

COMMISSIONS & COMMITTEES ON TECHNICAL EDUCATION IN INDEPENDENT INDIA: AN APPRAISAL

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After independence, nationalism as well as global impact and desire for national progress drove the Government to form different committees to review the education system in the country at different points of time. It is found that the numbers of the committees were too many, and the policy recommendations were not always implemented as they were found contradictory at times. The present note reviews the recommendations of commissions constituted from 1945 to 2011 taking into account only of Technical Education starting from lower to higher level.

1.0 Introduction

The study of history of Technical Education in India shows structural differences, even after India became independent. There have been commissions on University Education such as, Radhakrishnan Commission (1948) & Yashpal Committee (2008); commissions on Technical Education such as Sarkar Committee (1945), Thacker Committee (1959), Chandrakant Committee (1971), Nayudamma Committee (1978), Rama Rao Committee (1995), Mashelkar Committee (1998), U.R. Rao Committee (2002), P Rama Rao Committee (2002) & Kakodkar Committee (2010); commission on Polytechnic Education such as Damodaran Committee (1970); commissions on National Institute of Technical Teachers' Training & Research (NITTTR) such as, Kelkar Committee (1976), Jha Committee (1978), Bhattacharya Committee (1991) and Indiresan Committee (2000) and so on. It is to noted here that the Hill's report (1944)¹, which led to establishment of separate research institutions has not been included here though its impact has been felt.

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Commissions are meant to provide direction for improvement. However, a thorough study reveals that the number of commissions have been too many. What follows is a summary recommendations on Technical Education of such committees. Though the scope differs and also recommendations differ, what is surprising is even now, not many recommendations have been fully implemented. So, an attempt has been made to put in one place the recommendations on Technical Education of different commissions formed in India after independence to make the analysis not only easier but also to appreciate the dynamics of development.

2.0 Education Commissions & their recommendations

2.1 Sarkar Committee (1945 - 1949)

According to the recommendation of the Central Advisory Board of Education & on the initiative of Sri Ardeshir Dalal, a visionary director, Tata Iron and Steel Company, the Government of India appointed a Committee, under the chairmanship of the late Sri Nalini Ranjan Sarkar in 1945 to survey the entire question of Technical Education in India and to make definite and concrete recommendations in this respect as the Post-War Reconstruction plan. The Sarkar Committee submitted an interim Report in 1946 (the report was published in 1949), in which the Committee recommended that four Higher Technical Institutions should be set up as soon as possible, one each in the east, west, north and south.

The Committee was of opinion that the existing facilities for higher Technical Education are inadequate, both in quantity and quality. To meet the demand of technically skilled personnel required for the post world war II, certain steps can be taken:

- a) Four Higher Technical Institutions in the pattern of Massachusetts Institute of Technology may be established in the North, South, East and West part of India and the institution in the East would be made in or near Kolkata.
- b) The Western Institution should be in or near Bombay and be taken in hand concurrently with the Eastern Institution or failing that as soon after as possible.

- c) To satisfy the immediate needs for engineers generally and for those with specialised training in Hydraulics in particular, the engineering nucleus or the Northern Institution should be set up without delay.
- d) To ensure the proper planning of buildings, equipment and courses of study, the Principal and Heads of the Main Departments of these institutions should be appointed and the services of an architect with experience in the planning of technical institution be secured at a sufficiently early stage.

As a consequence, five IITs were established at Kharagpur, Bombay, Kanpur, Madras and Delhi between 1951 and 1963. The IITs were created with foreign technical collaboration & UNDP assistance. They were also modeled on the Massachusetts Institute of Technology, USA and the University of Manchester, U.K. pattern and to train scientists and engineers with the aim of developing a skilled workforce to support the economic and social development of India after independence in 1947.

It must be pointed out here that, N.R.Sarkar's background was finance & administration, not technology.

2.2 S. S. Bhatnagar Committee (1947)

A Scientific Manpower Committee was appointed under the chairmanship of Dr. Santi Swarup Bhatnagar, Secretary, Ministry of Education and Educational Adviser to Government, in 1947 to assess requirements of scientists, technologists, engineers & doctors and to meet the needs of economic & industrial development after independence. The committee assessed the requirement of the technical manpower in the different government sectors for about 10 years and it was estimated that the ratio between the demand and the supply of the technical manpower would be at 4:1. This was the first-ever systematic assessment of the scientific manpower needs of the country in all aspects and it served as an important policy document for the government to plan the post-independent S&T infrastructure.

2.3 Radhakrishnan Commission (1948 - 1949)

The Government of India appointed the University Education Commission in 1948 under the chairmanship of Dr. S. Radhakrishnan to study the problems of Indian University education and to recommend remedial

measures to suit the future requirements of the country. It aimed to improve the quality of University education. It submitted its report on 25 August, 1949. Its main recommendations regarding the technical education are as follows:

- i) To improve the quality of University education, improvement of secondary education is necessary.
- ii) More vocational education institutions should be opened to reduce the burden of the university.
- iii) Duration of pass graduate for 2 years & honors graduate for 3 years.
- iv) The curriculum for the 1st year for every discipline of engineering should be the same.
- v) Work experience should be given same importance alongwith the formal education.
- vi) Before giving the recognition to a college, the status & capacity of the college for the student evaluation should be verified.
- vii) Opening of new technological institutes.
- viii) The engineering students should be given practical training at the concerned industrial centres.
- ix) Provision for higher education and research should be made in the field of engineering.

