Technical Education and Industry: 2

Report of a Commonwealth Regional Seminar

Ibadan, Nigeria
24 April - 5 May 1978

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INTRODUCTION

One reason why most developing countries are willing to spend a large proportion of their annual budget on education is that their governments hope that educational expansion will lead to a greater supply of manpower for national development. Experience shows, however, that this expectation has not been fulfilled. In no field has disappointment been more acutely felt than in technical education.

Practical industrial training has exercised the minds of Commonwealth governments and the Commonwealth Secretariat for several years. Successive conferences of Commonwealth Ministers of Education have stressed the importance of practical training in industry for technicians, technologists, and engineers.

In recognition of the interest and continuing priority which member states attach to the training and placement of technicians, the Secretariat organized in 1976 a seminar on the theme of Technical Education and Industry in Hong Kong for Commonwealth countries in Asia and the Pacific. The purposes of that seminar were to improve communication between technician educators and industry, to raise the quality and quantity of training for technicians, and to improve co-operation among member countries of the Commonwealth.

The current seminar is the second to deal with the theme. It was organized, with funds provided by the Commonwealth Fund for Technical Co-operation, on the recommendation of the Accra conference of Ministers of Education following the success of the Hong Kong seminar. Its emphasis was once more on partnership between education and industry. It considered how more encouragement could be given to industry to train skilled personnel for its own and other requirements. It also considered and made recommendations on regional and Commonwealth co-operation.

It is hoped that the seminar will result in practical programmes and viable projects that will assist Commonwealth countries of Africa in making technical education more relevant to their needs. In particular, it is hoped that member governments will give serious consideration to those recommendations dealing with action at the national level, and that regional and pan-Commonwealth co-operation will flow from such national action.

The Commonwealth Secretariat wishes to acknowledge its gratitude to the Government of the Federal Republic of Nigeria for playing host, and the University for the facilities it placed at the disposal of the seminar and for having made participants so welcome at a difficult time. Special thanks are due to the Chairman, Dr. S.E. Chukwujekwu, who steered the sessions so ably, to the consultants and resource persons, to the chief liaison officer, co-secretary, rapporteurs, liaison officers and supporting staff, to the Director of the University Conference Centre and his staff, and to everyone else who contributed to the success of the seminar.

Education Division
Commonwealth Secretariat

SUMMARY OF MAIN RECOMMENDATIONS

Recommendations to Member Governments

1. Governments should consider enacting industrial training legislation to ensure that private and public industry provides training to assist the development of national economies. The scope of this legislation should include craft, technician and technologist training; curriculum development; studies of manpower needs, including setting appropriate ratios of skilled personnel for industrial development.

2. Governments should establish national training councils/boards, wherever these do not exist, by appropriate legislation which will also specify financial arrangements. Training councils/boards should include representation from government ministries, employer and employee organizations, educational, training and professional institutions. The term of reference of such boards should include assessing training needs and identifying priorities; setting, maintaining and reviewing training standards; involvement with craft, technician and technologist training and acting as a certifying body.

3. Small-scale industries that cannot provide the necessary technician training should be encouraged to sponsor students and arrange for their training in larger industries or through co-operative efforts with governments grants/tax relief.

4. In order to fulfil the aims of industrial training legislation a high priority should be given to the training of technical teachers and industrial trainers. Programmes should be established for accelerating staff development.

5. Educational institutions should provide courses on business management and entrepreneurship in addition to teaching technical skills. Industrial training/attachment should be assessed in final certification.

6. Governments should encourage the development of appropriate social attitudes towards technical training by educating society on the importance of technology to general development.

7. Technologies should be developed to utilize the human and material resources of a country through appropriate incentives and, if necessary, import controls.

8. National quality and performance standards, rationally related to internationally adopted standards, should be developed for domestic and imported manufactured goods.

9. Governments should set clearly defined policies and strategies for national development, and direct the needs of individual aspirations by creating incentives, such as adequate renumeration and status, particularly in areas of shortfall in manpower needs.

10. Industry should be encouraged to release its employees at all levels for further related technical education at local institutions on sandwich/block/

day/evening courses; these courses should be designed to provide the correct combination of practice and theory relevant to the particular occupational skills under consideration.

11. Governments should, while embarking on or encouraging new projects to industrialize their countries, pay early attention to environmental protection and safety measures through legislation and education.

12. Governments should enlighten the public on desirable social attitudes towards the training of women and girls in technical education, and should take urgent steps to ensure that the human and physical resources for the teaching of science and other pre-vocational subjects in girls' schools are comparable to those in boys' schools where such separate schools continue to exist.

Recommendations to the Commonwealth Secretariat

13. The Secretariat should review its system of disseminating information to ensure effectiveness in reaching relevant institutions, organizations and appropriate individuals.

14. The Secretariat should consider publishing a journal of technical education for subscription by individuals and institutions in member countries. Such a journal should deal with the development of teaching techniques and educational experience gained in member countries.

15. The Secretariat should consider establishing a Staff College or similar provision in Africa for the development of teachers and administrators in technical education institutions.

16. Technical institutions should be encouraged to publish house journals for circulation in local colleges and industry, and externally.

17. When the proposed Commonwealth Association of Polytechnics in Africa is formed, one of its initial activities should be the organization of an annual technical education week.

HIGHLIGHTS OF COUNTRY REPORTS ON TECHNICAL EDUCATION

The Gambia

General education includes primary education (6 years), junior secondary education (4 years), and vocational education which takes place in a Vocational Training Institute.

Prior to 1964 vocational training at the Institute was restricted to carpentry, joinery and masonry. Now with the increased need for skilled craftsmen, it has expanded its facilities to enable it to offer courses in other areas such as mechanical engineering, craft practice, welding and motor mechanics. Students of the Institute take the Institute's Examination as well as the City & Guilds Part I Examination. Further expansion and upgrading into a Technical Institute will enable it to offer courses in agriculture, plumbing, electrical installation etc. It is also expected that in the near future a Rural Training Centre will be established.

So far, industrial training has not been able to meet the needs of industry for middle-level manpower.

Ghana

With the launching of the new Education Service in April 1974 there has been a shift in emphasis from the purely academic type of education to one giving high priority to technical education and vocational training at all levels of the educational system.

