frequent dialogue with industry and government through seminars and workshops is necessary. To enhance employability, summer internships should be made an integral part of the curriculum. Restrictive provisions and the elaborate regulatory framework of the Apprenticeship Act 1961 have inhibited industry from adequately using the apprenticeship scheme for honing the skills of engineering graduates. Clauses need to be incorporated in the Act that will enable training in multiple skills (not just a specific trade) and allow entry to and exit from the scheme at different points in the education and career cycle. Likewise, industry needs to encourage continuing education programmes for their employees by collaborating with appropriate educational institutes. Academia and industry should engage in joint research to encourage innovation and competitiveness in the global economy.

8. Improve access

While the government would need to establish new institutions in the under-provided states, it must be emphasised that the recent proliferation of engineering institutions in the southern states is largely the result of private initiatives. A framework for public-private partnerships should therefore be developed in collaboration with the concerned states to establish new quality institutions.

9. Mentoring

Elite institutions should consider some additional responsibilities such as adopting a few engineering institutions of their choice and helping them raise their standards, creating and making available educational resources in the public domain for use of all students and conducting distance education courses, especially for students at the post-graduate level and working professionals. In particular, the existing IITs could mentor the new ones being established. The latter, in due course, could play a similar

role vis-à-vis others. Similarly, National Institutes of Technology and Regional Engineering Colleges could play a mentoring role for selected engineering institutions in their respective regions. Mentoring by its definition is a voluntary activity, but if we can create an atmosphere where institutions of distinction feel a sense of calling in the interest of the larger national good, it would transform our education.

We believe that the changes and reforms proposed in this letter are necessary to bring about a qualitative transformation in engineering education to meet present and future needs. We look forward to being engaged in consultations for their speedy implementation.

Thank you and Warm Personal Regards,

Yours sincerely,

Sam Pitroda

Dr. Manmohan Singh,
Hon'ble Prime Minister of India

CC: Dr. Montek Singh Ahluwalia, Deputy Chairman, Planning Commission
Sh. Arjun Singh, Minister, Human Resource Development

Annexure

Members of the NKC Working Group on Engineering Education

1. **Professor M.S. Ananth (Chairman)**
Director, Indian Institute of Technology Madras
2. **Professor Anil Marathe**
Indian Institute of Technology Bombay
3. **Professor Ashok Thakur**
Vice Chancellor, West Bengal Technical University
4. **Professor Gokhale**
Director, National Institute of Technology Nagpur
5. **Professor S.N. Maheshwari**
Indian Institute of Technology Delhi
6. **Professor N. Satyamurthy**
Indian Institute of Technology Kanpur
7. **Professor Vijay Gupta**
Vice-Chancellor, Lovely Professional University
8. **Dr. M.P. Ravindra**
Vice President, Education, Infosys, Bangalore
9. **Dr. Y.S. Rajan**
Principal Adviser, Confederation of Indian Industries
10. **Dr. Sandhya Chintala** representing **Dr. Kiran Karnik**
Chairman, NASSCOM
11. **Mr. Baba Kalyani**
Chairman and MD, Bharat Forge

Special Invitees:

1. **Prof. M.V. Krishnamurthy**
Director (Academic Research), VIT University
2. **Prof H.P. Khincha**
Vice-Chancellor, Visvesarya Technology University