This is a document of great importance as it has guided the development of University education in India since independence. Perhaps very few reports on education laid down the aims and objectives of education so comprehensively as done by this commission. Following the recommendations, the University Grants Commission (UGC) was formed and assumed a most important role in the coordination and development of Universities in India from 1956. The present higher education structure of 10+2+3 was recommended. The UGC Act (1956) still governs the University education system in India.

2.4 Mudaliar Commission (1952)

Under the chairmanship of Dr. A. Lakshmanaswamy Mudaliar, the Secondary Education Commission was constituted in 1952 to study the

problems of secondary education in the country and to make recommendations for changes to be introduced therein. The Commission made valuable recommendations regarding the objectives of education, reorganisation of teaching institutions, medium of instruction and the system of examinations. This is important because these guide the inputs to the higher education system.

It suggested that the secondary education should be a preparatory stage for higher education. For Technical Education, the commission suggested that technical schools should be started in large number either separately or as part of multi-purpose schools. Such schools should be located in close proximity to appropriate industries and they should function in close cooperation with the industry concerned.

2.5 Thacker Committee (1959 – 1961)

In 1959, a committee was formed under the chairmanship of Professor M.S. Thacker, which made a comprehensive study of postgraduate engineering education and research. The committee submitted their report in 1961. Some of the major recommendations were:

- i) To attract candidates of high merit, scholarships should be provided to PG students.
- ii) PG programmes and research should be concentrated in a limited no. of institutions as there is limited no. of qualified staff.
- iii) Relationship should be developed between academic institutions and industry to promote the growth of technology.

More employment opportunities should be created for PG students.

- iv) PG students and research scholars should be encouraged to undertake part time teaching.
- v) Two types of postgraduate courses – a diploma course of one year and a two-year master degree course could be offered
- vi) Course content should include mathematical studies, material science and technology, instrumentation.
- vii) Project work could be research oriented or design oriented.

- viii) For the entry of Ph.D. in engineering master degree should be must.
- ix) In certain specific fields, M.E./M.Tech. courses may be made available to masters degree holders in the appropriate branches of science.

Growth & development of postgraduate education and research in the country in the sixties and seventies was significantly influenced by the recommendation of the Thacker Committee. Third five year plan was to begin in 1961. The Thacker Committee specifically requested that a provision of Rs. 10 crores should be made in the plan for the development of postgraduate education.

2.6 Kothari Commission (1964-1966)

The Kothari commission otherwise known as National Education Commission was appointed under the Chairmanship of Dr. D. S. Kothari by the Govt. of India on 14th July, 1964 to advise the govt. on “the national pattern of education, general principles and policies for the development of education”. It submitted its report in 1966. The report suggested the introduction of 10+2+3 pattern of education in all parts of the country. It is observed that, though the structure was already recommended by Radhakrishnan Commission, this has only been accepted now and still being followed in the country. It also emphasised on vocational, technical and science education. The report stressed that there should be

- a) A radical improvement in the quality & standard of higher education & research
- b) Expansion of higher education to meet manpower requirement
- c) Improvement of university organization & administration

Some of the important recommendations of the commission were:

- Training Semi-skilled and Skilled workers
 - i) Further expansion of facilities of ITIs. The minimum admission age should be lowered to 14.
 - ii) Training in ITIs and technical schools must be production oriented.
- Education of engineers
 - i) Meritorious students from B.Sc. should be encouraged for some branches of engineering such as electronics and instrumentation

- ii) Practical training should be provided to the students from the third year of the course and with the help of the industry
- iii) Research design projects should be incorporated in the curriculum.
- iv) Changing of syllabus continuously
- v) Suitable salary should be offered to attract the highly qualified engineers for teaching and research purposes.
- vi) Manufacturing of prototype substitutes for imported items of equipment should be encouraged to avoid the wastage of money.

The unique feature of this report was that, it was the first report to have a comprehensive review of the entire educational system. The commission was of the opinion that, education is the most powerful instrument of national development. Many of the recommendations have been accepted & helped the government to make the National Education Policy (1964), which was only reviewed and redrawn after twenty years.

2.7 Damodaran Committee (1970)

In early 1970, govt. of India appointed a high power committee under the chairmanship of G.R. Damodaran to examine the problems regarding the unemployment of technicians and to suggest some solutions. The aim of the committee was to examine the entire system of polytechnic education, the needs of the industry and the other opportunities of employment & to prepare a blueprint for future development. Major suggestions of the committee were:

- i) Narrow specialization at the first diploma level should be avoided.
- ii) Diploma courses should be diversified within the major branches of study.
- iii) Refresher courses should be organized for the technicians to make them aware of the changing requirements of different jobs over the time.
- iv) Basic technicians' courses should be of 3 years.
- v) Project work involving industrial problems should be incorporated in the curricula of the diploma courses.

This report is considered the bedrock of polytechnic system & helped to revamp the polytechnic education in India.

2.8 L.S. Chandrakant Committee (1971)

About 10 years after the Thacker Committee, an appraisal of the postgraduate education and research programmes were undertaken under the then Educational Advisor to GOI, Dr. L.S. Chandrakant in 1971. Its major recommendations were:

- i) PG curricula should be revised. Reducing the over-emphasis on theory, emphasis on laboratory and project work should be increased.
- ii) PG diploma programmes should be organized for industry.
- iii) Institutions must be given freedom to initiate new programmes.