First cycle education is of nine years' duration and comprises six years primary plus three years junior secondary and is basic, free and compulsory for all.

Second cycle education selection is made into the following terminal courses: two years senior secondary lower, and three years technical/ vocational or commercial.

Pupils who successfully pass the second cycle of education and who have the relevant qualification can proceed to (a) two years senior secondary upper (present "A" level); (b) three year teacher training course, or (c) polytechnic course.

Pupils with GCE "A" level qualification who do not proceed to university are encouraged to train for middle-level professions in polytechnics, specialist, and teacher training colleges.

The Technical Education Division of the Ghana Education Service provides the machinery and infrastructure for a system of (a) technical education and vocational training aimed at producing adequate supply of middle-level and skilled manpower in all fields of industry; (b) training of technical teachers; and (c) institutional supplements or "off the job" training

of apprentices, the "in-plant" aspect of which is by law the responsibility of the Ministry of Labour acting through the National Vocational Training Institute.

The National Vocational Training Institute (NVTI) was established by an Act of Parliament in 1969 with the sole responsibility for the organization of apprenticeship in-plant training, preparation of training programmes, and provision of training standards for these programmes. Its activities are presently limited to craft apprentices only. It is governed by a Board of Directors on which are represented the Trade Union Congress, Employers Association and the Technical Education Division of the Ghana Education Service. There are also other councils and committees on which industry and commerce are represented: one of them is the National Apprenticeship Council.

The board has so far approved 50 apprentice Training Standards and established 55 apprenticeable trades.

The functions of the Technical Education Division are presently organized and conducted through the following:

(a) Fourteen technical institutes and trade centres responsible for full-time, block release, part-time, and evening-class courses for craft-level students.

(b) Three polytechnics for technician and middle level manpower training for industry and commerce.

(c) One School of Mines for the training of technicians in the mining industry.

(d) Two training institutions for the training of technical teachers for the polytechnics, technical institutes and secondary schools - both junior and senior.

All the above institutions are administered by management committees on which industry and commerce are fully represented. These are being enlarged into Boards of Governors to make them more effective.

Technician courses have built-in provisions to ensure that their output provides adequate industrial experience. These take the form of at least a year of industrial attachment between the second and third part of a three-part course.

The following technician courses, with specialization at the Part III level, are now available in the system - mechanical, electrical, and construction. Also available are courses in science laboratory and dispensing.

Relations with industry have improved over the years in the sponsorship of students, placement for industrial attachment, industrial visits, and project work for technician trainees.

Regarding examinations, the machinery for the change-over from City & Guilds of London Institute to local examinations is gradually taking shape and it is hoped that by 1980 all the processes will have been completed.

Advisory Committees have been formed for all course areas; industry and commerce are fully represented, with the hope that resulting schemes and programmes will reflect the needs of local industries.

Kenya

Education in Kenya consists of seven years of primary, four years of secondary, and two years of higher secondary school education.

Secondary education leads to a national examination, the East African Certificate of Education (EACE) examination. This is the level at which most training programmes for middle-level management manpower start. The two years after EACE lead to the East African Advanced Certificate of Education (EAACE) examination. This examination qualifies students for entry to universities and other institutes of higher learning.

There are about 8,000 primary schools with enrolment ranging from 50 to 900 children. In addition, there are 450 government-maintained secondary schools which are supplemented by a similar number run and financed on "harambee" (self-help) basis by local people. Among the maintained secondary schools are 30 secondary schools offering industrial education and 13 which offer technical education.

In secondary technical schools, the curriculum includes basic engineering and basic building trades courses. The bulk of these students are selected by employers through the Directorate of Industrial Training for craftsmen apprenticeship training programmes. Training is on sponsorship basis and normally lasts three years.

The polytechnics receive students with relevant credit passes in the EACE Examination (English and Mathematics are compulsory) for technician, Ordinary and Higher Diploma courses. Courses offered are mechanical, electrical, automotive, building and civil engineering. Commerce and accountancy courses are also available.

Students pursuing technical courses are wholly sponsored by their employers. Sandwich, day-release and evening classes are held to suit each candidate.

To supplement polytechnic training, parastatal organizations have their own training schools to suit their own special training requirements.

Harambee Institutes of Technology are run on a self-help basis, and depending on individual finances, offer various courses at both craft and technician levels.

Village Polytechnics and National Youth Services assist in imparting craft skills to some youths who cannot be absorbed into the secondary school system after their primary education.

Under the National Industrial Training Act of 1971, employers are required to pay a levy to a central fund to cover craft and technician training costs of trainees sponsored by employers. Training costs incurred directly by employers are refunded from the levy fund. The fund, the training programmes, and the supervision and control of courses are managed by the National Industrial Training Council with its particular trade committees. The Council is composed of representatives from government (Education, Labour and Directorate of Personnel Management) and the Federation of Kenya Employers and Central Organization of Trade Unions. The Council Secretariat is the Directorate of Industrial Training which is under the Ministry of Labour.

Lesotho

The Kingdom of Lesotho is an enclave within the Republic of South Africa, being a very small country with an area of 22,000 square miles and a population of $1\frac{1}{2}$ million.

General education is the responsibility of the Ministry of Education. It begins with primary school education of seven years' duration followed by junior secondary school education of three years' duration with a Junior Certificate obtained after a successful pass at the end of the third year.

The next two years are spent in a high school, at the end of which a General Certificate of Education 'O' level is obtained. The quality of pass at this level forms the basis of the entry qualifications of the National University of Lesotho.

Presently there are 1065 primary schools, 64 junior secondary schools, 22 high schools and one university.

Technical education is the responsibility of the Ministry of Education. Training courses are organized at the craft level in carpentry and joinery, brick work, electrical installation work, plumbing and sheet metal work, automotive and general mechanics, and basic electronics. These courses are of two to three years' duration and are offered at the four technical training institutes in the country. The minimum entry qualification is the Junior Certificate, with good passes in mathematics, a science subject and English.

One of the institutes, Lerotholi Technical Institute, is being developed into a polytechnic with introduction of diversified courses. A civil engineering and construction course of three years' duration is already in operation; it is to be followed by electrical and mechanical engineering courses in the near future. The Commercial Training Institute offers courses in business studies and secretarial work. Other courses envisaged in the future deal with the training of laboratory technicians and para-medical health assistants.