2.9 Kelkar Committee (1976)

To remove the deficiencies of the polytechnic institutions and train better teachers for polytechnics, on the recommendation of the AICTE, the central Government started four Technical Teachers' Training Institutes (TTTIs) at Chennai, Calcutta, Bhopal and Chandigarh between 1966 and 1967. The Union Education Minister appointed a committee under the chairmanship of Dr. P.K.Kelkar, Ex-Director, IIT, Bombay to evaluate to what extent the aims and objectives of the setting up of the TTTIs have been fulfilled by each of the institutes, to suggest future role of the TTTIs in the scheme of Technical Education in general and for purposes of teacher training in particular. The committee mainly studied the training of teachers in Technical Education. The committee recommended the following:

- i) Introduction of Modular Training Programme and Short Term Training Programme
- ii) Training in pedagogy and industrial training be in modular form of 12 weeks duration
- iii) Specially designed 6 months programmes for science teachers of polytechnics should be arranged.
- iv) Flexible non formal programmes for subject-updating should be tried
- v) Specially designed 6 months programmes for training of science teachers should be introduced.
- vi) To bring an attitude change, special appreciation courses for senior personnel should be arranged.

vii) Computer centre, film libraries, film production, language libraries should be set up.

viii) A coordination council for the four institutes should be set up.

2.10 C.S. Jha committee (1978)

Within 2 years of the Kelkar committee, another committee was formed under the chairmanship of C.S. Jha in 1978. The main task of the committee was to review the staff requirement and staff structure for Technical Teachers' Training Institutes (TTTIs) and make recommendations on cost reduction. On the basis of their observations, the committee recommended that:

- i) TTTI's efforts should be distributed as training (50%), curriculum development (30%) and supporting activities (20%)
- ii) Staff-student ratio should be 1:8 for all training programmes.
- iii) Overall staff structure to be 1:1:1 for professors, Assistant Professors and lecturers.
- iv) Minimum no of participants to be 10 for long and short courses.
- v) Training facilities to be offered to overseas teachers also.
- vi) Close collaboration between TTTIs is necessary for optimal use of facilities.

2.11 Nayudamma Committee (1978 – 1980)

A Review Committee on Post-Graduate Education and Research in Engineering and Technology was set up under the Chairmanship of Dr. Y. Nayudamma in 1978. In June, 1980, the Committee gave an extensive report. The committee found that the state of the country's effort in engineering education and research was highly unsatisfactory. The Committee recommended restructuring and organisation of post-graduate courses, identification of emerging areas, revision in the norms of assistance to institutes, faculty improvement etc. Both Chandrakant Committee (1971) & Nayudamma Committee found that one year Post Graduate Diploma programmes in engineering were not successful. And the system was abolished subsequently.

The major recommendations of this review were:

- i) M.E. /M.Tech programmes should be of 2 years duration having 3 semesters – two of course work in the first year and one of dissertation and viva in the second year.
- ii) Holding an All India Graduate Aptitude Test in Engineering (GATE) twice a year to ensure selection of only meritorious and motivated students. This led to holding the national exam GATE.
- iii) Course of study should ensure participation of industry, be need-based and of national relevance.
- iv) Curriculum should have 30 – 50% core area subjects, 50-70% optional area subjects, and dissertation should be on live programmes or emerging areas.
- v) Project / dissertation work should be joint project with industry.
- vi) Encouragement of sponsorship of candidates by industry or government organizations
- vii) Tax rebate to industry on contributions to postgraduate education and research in engineering and technology.
- viii) Monitoring of academic research at all levels as to their socioeconomic relevance.
- ix) The national investments in S&T education and research should be increased.
- x) Part time PG programmes should be introduced in the industry relevant areas.
- xi) Old fashioned PG programmes should be revised.
- xii) AICTE should be made a statutory body through an act of parliament.
- xiii) Ph.D. essential for postgraduate teaching.

Following the recommendations, the M.E. /M.Tech programme was reduced to 3 semesters. GATE is being conducted every year. The recommendation to give statutory power to AICTE has also been implemented. The Ph.D. criteria for postgraduate teaching are still to be followed in many institutions.

2.12 National Policy on Education (1986)

The National Policy on Education (NPE), 1986 and its Programme of Action (POA) as updated in 1992 are based on review of the entire educational process and has been formulated on the basis of a national consensus. New Education Policy of 1986 gave more emphasis on human development. It aimed at promoting national progress, cultivating a sense of common citizenship and culture and strengthening national integration and pays greater attention to science and technology, moral values and relates education to the life of the people. Its main Recommendations were:

- i) Technical Manpower Information System should be developed and strengthened to improve the situation regarding manpower information.
- ii) Programmes of computer literacy will be organised on wide scale from the school stage.
- iii) The development and expansion of vocational education will need a large number of teachers and professionals in vocational education, educational technology, curriculum development, etc. Programmes will be started to meet this demand.
- iv) Training in entrepreneurship will be provided through modular or optional courses, in degree or diploma programmes to encourage students to consider “self-employment” as a career option.
- v) In order to meet the continuing needs of updating curriculum, renewal should systematically phase out obsolescence and introduce new technologies of disciplines.
- vi) The community polytechnic system will be appropriately strengthened to increase its quality and coverage.
- vii) For Promoting Efficiency and Effectiveness at all Levels:
 - Institutions will be encouraged to generate resources using their capacities to provide services to the community and industry. For this, they will be equipped with up-to-date learning resources, library and computer facilities.
 - Adequate hostel accommodation will be provided, specially for girls.
 - More effective procedures in the recruitment of staff

- Staff Development Programmes will be integrated at the State, and co-ordinated at Regional and National levels.
 - The curricula of technical and management programmes will be prepared according to the needs of industry.
- viii) Professional societies will be encouraged and enabled to perform their due role in the advancement of technical and management education. (This is one area which is still neglected).
- ix) The All India Council for Technical Education (AICTE) will be responsible for planning, formulation and the maintenance of norms and standards, accreditation, funding of priority areas, monitoring and evaluation, maintaining parity of certification and awards and ensuring the co-ordinated and integrated development of technical and management education.