Presently, technical training within the country at various levels involves nearly 700 students.

Certificates are offered by the Ministry of Education except for external examinations such as the London City & Guilds Examination.

Employment Opportunities

Both the public and the private sectors are ready employers for trainees at all levels. Industrial training Acts are not yet operative in Lesotho as industrial development is still in its infancy. In spite of this, however, there is satisfactory co-operation between industry and the training centres and institutes.

Mauritius

In the field of technical education, the country has three state co-educational junior technical schools which run four-year pre-vocational education in woodwork, metalwork and home economics. In addition, one state secondary school offers technical and vocational courses alongside the more popular academic subjects.

In 1969 the country took a positive step towards producing the much needed manpower for industry. To this end an Industrial Trade Training Centre (ITTC) was established with financial assistance from the UNDP. This project was executed by the ILO. The Centre provides training in the following fields: electrical installation, auto-mechanics, welding and metal fabrication, plumbing and pipe-fitting, carpentry and joinery, masonry and concrete. Another centre is soon to be established in the northern part of the country to run the following courses: maintenance fitting, tractor mechanic, sheet metal work, cabinet making, upholstery.

The country has one university, a school of agriculture, a school of administration and a school of industrial technology, all offering degree and non-degree courses. There is also an Institute of Education which engages in educational research, curriculum development and teacher education.

Training within industry is a concern of each industrial organization. At present there is no partnership between educational institutions and industrial organizations. The country has formulated an industrial policy which anticipates an expansion of its export manufacturing sector to provide new job opportunities in order to eradicate the country's unemployment problem.

Nigeria

The Federal Republic of Nigeria consists of 19 States with a population of over 90 million. The educational system comprises six years of primary schooling followed by a single tier five-year secondary course and a tertiary system of teacher training, technical/technological or university education.

Entry into secondary schools is through a common entrance examination. Pupils who fail to gain admission usually find a place in teacher training colleges or vocational schools. Students who successfully complete secondary education tend to pursue further studies in higher schools, schools or basic/preliminary studies in preparation for the university. On the other hand, students who fail to successfully complete their secondary school education often seek admission into technical schools or trade centres.

Both State and Federal Governments can legislate on educational matters. Responsibility for overall planning, monitoring and co-ordinating education programmes lies in the hands of the Federal Ministry of Education. The Universal Free Primary Education project is one of the exercises currently being undertaken by the Federal Ministry of Education.

There are three levels of technical education in the country; vocational, technician, and professional. Although the first vocational/technical institution was established as far back as 1913, the progress of development of vocational-technical education has until lately been slow. Facilities for teaching and learning are now being expanded. It is expected that the polytechnics and colleges of technology will, by 1980, have a total student enrolment of 36,000 and that student enrolment in technical schools will be 118,000.

A new policy on education is currently being developed. An important highlight of the new system is the development of a three-year junior secondary system and a three-year senior secondary system. It is hoped that the curricula for the junior secondary system will incorporate a substantial technical-vocational component. At present craft skill training is largely institutional and is conducted in technical schools and trade centres

controlled by the State Ministries of Education. However, the Federal Ministry of Labour conducts limited trade tests for craftsmen trained in the non-formal educational institutions. Technicians are trained in the colleges of technology and polytechnics while professionals are trained in the universities. Whereas all the universities are owned by the Federal Government, the majority of the colleges of technology and polytechnics are owned by the various State Governments.

There is a National Board for Technical Education which is charged with the responsibility for co-ordinating and advising the Government on technical education problems which fall outside the jurisdiction of the universities. There is also the Council of Heads of Polytechnics and Colleges of Technology which in co-operation with industry is responsible for the preparation of syllabuses.

In order to encourage close co-operation between education and industry, the Federal Government in 1971 established the Industrial Training Fund to catalyse the process of manpower formation for industrial and commercial needs. The Fund is financed through levy contribution by employers and subvention by the government. In the past few years, the Fund has developed a number of programmes and schemes aimed at sharpening training awareness and bridging the gap between industry and institutions at various levels. One important scheme is the Student Industrial Work Experience Scheme (SIWES) by which students in some selected fields are given industrial attachment for a three-month period each year. There is also the Vocational Improvement Programme in which the Fund makes use of available facilities in existing trade centres and technical colleges in the evenings to provide courses for self-employed and other categories of tradesmen. The Fund also bears a proportion of the direct cost of worker training of its contributing employers.

The problem of the status of the technician is still very much with the Nigerian society. A feature of an industrializing society is that people who have been to schools prefer "white colar" jobs. The result is that most technicians gravitate into non-technical jobs.

Seychelles

The country offers six years of primary school education followed by three years of secondary school education. At the end of this, students may enter a technical school where they are trained up to the Trade Test level in all the subjects of the school, but for some the training is carried further up to the United Kingdom's City & Guilds level. In addition to the full-time courses, there are day-release courses, evening classes and short courses of about four weeks' duration.

There is a college which trains up to the General Certificate of Education "A" level. Successful graduates obtain grants or scholarships and proceed overseas for higher courses.

Sierra Leone

Pre-university education in Sierra Leone is in three phases: primary and pre-school, secondary education and technical/vocational education and training. Education is not compulsory, but 70% of primary school children are admitted to secondary schools annually.

Over the first three years of secondary education there is an average drop-out of 40%. Those students who obtain the West African Examinations

Council General Certificate of Education/School Certificate may pursue higher education at university colleges, teacher colleges and the Technical Institute.

Much foundation work has been done in technical and vocational education and training to provide the middle-level manpower needed in industry and the community. There are four full-time Government training institutions, namely the Technical Institute, Kenema, the Freetown Trade Centre, Kissy, the Magburaka Trade Centre, Magburaka, and the Technical Institute, Freetown. The last of these caters for technician-level training to City & Guilds of London Institute's standard for ordinary Technician Diploma in building and civil engineering, mechanical and electrical engineering, and telecommunications, and radio and television maintenance. There is also a two-year course in commercial and business studies leading to the Royal Society of Arts Ordinary National Certificate and Ordinary Certificate in Business Studies examinations. The other institutions restrict their intake to students from 15 to 20 years of age who have completed at least the third form of a secondary school. Courses conducted include all building trades subjects and basic engineering trades - a core course followed by one of the following study programmes: internal combustion engine, mechancial fitting/turning, electrical installation, refrigeration and air-conditioning.