According to the recommendation of the National Policy on Education 1986, the AICTE became a statutory body through an Act of Parliament, in December, 1987.

2.13 Nayudamma Committee (1986)

The Government of India constituted a Review Committee under the chairmanship of Dr Y. Nayudamma, Chairman, Centre for Development Alternatives, Madras to review the functioning of the five IITs at Kharagpur, Bombay, Madras, Kanpur and Delhi. Before this, to review the work and progress, the India Government has appointed separate Reviewing Committees for each of the five IITs between 1971 and 1973. This is the first time that a single common committee was appointed to review all the IITs together. The Committee examined the recommendations contained in the interim report of the Sarkar Committee.

The main recommendations were:

- (i) The student strength of undergraduate and postgraduate courses should be aimed to be maintained at 1:1 ratio
- (ii) Instead of starting new IITs, wherever higher technical manpower is needed, support to Departments/Engineering Colleges/Centres who have done well, is recommended.

- (iii) B.Tech level programmes in the IITs should aim at greater flexibility and a science-based engineering curriculum
- (iv) IITs should have greater interaction between themselves and with outside educational institutions, universities, CSIR and other research laboratories
- (v) UG & PG Programmes should be reviewed periodically and updated and modified to match with the needs of the country, and the developments in Science & Technology
- (vi) Doctorate degrees may be offered on work relating to developmental projects, hardware, experimental work, instrumentation etc-areas in which the IIT faculty seem to have an ambivalent attitude.
- (vii) Departments should have more autonomy delegated to them and run them with their own committees of management.
- (viii) There should be a strict and objective assessment of all faculty and special status and additional 'perks' to be given to highly merited people.

The IITs were also asked to improve their interaction with industry through a variety of mechanisms. On the scaling up of quality technical education, the Committee felt that institutions like the Regional Engineering Colleges (later renamed as NITs)² must receive infusion of funds and should be upgraded but did not suggest new IITs. Interestingly, they also suggested a cap on an optimum campus size of 2500 students for each IIT. Since then the IITs have steadily grown in size and in 2002–03, all 7 IITs together graduated 2274 UG, 3675 PG and 444 PhD students with faculty strength of 2375.

2.14 Amitabha Bhattacharya Review Committee (1991)

The Bhattacharya committee was appointed to review the progress made by the Technical Teachers' Training Institutes (TTTIs) in fulfillment of their objectives, to identify the institute's problems and weaknesses and to suggest directions for future development of the Institutes. The committee made the following recommendations:

- i) The expertise and resources of TTTIs should be fully utilized by the system

- ii) TTTIs should offer highly flexible modular Training Programmes
- iii) Programmes in emerging technology should be a strong component of the teacher training programmes.
- iv) TTTIs should lay emphasis on the development of new innovative instructional materials by adopting the latest in communicating technology.
- v) TTTIs should undertake innovating research and development activities to improve the quality of technician education.
- vi) Finally, in order to ensure development of polytechnic system by effectively responding to the engineering and technology manpower requirements through appropriately trained teacher, TTTIs should have the necessary built-in-flexibility, authority and status. This calls for their being designated as deemed universities with a name most truly reflective of their role and their status i.e. “The Institute of Technical Education and Research.”

Most of the recommendations were implemented such as undertaking of a number of research studies. Offering training programmes in emerging technology areas. But the name of TTTI could not be changed before the recommendation of Indiresan Committee. And they also could not get the ‘Deemed University’ status.

2.15 P Rama Rao Committee (1995 – 1999)

In 1995, the AICTE felt the desirability of undertaking a fresh review of PG education as nearly 15 years had passed since the last review. A PG Review Committee headed by P. Rama Rao was constituted in September 1995, submitted its Report in 1999. The committee recommended urgent measures to revitalize PG education and research in engineering & technology. The recommendations of this committee regarding the PG programme, doctoral programme and faculty development were:

- i) Duration of masters’ programme to be increased to 21 months.
- ii) 1 year PG diploma programme in specialized topics and IT-based distance education should be continued.
- iii) Scholarship of PG students should be increased and reviewed periodically. Attractive fellowship and contingency grant should be given to attract motivated and meritorious scholars.

- iv) To attract motivated and merited scholars, National Doctoral Programme should be started.
- v) To meet the shortage of faculty certain programmes e.g. Early Faculty Induction Programme and Quality Improvement Programme should be expanded.
- vi) Manpower Information System should be build.
- vii) All Ph.D. scholars should be involved in teaching and research work simultaneously.
- viii) The no of Ph.D.s in engineering & technology which was around 375 per year should be increased to around 750 per year to meet the faculty requirement.
- ix) Initiatives should be taken to attract foreign students.
- x) Govt. support to PG and research programmes should be continued.

Some of the recommendations were implemented including introduction of National Doctoral Fellowship, enhancement of scholarship & fellowship. The major change of reverting the PG programme in engineering back to 4 semesters was done.

2.16 Mashelkar Committee (1996 - 1998)

During 1956-1960, Regional Engineering colleges were established to cater to the projected growth of technical manpower in various states. A High Power Committee under the Chairmanship of Dr. Raghunath Anant Mashelkar, the former Director General of the Council of Scientific & Industrial Research has been constituted on June 17, 1996 to review the progress made by the Regional Engineering Colleges and their achievements and suggest the future role of R.E.Cs in building a high quality Technological Education base in the country. The committee submitted its report entitled “Strategic Road Map for Academic Excellence of Future RECs” in 1998.