There is a national advisory body known as the Technical Education Advisory Committee (TEAC) composed of representatives from government agencies and representatives from employers and labour organizations, industry and commercial sectors, and public corporations. The Committee is responsible for policy making, planning, and the co-ordination and integration on a country-wide basis of all vocational training activities. The TEAC is an important body especially in its role in establishing the apprenticeship scheme.

Areas of development include assistance under the IDA educational programme for additional facilities at the three trade centres. These facilities - production unit, science laboratory, library and dormitory - together with ILO/UNDP input of equipment will be adequate for both full-time and apprenticeship training.

The establishment of an Apprenticeship Authority is one of the priority areas of development. The decision has been taken that the proposal should be implemented jointly by the Ministry of Labour and the Ministry of Education. The Ministry of Labour will administer apprenticeship, and the Apprenticeship Board will be responsible to the Ministry of Labour.

The third area of development is the ILO input in establishing an Instructor Training Unit (ITU) to train instructors for the trade centres, run up-grading and refresher courses, and training officers for industry. To this end, experts in various trade subjects, instructor training and curriculum development have been assigned to the project. These officers will work with principals of all trade centres, review the curriculum, and set such standards as would be in line with the needs of industry and the community.

In the absence of an apprenticeship scheme, industry co-operates with authorities of existing training centres in implementing policy matters; a few accept students on attachment and assist in providing training materials. Graduates skilled in building trades are readily employed. There is also great demand for those qualified in commercial and business studies.

The vocational training manpower survey (1976) showed a 5% increase in employment compared with the figure in 1975. The report revealed that there are 25 apprenticeable trades.

Tanzania

There is a seven-year universal primary education, followed by a four-year secondary school system and a two-year higher secondary school programme. University degree programmes are of three to five years duration. Other post-primary systems consist of vocational-education, and teacher education including programmes for technical and science teachers.

At the diploma level, there are colleges and institutions which cater for managerial manpower development and middle-level financial management.

Higher school graduates do a twelve-month period of national youth service. University education is closely related to the demands of commerce and industry; as a result, no candidate can be admitted into the University unless sponsored by an employer. Each application is expected to be forwarded through the candidate's employer and through the local secretary of the Party. This arrangement is meant to ensure that there is a job for every university graduate. Political education is also available for those with leadership responsibilities (e.g. principals, headmasters and managers of corporate institutions).

Technical education in Tanzania starts at the primary school level where basic local crafts, metalwork and woodwork are introduced. This scheme adopts the modular approach with emphasis on "how-to-do". At the secondary school level, there is a further emphasis on technical subjects.

Since 1971, vocational education has been incorporated into the secondary school system. A cost-reduction exercise has been devised to enable some secondary schools to offer diversified courses in technical education, agricultural education, business and commercial education, and domestic science. Students pursuing technical education take trade tests administered by the Tanzanian Ministry of Labour.

The training of craftsmen which used to be under the Ministry of Education was made the responsibility of the Ministry of Labour in 1965. However, in 1969 craft skill training, which used to take three years in trade centres, became organized in two stages - a one-year course at a trade centre followed by a three-year industrial attachment. To further emphasize the importance of vocational training, the Government has now established a Vocational Training Council. This Council has three vocational training centres with a total annual student intake of 1,200.

Attempts to make technician training more responsible to the needs of local industries began in 1971. Candidates for this level of training are expected to have attained the Form IV Certificate of the National Examination Council. The full technician certificate course lasts for three years. Each academic year consists of three twelve-week terms at college and one ten-week term devoted to training in industry. The curricula for these courses are developed jointly by representatives of the Ministry of Education, industry and other employers.

Uganda

The educational system in Uganda starts from the kindergarten stage

followed by a seven-year primary school education. About 80% of the products of the primary school system do not proceed further with their education. Therefore, emphasis is now being placed on craft skill training to absorb these drop-outs. Programmes to absorb this group include youth programmes, teacher education, and young farmers' programmes.

There is a four-year secondary school programme leading to Ordinary Level Certificates for those who are able to continue further. Secondary school subjects include a number of vocational courses like technical drawing, woodwork, metalwork and home economics. Graduates of secondary schools find their way into any of the following: higher schools, teacher training, technical and commercial institutions and departmental training. After two years of higher schooling, graduates proceed to university, higher technical and commercial colleges, Grade 5 teachers' colleges and departmental training.

The majority of courses at the higher technical college are run in conjunction with employers on a sandwich or day release basis.

The overall responsibility for administration of schools lies with the Ministry of Education which maintains direct links with post-primary and tertiary institutions.

There are ten schools which offer three-year courses in technical subjects. Candidates for admission into these schools are selected from primary school leavers. On successful completion of courses, a junior technical certificate is awarded. Some of the courses offered include carpentry and joinery, concrete practice, plumbing, and electrical installation. These schools provide the only opportunity for obtaining technical skills to 80% of the primary school leavers.

There are also five technical institutes which offer two-year craft and advanced craft courses of the East African Examinations Council. These institutes operate at post-secondary level. Graduates of these institutes may continue their courses in technical colleges where diplomas and certificates are awarded at both ordinary and higher levels.

Technical training in Uganda is geared to industrial requirements. In fact, the syllabuses for technical institutions are prepared by the National Advisory Committee on which industry is adequately represented. Furthermore, industries sometimes sponsor students for courses in technical education institutions. There are also in-plant training arrangements to adapt and up-grade skills. At the international level, there are co-operative agreements with the ILO and UNESCO to advise and assist with the development of industrial and technical teacher training.

Zambia

The educational system of Zambia, a country of 5 million people, includes seven years of primary level, three years junior secondary and two years senior secondary. National service, lasting 20 months, is undertaken by all students after completing senior secondary education. Entry to university and other institutions of further education is possible for eligible students after national service.