The committee came out with recommendations on governance structure, academic matters, faculty issues and staff development and funding issues. The Mashelkar Committee report was fully accepted and recommendations were implemented by the government. As a result, 17 Regional Engineering Colleges have been converted to National Institutes of

Technology (NIT), changing the entire pattern of funding and governance and the control was shifted from state to centre.

This has been a major shift. Regional aspirations were given a national shape. But even with lot of fund input NITs are yet to make their mark on the national scene in Science & Technology research & development.

2.17 Professor P.V. Indiresan Review Committee (2000)

The activities of Technical Teachers' Training Institutes (TTTIs), during the period 1990-91 to 1999-2000, were primarily directed towards assisting the polytechnics in implementing the various development programmes under the World Bank Assisted project. In 2000, the Government of India felt the need to take a fresh look into the programmes and activities of TTTIs. In November, 2000, a review committee under the chairmanship of Professor P V Indiresan was formed to review the programmes and activities of TTTIs, to study the major problems and to give directions for future development of TTTIs. The Indiresan committee in its report has pointed out some weaknesses of the institutes, such as lack of training policy at the state level and central level, lack of financial and administrative autonomy, Inadequate funding, paucity of faculty, decline in productivity etc. And the following recommendations were made for optimal utilisation of the facilities, expertise and experience available in the four TTTIs.

- i) Extension of reach of the Institute over the entire gamut of the Technical Education.
- ii) Training of teachers in other sectors apart from the polytechnic education should be undertaken
- iii) Efforts must be made to get the degrees like M.Teh.Ed. / M.E.E. courses recognised for career advancement.
- iv) Emphasis on Educational Technology including Distance Education & web based learning.
- v) Training for overseas teachers particularly from SAARC and ASEAN countries.
- vi) Helping the polytechnics by providing assistance in laboratory development, improvement of instruction, testing and evaluation.

vii) Integration of IT in Teacher Training.

viii) Reorganization of the structure for the BOGs and administrative staff.

Further, the committee felt that to improve the performance and productivity of TTTIs, it may be desirable to upgrade them as National Institutes from their present regional status to generate the healthy competition among TTTIs. To change its thrust, the TTTIs may be renamed as 'National Institutes of Technical Education and Research' (NITER).

TTTIs were upgraded and renamed as National Institute of Technical Teachers' Training & Research (NITTTR) vide Government of India order dated 20th October, 2003 with an objective to play larger role for the improvement of Technical Education in the country. The Director is the Executive Head (CEO) of the institute.

Here again, the formation & funding was fast. But NITTTR's impact on national scenario is still to be felt.

2.18 U.R. Rao Committee (2002 - 2003)

A review committee was set up by the Ministry of Human Resource Development in November 2002 under the chairmanship of Prof. U.R.Rao, former chairman ISRO, to review the functioning of the AICTE and to re-define its role in view of the emerging changes and to suggest steps for further improvement. Among the many recommendations made by the committee, following are the notable:

- i) To control the number of institutions & the intake of students more rigorously. Those institutions that do not have enough faculty or infrastructure must be ruthlessly stopped.
- ii) Right type of salary should be paid to the employees. PhDs should be recruited in the faculty positions.
- iii) Fees should be reduced for the poorer students.
- iv) Government must play a role in setting up of new institutions. To make India globally competitive, industry should also bear the cost of Technical Education. This has never been done in India.
- v) Further expansion of UG technical institutions should not be allowed and approvals for new institution should be stopped for at least 5 years

in states where the UG student intake exceeds the national average of 350 per million population.

- vi) The PG and doctoral programme need to be restructured and vastly strengthened and the no. of Ph.D.s need to be increased to at least 750 per year.
- vii) To help the faculty paucity situation, such as utilizing qualified retired people, and having adjunct professorships.
- viii) To get the right kind of education system association of technical education institutions and industry is required.
- ix) Centralized research facilities should be provided by the AICTE in centralized places.

2.19 P Rama Rao Committee (2002 - 2004)

On 27th June, 2002 Govt. of India appointed a review committee under the chairmanship of Dr. Rama Rao to review working of the Indian Institutes of Technology together. It was a second joint review committee after the Nayudamma Committee in 1986. The committee submitted its report in 2004. Some of these recommendations are:

i) Governance of IITs

- To set up an empowered PAN-IIT Synergy Committee which is supposed to report to directly to IIT Council, which is the highest decision making body in the IIT governing structure.

ii) Faculty

- Pay scales and allowances for the present faculty and pension schemes and medical facilities for the retired faculty of the IIT should be reviewed. Retirement age can be extended from 62 to 65 years for some selected highly qualified faculty.
- IITs should create a separate Human Resource Unit to look after the faculty recruitment and their retention.

iii) Research enhancement

- To provide incentives to the faculty members for their outstanding performances.

- To introduce research projects at the 2nd year stage for the B.Tech.s, so that bright Ph.D. students can complete Ph.D. requirements by the age of 25. For this, bright candidates from B Tech can be taken for Ph.D. programmes.
- Efficient screening procedures for selection of research students.
- To encourage the collaborative project work with the foreign institutions.
- Permit the students from abroad for Ph.D. and post doctoral programmes.
- IITs should allocate separate fund exclusively for the research.
- Alliances with other national laboratories and funding agencies.

iv) Admission process

- Since the differences in the secured marks are not very significant even if the rank is as low as 8000, lower ranks upto 8,000 may be announced as qualified. This will help the NITs and other engineering colleges to take the remaining students from JEE list.
- The level of the entrance examination should be suitable for a bright school leaving child and within the school curricula.
- To encourage the industry to invest in major joint research projects with IITs.

2.20 Knowledge Commission Report on Technical Education (2005 - 2008)

On 13 June, 2005, the Prime Minister of India, Dr. Manmohan Singh, constituted the National Knowledge Commission, as a think-tank charged with considering possible policy that might sharpen India's comparative advantage in the knowledge-intensive service sectors. In particular, the Commission was to advise the Prime Minister's Office on policy related to education, research institutes and reforms needed to make India competitive in the knowledge economy.

NKC proposes the following set of initiatives:

- i) Reforming the Regulatory Framework by establishing an Independent Regulatory Authority for Higher Education (IRAHE) to cover all streams.
- ii) Good quality graduate students must be motivated for doing Ph.D. Attractive incentives through opportunity for international exposure like

attending international conferences or exchange programs must be provided.

- iii) Professionals from industry and research laboratories should be invited to participate in the teaching process. Institutions should be encouraged to create adjunct positions for them.
- iv) Tap potential faculty should be identified at their undergraduate level and motivated to take teaching as a career.
- v) The current curriculum should be modified to provide flexibility, interdisciplinarity and choice of electives.
- vi) Faculty should have the freedom to design their own evaluation systems and experiment with them.
- vii) In order to reduce the perceived gap between science and engineering, it is desirable to start four year undergraduate programs in science along the lines of engineering programmes.
- viii) In order to meet the increasing demand, more institutes of excellence need to be established. Public private partnership could be explored for the same purpose. However, all polytechnics should be operated in PPP mode.
- ix) An apex independent regulatory authority should be established that can achieve the objectives of regulation without political interference. An autonomous Standing Committee for Engineering Education should be established under proposed Independent Regulatory Authority of Higher Education.
- x) The Government should help the elite institutions maintain their excellence. Policy framework and procedural simplicity should be such as to enable more and more institutions to become elite.
- xi) Increasing the number of faculty by relaxing the criterion of holding a Ph.D. degree for undergraduate teaching

Many of the recommendations of the NKC are already in the implementation stage by different ministries of the Government. This includes areas such as Libraries, e-governance and translation. Some of the major areas under work are higher education, vocational education, entrepreneurship, school education etc. The XI Plan has integrated many NKC recommendations on its agenda.

2.21 The Yashpal Committee (2008 - 2009)

The government of India, through a notification issued by the MHRD in February 2008, constituted “The Committee to Advice on Renovation and Rejuvenation of Higher Education in India”, headed by scientist Yashpal to review the functioning of the UGC and the AICTE and critically assess their role and preparedness in providing institutional leadership to the emerging demands of access, equity, relevance and quality of higher education/technical education and the university system.

The committee was aware of the work that has been done by various other committees and commissions on this issue, the most recent being the report of the National Knowledge Commission (NKC) on Higher Education. The committee shares the concerns articulated by the NKC regarding several issues on higher education. After much consultation with all the stakeholders, including students and teachers, the committee submitted its final report, ‘Renovation and Rejuvenation of Higher Education’ to the Ministry of Human Resource Development (MHRD) on June 24. Major Recommendations were:

- i) Universities to be self-regulatory bodies to be assisted by hassle-free and transparent regulatory processes;
- ii) Universities to be made responsible regarding the academic content of professional courses.
- iii) Creation of an all-encompassing Commission for Higher Education, a central statutory body to replace the existing regulatory bodies including the UGC, AICTE, NCTE etc.
- iv) Curricular reform to be the topmost priority of the newly created HEC.
- v) Undergraduate programmes to be restructured to enable students to have opportunities to access all curricular areas with fair degree of mobility;
- vi) All universities to have the full range of knowledge areas. No single discipline or specialized university to be created;
- vii) Institutions of excellence like the IITs and IIMs to be converted into full-fledged universities, while keeping intact their unique features, which shall act as pace-setting and model governance systems for all universities;

viii) Expansion of the higher education system to be evaluated and assessed continuously to ensure not only equity and access but also quality and opportunity of growth along the academic vertical.

2.22 Dr Anil Kakodkar Committee (2010 - 2011)

The Ministry of Human Resource Development (MHRD) on 3 February 2010, constituted a Committee under the Chairmanship of Dr Anil Kakodkar, Chairman, BOG, IIT Bombay, to suggest a roadmap for strengthening the financial, administrative and academic autonomy of the IITs. The Terms of Reference for the Committee also included suggesting how to attract top students of the country into postgraduate studies in India, growth of the established IITs, establishment of new IITs and improving interaction among IITs, IIMs, IIIT, etc. the committee submitted its report in April, 2011 titled "Taking IITs to Excellence and Greater Relevance". Major Recommendations were:

- i) Scale up Ph.D. students from less than 1000 Ph.D. graduates per year today to 10,000 Ph.D. graduates by 2020-25 from about 20 IITs
- ii) The tuition fees should be between Rs 2–2.5 lakh per year per student.
- iii) The committee has also proposed that Ministry should fully provide for fees and living expenses for all research students (post graduates) as well as under graduate students from weaker sections as per currently prevalent norms at IITs.
- iv) IITs to be made independent of non-plan (operational) support from the Government for their operational expenditure while at the same time seeking greater plan (capital) support to enhance research in a comprehensive manner. The objective of realizing autonomy would be facilitated by de-linking IIT finances with non-plan support of the Government.
- v) IITs are to be totally independent of MHRD for their governance and management functions. They are to be run by their Boards with all rules and regulations made by their Boards.
- vi) The curriculum system needs to adopt greater flexibility to provide greater choice to students so that they are better prepared for a chosen career option.