From 1920 to 1960 government and missionary organizations offered skill training in workshops attached to primary schools. After independence some of these facilities were closed down due to lack of employment oppor-

tunities in spite of demands for skilled workers in some industries. In 1968 the government decided to expand technical education and trade training by setting up a Department of Technical Education and Vocational Training. Under the Technical Education and Vocational Training Act, 1972, a policy concentrating on full time pre-employment technical education courses was established. This approach was preferred to a more traditional apprenticeship system.

The Department for Technical Education and Vocational Training (DTEVT), initially under the office of the President and later taken over by the Ministry of Education, has 14 institutions offering training in craft skills, technical teaching, technician and technologist work. A National Council for Technical and Vocational Education oversees this programme and also the work of private institutions.

Programmes based on curriculum charts accepted by government and industry lead to the award of certificates by the Zambian Examination Council. Most of the examinations have been localized, with the exception of paramedical and air-services courses, which are externally assessed.

Certificate awards are made by examinations and continuous assessment. Industrial attachment reports are also used for final assessment.

There is a problem in finding suitably qualified and experienced teaching staff for paramedical, mining engineering and air services programmes. The high demand from industry for persons with such qualifications makes it difficult to recruit and retain them in the teaching profession.

Since the DTEVT was established in 1969, the partnership between the training institutions, commerce and industry has improved. Representatives from industry serve on national and local bodies for technical education and training. Teaching staff are given attachments to industry, and staff development programmes are being developed. Some industries have established training centres, offering programmes approved by the DTEVT.

SUMMARY OF DISCUSSIONS OF LEAD PAPERS

PARTNERSHIP: THE NATIONAL FRAMEWORK

The origins of modern apprenticeship can be traced to the Industrial Revolution of the mid 18th Century when the training of craftsmen and artisans began to be instituted in a formal way, the principle feature being the contractual obligation of the employer to train the employee in return for service. Another impact of the Industrial Revolution was the gradual involvement of government in the process and control of apprenticeship by defining its various aspects through legislation.

All forms of apprenticeship have similarities. Admission regulations, duration of training, syllabuses, examinations, industrial training, and funds for training are all included in modern legislation. Apprenticeship is usually administered by an organization or council. Where previously the methods of apprenticeship embraced on-the-job training almost exclusively, this has changed to:

(a) formal training in schools in parallel with, or prior to, periods in industry;

(b) both theoretical and practical training being given in certain institutions (e.g. technical schools).

In many countries apprenticeship is controlled on a national basis while state or regional bodies are encouraged to reinforce the national framework.

Four case studies are compared. These are United Kingdom, West Germany, United States of America, and India. India has been chosen in order to delineate and illustrate the evolutionary nature of legislation and implementation in a large, complex, rapidly developing framework.

United Kingdom

Britain has passed through four phases of apprenticeship initiated by the Industrial Revolution and the distinctive periods of post-war problems. The flaws inherent in each phase have induced changes, culminating in the Industrial Training Acts of 1964 and 1973.

The 1964 Act empowered the Minister of Labour to establish, for each type of industry, an Industrial Training Board consisting of representatives from the employers, employees (trade unions) and technical education. Each Board was given the task of organizing training for workers at all levels, funds for this training being raised through the imposition of a levy. These levies varied from one industry to another (e.g. for the Engineering Board it was about 2.5% of the total payroll while, for electricity supply, it was 0.35%). The maximum levy was 3.8%.

As a result of the 1964 Act, the tasks of collecting the mandatory levy and spending the money on training, dominated the policies of the ITBs. Levy/grant schemes became more sophisticated as levy exemption arrangements were adopted. Industry's reaction to the new ITBs varied widely. The engineering industry generally accepted common funding, whereas others campaigned vigorously for the abolition of ITBs.

In 1973 a new Training Act enabled the UK Government to exercise more direct control over industrial training.

A Manpower Services Commission was established and an agency of the Commission - the Training Services Agency (later to become the Training Services Division) - became the co-ordinating body for the ITBs. All operating costs (other than levy-backed grants) were met by central government. Special grants, notably to alleviate unemployment, were channelled through the ITBs to mount training courses. A Training Opportunities Scheme (TOPS) was launched using existing facilities in colleges and training establishments. Government training centres were re-named "Skill Centres" and programmes of young adult training were expanded.

Employers and unions worked in consultation with the ITBs and the Training Services Division (TSD) to reduce the traditional apprenticeship period; a notable example being in the electrical contracting industry where full tradesman status could be given at the age of 19.

During the period 1974 to 1976, industry became increasingly restive over the educational standards of school leavers and the TSD issued a number of consultative documents dealing with the school-to-work interface and the need to provide vocational preparation for young people.

The provision of "link courses", in which school students attended technical colleges for one day a week, became more widespread. These courses allowed students to sample possible careers, provided a diagnostic service, and built foundations for further education courses.

West Germany

The West German system of apprenticeship was historically based on practical training in workshops and vocational training in institutes established by industry. The system is administered by two autonomous organizations, viz:

(i) The German Council for Industry and Commerce which is responsible for the higher levels of training.

(ii) The German Association of Chambers of Artisan Trades which is responsible for craft training.

United States of America

Prior to the National Apprenticeship Act of 1937, the USA witnessed many forms of apprenticeship, ranging from on-the-job training to formal school training and combinations of both. All these apprenticeship schemes were voluntary.

The National Apprenticeship Act authorised and directed the Secretary of Labour to stimulate training for workers through the active

co-operation of industry and the involvement of employers, labour organisations and eminent citizens in establishing standards and training programmes through advisory committees.

The advisory committees were not empowered to levy or raise funds but merely to encourage industrial involvement through public dialogue.

India

Indian apprenticeship can be divided into two historical phases - the pre-independence and post-independence periods.

The former was similar to that of the United Kingdom. The railways took the lead, followed by Defence Departments and, finally, a Board of Apprenticeship Training (BOAT) was established.

After independence, India set up Industrial Training Institutes (ITIs) to organize and implement the various programmes designed to meet urgent manpower requirements. At present, there are 357 such institutes with over 150,000 places in 30 engineering and 22 non-engineering trades.

For engineering trades, the period spent in the ITI is 18 months followed by six months in-plant training. For other courses the period of formal schooling is 12 months. The emphasis of the ITIs is on practical work: of the 3000-hour courses, 2,500 hours are devoted to theory.