- vii) At least 100,000 quality engineering graduates per year through Central government-funded institutions alone should be produced.
- viii) Identification/creation of 50 Central government-funded institutions (other than the 20 IITs) is to be done, which could be nurtured with the help of young IIT faculty. These would include NITs, ISERs, NISER, IIIT and certain other institutions.

At the time when the Indian Institutes of Technology are facing faculty crunch & inadequacy of autonomy, the committee has attempted to come out with a vision statement that would be a road map for the IITs. Whether the successful implementation of the recommendations would help to put our country at the forefront of research by creating a large pool of researchers is yet to be seen.

3. Discussions of the Recommendations of the Education Commission Reports

3.1 Radhakrishnan Commission (1948 – 1949), Kothari Commission (1964-1966) & National Policy on Education (1986)

After independence, the first action of a great significance to be taken by the Government of India in the field of education was the appointment of the Radhakrishnan Commission (1948 - 1949). Following the recommendations of the committee, the University Grants Commission (UGC) was formed and assumed a most important role in the coordination and development of Universities in India from 1956. The present higher education structure of 10+2+3 was also recommended. The UGC Act (1956) still governs the University education system in India.

The Kothari Commission (1964- 1966) report was the first to have a comprehensive review of the entire educational system of India. The commission opined that, education is the most powerful instrument of national development which is a universal truth. It also triggered the thinking of the Government to issue a statement on the national policy on education with a view to providing guidance to prepare & implement educational plans. Many of the recommendations have been accepted & helped the government to make the National Education Policy (1968), which was redrawn again after twenty years. For higher education Kothari Commission agreed with the suggestion made by the Radhakrishnan Commission.

According to the recommendation of the National Policy on Education 1986, through an Act of Parliament, in December, 1987 AICTE has been vested with statutory authority for planning, formulation and maintenance of norms and standards, quality assurance through accreditation, monitoring evaluation and ensuring coordinated and integrated development and management of technical education in the country. As a part of its programmes and activities, the National Board of Accreditation (NBA) for quality assurance was set up by the AICTE in September 1994.

3.2 Review committees on Post-Graduate Education and Research in Engineering

The Third five year plan was to begin in 1961. Growth & development of postgraduate education and research in the country in the sixties and seventies was significantly influenced by the recommendations of the Thacker Committee (1959 – 1961). The Thacker Committee specifically requested that a provision of Rs. 10 crores should be made in the plan period for the development of postgraduate education.

Both Chandrakant (1971) & Nayudamma Committee (1978 – 1980) found that the one year Post Graduate Diploma programmes in engineering recommended and implemented by Thacker Committee were not successful. And the system was abolished subsequently.

The Thacker committee as well as the Nayudamma committee had recommended the establishment of a Manpower Information System (MIS) to provide essential information on current demands of manpower. Based on the recommendation of these committees a project titled national technology Manpower Information System funded by MHRD/AICTE has been developed.

Thacker committee, Chandrakant committee & Nayudamma committee – all committees recommended that PG Education should be encouraged by Government scholarships. This has been implemented and produced more PG activity in institutions.

A significant no of recommendation of the Nayadumma Committee have been implemented. Following the recommendations of the Nayudamma Committee the duration of M.E. /M.Tech programme was reduced to 3 semesters. A Graduate Aptitude Test in Engineering (GATE) started being

conducted every year as all India entrance to PG courses in engineering for the uniformity at entry level. The amount of scholarship has also been periodically revised. The recommendation to give statutory power to AICTE has also been implemented.

However, a considerable no. of recommendations of the Committee remains to be implemented. The Ph.D. criteria for postgraduate teaching are still to be followed in many institutions. Master's degree as the minimum qualification for recruitment to many positions in the engineering profession was recommended and has been followed since 80's. Regular manpower audits have not been carried out. However, Technical manpower requirement is still not very definite.

Several recommendations of the P. Rama Rao Committee (1995 – 1999) were implemented. Such as, the introduction of National Doctoral Fellowship, the enhancement of scholarship & fellowship for master's and doctoral degree, launching of Technical Education Quality Improvement Programme (TEQIP) in 2002 with world bank assistance to improve the quality of Technical Education. The major change of reverting the PG programme in engineering back to 4 semesters was done. The existing National Technical Manpower Information System (NTMIS) has been re-oriented.

3.3 Review Committee on AICTE & NITs

The U.R. Rao Committee (2002 - 2003) raised serious concern about the technical education system in India such as, poor quality-assurance structures, especially accreditation procedures, low rate of Ph.D. output & shortage of qualified faculty. The report particularly emphasised on quality improvement & following its recommendations the Quality Improvement Programme (QIP) for faculties was strengthened. The Committee did draw attention to the unsustainable expansion of technical education and made far-reaching recommendations to achieve excellence in this sector.

According to the Rao Committee Report, about 10,000 Ph.Ds were required to provide qualified faculty for the rapidly expanding engineering colleges and R&D personnel needed for the industry. To provide opportunities for more students to have internationally quality engineering education, the Government's decision to upgrade some Regional Engineering Colleges to IIT level and to open more IITs were taken up.

Later, with the Mashelkar Committee (1996 - 1998) recommendation, Regional Engineering Colleges were converted to National Institutes of Technology (NIT), changing the entire pattern of funding and governance and the control was shifted from state to centre. This has been a major shift. Regional aspirations were given a national shape. But even with lot of fund input NITs are yet to make their mark on the national scene in Science & Technology research & development.

3.4 IIT Review committees

In the Nayudamma Committee (1986) report, the IITs were asked to improve their interaction with industry through a variety of mechanisms. To enhance the quality of technical education, the Nayudamma Committee recommended that institutions like the Regional Engineering Colleges (later renamed as NITs) must receive infusion of funds and should be upgraded but did not suggest new IITs. Interestingly, they also suggested a cap on an optimum campus size of 2500 students for each IIT. Since then the IITs have steadily grown in size and in 2002–03, all 7 IITs together graduated 2274 UG, 3675 PG and 444 Ph.D. students with faculty strength of 2375.

The Ramarao committee (2002 - 2004) had highlighted several of the issues involved and made recommendations regarding governance, faculty matters, research enhancement, entrance exam, linkage with industry and funding policy etc. For recruiting new faculty members, the IISc practices were considered more flexible than the IITs. The committee made a comparison of the IITs and IISc practices in this regard and recommended that IISc system may be adopted by the IITs for the faculty induction, assessment and promotion for its openness and multidisciplinary approach. However, these were, interestingly not adopted.

During the XI Plan period, the IITs have been in an expansive mode in that it doubled its numbers from 7 to 15. The Kakodkar Committee (2010 - 2011) was appointed to take stock of the present expansion programme and also suggest the future course of action in terms of inclusion, expansion and excellence in the XII Plan period and beyond. At the time when the Indian Institutes of Technology are facing faculty crunch & inadequacy of autonomy, the committee has attempted to come out with a vision statement that would be a road map for the IITs. Whether the successful implementation

of the recommendations would help to put our country at the forefront of research by creating a large pool of researchers is yet to be seen.

3.5 Knowledge Commission Report on Technical Education (2005-2008)

National Knowledge Commission (NKC) was envisaged by the Government as one of the key concurrent processes for the XI Plan (2007-12). Recommendations of NKC have been key inputs in formulating broad contours of the XI Plan. Many of the recommendations of the NKC are already in the implementation stage by different ministries of the Government. This includes areas such as Libraries, e-governance and translation. Some of the major areas under work are higher education, vocational education, entrepreneurship, school education etc. The action taken in Higher and Technical Education includes:

- 1) To expand capacity and improve quality of higher education, the Government has sanctioned the setting up of 15 new Central Universities and 14 new Universities based on world-class standards.
- 2) The Government is in the process of setting up eight Indian Institutes of Technology (IITs), 10 National Institutes of Technology (NIT), 20 Indian Institutes of Information Technology (IIITs) as far as possible in the Public-Private Partnership mode, three Indian Institutes of Science Education and Research (IISERs), seven Indian Institutes of Management (IIMs) and two Schools of Planning and Architecture (SPA). This has been a massive expansion.
- 3) The Committee for Rejuvenation and Renovation of Higher Education, set up for the review of UGC/AICTE has submitted its report.
- 4) The Science and Engineering Research Board Bill 2008 have been introduced in the Parliament.
- 5) The National Mission on Education through Information and Communication Technology (ICT) has been launched to leverage the potential of ICT in the teaching learning process with an aim to enhance the Gross Enrolment Ratio in Higher Education by 5 percentage points by the end of the XI Plan.

Overall, the National Knowledge Commission made its impact felt.

3.6 The review committees on Technical Teachers' Training Institutes (TTTIs)

After the formation of Technical Teachers' Training Institutes (TTTIs), within a short span of 25 years, several review committees were constituted by the Government to review the scheme of the TTTIs such as, Kelkar Committee (1976), Jha Committee (1978), Bhattacharya Committee (1991) and Indiresan Committee (2000). Among them, most of the recommendations of the Bhattacharya Committee were followed. This includes undertaking of a number of research studies, offering training programmes in emerging technology areas. But the name of TTTI could not be changed to "The Institute of Technical Education and Research" before the recommendation of Indiresan Committee. And they also could not get the 'Deemed University' status.

Following the recommendation of the Indiresan Committee, TTTIs were upgraded and renamed as National Institute of Technical Teachers' Training & Research (NITTTR) on 20th October, 2003 with an objective to play larger role for the improvement of Technical Education in the country.

Though, all the committees gave suggestions regarding the future role of the TTTIs in the scheme of technical education in general and for purposes of teacher training in particular and the funding were adequate & fast, but NITTTRs failed to provide the necessary professional and academic support to the technician education system. NITTTR's impact on national scenario is still to be felt.

4. Concluding Remarks

Reviewing of the educational system in India is not an easy task. A country where the colonizer – colonized interface played a determinant role in the growth of University System & Technical System of Education, both starting almost at the same time around 1857. It was only 1945, the first committee to look after technical education was formed & the University system was reviewed by Radhakrishnan Commission in 1948. It is found that in almost 60 years, we are finding on record in total about twenty commissions. The number is too high because the committees were national committees.

The summary recommendations reveal the pendulum like shifts; on points of quality of teachers, privatisation and structure of IITs. The conclusion

is – professionalism took back seat & idealism coupled with regionalism was predominant. Focused time span and strong interaction between ‘business & polity’ is the need of the hour. How delinking of teaching & research affected both has been pointed out. Also how the formation of many regulatory bodies: AICTE (1945), UGC (1956), MHRD (1985), NBA (1994), State Councils of Technical Education – has affected the quality of teaching and research as also quality assurance of Technical Education system can be understood from the review of these plethora of recommendations.

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1. Prof. A.V. Hill, a British Royal Society Secretary, was invited to India to advise on the organisation of Indian scientific & industrial research. He submitted his report ‘*Scientific Research in India*’ in 1944.
2. See Mashelkar Committee (1996 - 1998)

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