In 1956 a National Council for Training in Vocational Trades (NCTVT) was legislated to co-ordinate all aspects of vocational training. Following the work and experience of this Council, the Government of India enacted a new Apprentice Act in 1961 which brought apprenticeship firmly under state control.

The main features of this Act were that for industries with over 500 workers, training centres should be established; for those with less than 500, government institutes would assist in training, with costs being borne equally by the firms and the government.

A second important element was the definition of the ratio of apprentices to workers. This ratio depended on the types of industry, (e.g. 1:1 or 1:2 in engineering, while in textiles the ratio was as low as 1:50 or 1:100).

Lastly, mechanisms for examination and certification of apprentices were established on a country-wide basis making use of local institutional and industrial expertise.

The Legislative Framework

During the seminar lengthy discussions ensued on the legislative framework necessary to sustain industrial training systems. Distinctions were drawn between traditional apprenticeship schemes in which the apprentice has no basic training in the skill he wishes to acquire and industrial systems in which the student has acquired basic education and training but needs to supplement this with industrial experience in a particular skill.

It was agreed that because in different countries, a comprehensive view should be adopted which covers the training requirements of craftsmen, technicians, technologists, graduates and management staff as well as students who may be in any of these categories. The discussion on legislation as outlined in Dr. Chadrakant's lead paper, therefore, refers to this broad spectrum of industrial training.

There is also the concomitant need to consider legislation in the attainment of well defined national industrial and socio-economic goals, taking into account special factors such as the strength of direct or indirect government involvement, the time envisaged for the achievement of these goals, the flexibility of these goals with changing national circumstances and the modes of funding.

It was clear that national goals in many participating member countries were being pursued in the short term with reference to increasing the placement of nationals through control of expatriate work permits, accelerated production of skilled manpower through student attachments, on-the-job training and through a levy/grant system, and the introduction of more practical, compulsory, technical education at many levels, all being measures designed to encourage industry to become more involved with training.

The difficulties experienced by all concerned in the aftermath of such legislation were soon realized: the need for better identification and classification of training areas and the avoidance of overtraining in low priority activities; the acute shortage of industrial places in both quantity and variety and the unwillingness, and probable inability, of indigenously owned small firms to participate in training which often led to their poaching skilled manpower instead of contributing to the national pool. These comments led to examinations of the relative strengths and weaknesses of centralized versus decentralized administration and the mechanism of persuasion rather than coercion for the attainment of better, more effective results.

It was recommended that:

(a) Governments should legislate on industrial training to persuade and, if necessary, compel, industry to be involved with such activity.

(b) All training legislation should accord with the long-term and short-term goals and objectives for national industrial development and should accommodate to periodic changes in these policies with changing circumstances.

(c) Such legislation should seek to remove, as far as possible, the historical impediments to industrial training.

(d) Relevant legislation should be comprehensive, embracing the training of craftsmen, technicians and technologists. However, the point of implementation for a particular country should seek to rectify historical anomalies of types and numbers of skilled workers, and should depend upon the country's current state of development, its manpower projections and the need to establish, in the steady state, appropriate rations of these skills for continuing industrial development.

Machinery of Government

The government has a pivotal role to play in the implementation of training legislation. Besides conditioning attitudes for the proper recognition of technologies and its impact on society, it can foster technologies appropriate to the human and material resources of society.

Central to this theme of congruence between technical training and society, between the training process and its environment, is the need to create a public awareness that the choice of training for crafts and technology is determined in its own right and not as a second best alternative in the absence of the ability to justify academic pursuits. One way of creating this general social understanding might be to infuse technology into basic education at the earliest possible stage in order to bring about an appreciation of design, construction and product fabrication. Another might be to enhance status through national certification and the creation of national associations or societies.

In developing technology appropriate to an evolving economy it may be necessary initially to monitor the importation of equipment to conform to local requirements of parts interchangeability, reliability and common standards of performance. Laws and regulations inhibiting or restricting local production may also need to be reviewed, as should licensing arrangements. When encouraging local initiatives in manufacturing, similar domestic regulation affecting product and performance standardization may need to be enacted. Also it goes without saying that government will also need to provide suitable incentives to motivate and sustain indigenous industries to enable the necessary skilled manpower to be produced.

It is therefore recommended that:

(a) Government should encourage the reform of current social attitudes towards technical training by educating society to the true impact of technology.

(b) Technologies appropriate to the human and material resources of a country should be developed, if necessary, by control of imports and appropriate incentives.

(c) National product and performance standards should be developed covering domestic manufacture and imports.

(d) The quantitative aspects of manpower planning should be supplemented by emphasis on the quality of training. Thus, in addition to the ministry of education, ministries of labour, industry and the environment, should concern themselves with the training process in order to achieve maximum technical effectiveness, improve working conditions and recognize the importance of environmental factors and safety.

Financial Framework

A by-product of the discussions was the examination of the link between training and profitability as was being done in Nigeria. Though these studies are still in their infancy and broad relationships have yet to be determined, preliminary indications point to an effective mechanism for

regulating the different types and levels of training within an enterprise. It was felt that studies of this kind may lead eventually to greater voluntary industrial involvement with training.

As for creating the funds necessary to support national training programmes, several suggestions were advanced including levies and sales taxes. In the latter instance it was further proposed that money should be returned to the various industrial sectors in direct relation to its collection. As far as possible a national, autonomous Board or Council should be charged with making recommendations to government on this matter. It should, also, be empowered to collect and disburse these funds in the sole interest of technical training.

Priority should be given to the training of teachers of technical subjects. This is especially important in the early stages of national development where the higher levels of skills in particular trades may be in short supply. Schemes should be examined which encourage domestic teacher training in conjunction with the secondment of nationals for training abroad, the latter being maintained in balance with expatriates brought in on contract. Where twinning arrangements can be organized, of counterparts twinned with expatriates, this would undoubtedly accelerate national self-sufficiency in the supply and pool of trade, craft and technician teachers.

Technical education must get its proper share of the national education budget. This is a significant responsibility of government, neglected at a nation's peril if industrial development is high on the list of national priorities. There is no reason why some of these funds cannot also be channelled through the autonomous councils already mentioned to mix with funds raised in other ways. Where necessary, government might also absorb the administrative costs of the central organization handling training so that all monies collected from the private sector can be applied to the training function.

Training is required as much for small industries as for large, in rural areas and in urban centres. Extension services may well be the answer for providing this service to small industries in rural settings. Training must be effectively mobilized wherever the facilities are to be found. Possibly the facilities of large industries could be mobilized in the service of smaller ones; conversely the latter might band into industrial associations for effecting economies of scale in training. The disparities of involvement in training may to some extent be rectified by providing grants to organizations in relation to numbers of students and details of activity. Other corrective mechanisms could undoubtedly be devised.

Pursuant to these discussions the following recommendations were proposed:

(a) The levy/grant system might be used as a fiscal device for funding training; the levy might take the form of a direct tax on costs of operation or be related to sales; grants could be given in proportion to the amount of training carried out.

(b) Studies of the effect of training on industrial profitability might be encouraged as a device for promoting voluntary co-operation from industry in the training activity.

(c) A central Council or Board should be vested with substantial autonomy in the regulation of financial matters affecting training.

(d) Technical teacher training should initially be given higher priority and appropriate mechanisms should be developed for accelerating this development.

National Advisory/Co-ordinating Bodies

The preceding discussions inevitably led to a consideration of the best methods for implementing and controlling technical training on a national basis, recognizing on occasion certain regional characteristics. The general consesus was that this was best effected though a Central Council or Training Board organized on a national basis, under government legislation, yet independent of government in its function. Membership was to be drawn from a wide spectrum of society including governmental agencies, employers, trade unions and the training institutions. The Board should have wide powers of control, examination and certification and would enjoy a high degree of fiscal autonomy. On some matters (e.g. manpower planning) it would prepare recommendations for government consideration.

It was recommended therefore that:

(a) Central National Training Boards be established through appropriate statutes.

(b) These Boards should be autonomous and, in particular, should be independent of government direction.

(c) The composition would consist, in approximately equal numbers, of representatives from the appropriate ministries of government (e.g. labour, education, industry, environment, employers' federations; trade, craft and technician unions; the training institutes) and lay representation; due care being given to avoid dominance by any one group.

(d) The terms of reference should include the setting, maintenance and periodic review of training standards; the establishment or priorities in training; involvement with the full spectrum of craft/trade, technician and technologist training; and examinations and certification.

(e) In matters of manpower planning the Board would present its estimates to government for appropriate budgetary and other action.

PARTNERSHIP: EDUCATIONAL INSTITUTIONS AND INDUSTRY

Division of Responsibility

The seminar took particular note of the varying levels of involvement of governments, institutions and industries in terms of responsibilities for education and training as outlined in Dr. Tolley's lead paper. In some countries, it was noted, these responsibilities are not specifically assigned In others at the later stages, they are controlled by industry. In the majority of cases, however, they are shared.

Where possible, industry should be given the opportunity to select students for training, and should encourage projects - mutually worked out and agreed upon with institutions - which integrate theory and practice.

Taking these factors into account, it was recommended that:

(a) Generally, the responsibility for education and training should be shared between government, training institutions and industry. The government should look after basic education and training with industries participating increasingly in the sponsorship of subsequent technical training.

(b) Those industries that are too small to provide training should be encouraged to sponsor students either in larger industries or through co-operative effort. Support should be provided, where necessary by means of government grants or tax relief.

(c) All industrial training/attachment/improvership should be assessed and should form part of the final certification. This assessment should be done by industry, in the main, with the co-operation of the training institutions, along mutually agreed guidelines.

Product of the Schools

In addition to the National Boards - which the seminar had already recommended to take responsibility for manpower planning and other matters, it was proposed that a separate co-ordinating body should be established to plan, co-ordinate and implement the education and training activities of all technical and vocational institutions in member countries. On these National Boards, industry should be fully represented.

Also, each organization, be it industrial or institutional, should have training officers to promote and strengthen the transition between school and the world of work, and vice-versa. To this end, it was recommended that:

(a) Besides being closely involved in the design, implementation and standards of individual training courses, training officers should liaise closely with institutions so that full use could be made of all

available training facilities. This would ensure that what is taught is relevant to the needs of industry and that feed-back is effectively communicated to education and industry.

(b) Industry should be encouraged to release its employees for further related technical education at local institutions on sandwich/block/day/evening courses at all levels; these courses should be designed to provide the correct combination of practice and theory.

Course Content

The meeting recognized the work of advisory committees on curriculum development as being essential and suggested that industry and commerce should be fully represented on these committees to ensure that courses and programmes are relevant to their needs.

On the question of examinations, it was considered desirable that member countries should develop their own national systems but that where external examinations are currently being used, caution should be exercised when take-over is contemplated. In this regard, it was recommended that when dealing with technical subjects curriculum development committees should include representation from industry and commerce drawn preferably from appropriate national business organizations.

Interaction between Colleges and Industry

It was agreed that in principle there is a lot to be gained by mutual exchange of staff between institutions and industry. However, it was pointed out that a number of constraints exist, the main one being the reluctance of industry to release specialist staff for this purpose on a regular basis. Consequently, industrial staff undertake part-time teaching privately. Industry should be made aware that this type of partnership is to be regarded as a necessity.

It was recognized that while industrial training staff may be capable of giving practical courses, they sometimes lack the techniques required to teach the theoretical aspects of technical subjects adequately. It was thought that staff from educational institutions could help to rectify this deficiency.

Following the lively discussion that ensued, the meeting recommended that:

(a) Industry should be encouraged by appropriate incentives to release staff to teach specialist courses in institutions. To overcome the constraints of timetabling, the lecturers from industry might be drawn from several organizations or, alternatively, occasional lectures might be given over an extended period.

(b) Educational institutions should provide staff to industry to cover basic teaching where necessary.

(c) Industrial attachments should be arranged for short periods for students and teachers at appropriate levels.

(d) Institutions should provide courses (which may or may not be at the request of industry) designed specifically for the up-grading of skilled workers to enable them to contribute more effectively to general industrial productivity and also to help workers to aspire to a higher status.

(c) A central Council or Board should be vested with substantial autonomy in the regulation of financial matters affecting training.

(d) Technical teacher training should initially be given high priority and appropriate mechanisms should be developed for accelerating this development.

National Advisory/Co-ordinating Bodies

The preceding discussions inevitably led to a consideration of the best methods for implementing and controlling technical training on a national basis, recognizing on occasion certain regional characteristics. The general consensus was that this was best effected through a Central Council or Training Board organized on a national basis, under government legislation, yet independent of government in its function. Membership was to be drawn from a wide spectrum of society including governmental agencies, employers, trade unions and the training institutions. The Board should have wide powers of control, examination and certification and would enjoy a high degree of fiscal autonomy. On some matters (e.g. manpower planning) it would prepare recommendations for government consideration.

TECHNICAL EDUCATION IN AN INDUSTRIALIZING SOCIETY

The Need for Planning

The seminar noted that there is little or no policy regarding the importation of technology in most countries of Commonwealth Africa. Thus, not only are considerations not given to environmental hazards resulting from use of imported equipment but standards of equipment vary greatly. This situation makes the purchasing of spare parts and routine maintenance difficult and expensive, especially in the face of prevailing foreign exchange problems. It was suggested, therefore, that thorough planning should be carried out by each country before it begins to adopt any new technologies. The nature of the planning advocated by the seminar includes a survey of the needs of industries, availability of spare parts and the feasibility of setting up maintenance services.

It was noted that the needs of industry may run counter to the needs of the individual. This is particularly evident in training, safety and health. It was suggested that training should make the individual adaptable and able to carry out innovations when necessary. As regards individual choice of career, the meeting felt that the manpower planning machinery could lay special emphasis on areas of need where there are short falls, and on incentives, remuneration and status.

It was also felt that planning should be seen as a joint responsibility of government, industry and educational institutions. Unless close co-operation exists between these bodies, graduates of institutions are unlikely to be fit for the jobs offered by industry. Besides, lack of co-ordination could easily result in uncritical importation of unreliable or useless equipment.

Status and Remuneration

Reconizing that in general status and remuneration appear to be determined by the value system of society, the meeting noted that in most countries of the Third World, craftsmen and technicians are underpaid in relation to the contribution which these people make to the welfare of society and to the national economy. This situation has led to acute shortages of manpower at the technician/craft level, and the meeting therefore drew attention to the need for governments to devise suitable pay structures to remedy the situation. In connection with pay incentives, it was suggested that salary scales need not be made directly proportional to pay. By and large, status in member countries appears to be linked with paper qualifications, and jobs involving manual skills tend to rate low in salary determination and promotion prospects.

In order to give proper recognition and reward to technicians and craftsmen who normally operate at the lower levels of industry, a change in society's attitude is required. It was suggested that training programmes for all who work in industries should be designed in such a way as would give future management personnel a measure of experience at the shop floor

level. It was mentioned also that every encouragement should be given to workers to take pride in their work and hence to strive for a proper balance between job-satisfaction vis a vis status and remuneration. One way in which this could be done is by encouraging the formation of occupational associations and student chapters of national professional associations for example, the Institution for Civil Engineers, to develop pride in their profession.

Counselling

The meeting observed that there is confusion over the use of the term "engineer", a fact which gives rise to a number of difficulties when a technical student is faced with choice of a career. The meeting suggested, therefore, that career information should include details of work done by engineers, technicians, and craftsmen, the contribution which such personnel make to society, their career prospects. The meeting also recognized the importance of continuous guidance and counselling of trainees in technical institutions, and recommended such practices where they do not yet exist. Further, in counselling, students in industrializing, developing countries must be encouraged to see that while their individual needs should be recognized and respected, social needs may have to take precedence over their individual needs (especially in cases where the state bears the cost of training). National Manpower Boards should be set up, whenever they do not yet exist, to formulate the necessary control policy regarding training field.

Curriculum Development

Technological changes in manufacturing, distribution, marketing and services require changes in the skills required by the labour force. These changes in skills mean that if students are to be employable and are to perform satisfactorily, curricula in technological institutions have to be up to date and imaginative. To help achieve this, industry should be involved in the design and implementation of curricula which reflect the needs and resources (culture, technology, materials, human resources) of the community, and an exchange system involving staff of industry and education should be established. Teachers from institutions should be attached to industry for short periods and vice versa. This interchange should occur at all levels of training. Another way by which institutions could turn out the right type of product is to create opportunities for trainees to get involved in projects which stimulate real-life situations of entrepreneurship.

Education and Training of Technicians

Continuing education and training helps not only to update skills but stimulates interest especially in career technicians. It was suggested that both industry and educational institutions should be encouraged to realize the importance of retraining for the personal development of the individual and for economic development in general, and also for the creation of an appropriate atmosphere where technological personnel can acquire managerial and administrative responsibilities. Such retraining should, whenever possible, consist of short courses.

It was pointed out that scholarship policy regarding initial and further training by industries should be in line with government policy. Moreover, if trainees are to be sent for training outside the country, special effort should be made to ascertain the relevance of courses in host countries to national needs and the aspirations of the trainees. It was suggested that

certain agencies, such as a National Council for Science and Technology, should be set up to monitor the major skill shifts that have occurred in the various technologies.

The following additional recommendations were made:

(a) Member countries should be encouraged and, where necessary, assisted to organize training for trainees from other countries.

(b) A special fund should be created to enable trainees from member countries to acquire industrial training experience in other Commonwealth countries.

(c) A bulletin or directory should be published, giving technical education programmes offered in Commonwealth countries.

(d) The quality and standard of products should be safeguarded, one way being through consumer evaluation.

Areas of Growing Importance

The meeting identified a number of growth areas which should be considered in any attempt to formulate goals of technical education. These were:

(a) Technology related to utilization of the vast natural resources in member countries.

(b) "Tero-technology", or the technology of both preventative and curative maintenance of imported goods and machinery.

(c) Indigenous technology which satisfies the economic needs of the people and helps improve health and living standards of both urban and rural communities.

(d) Development of management skills, especially for leadership of small-scale industries, through such actions as the establishment of an Institute of Public Administration or Management Development Board in member countries to assist with the training of managerial and administrative personnel.

(e) The training of women and girls in technical education. Women in technical professions have proved to be as competent as their male counterparts and therefore more women and girls should be encouraged to undertake technician training. The two main constraints are cultural attitudes and the lack of basic opportunity, and the seminar therefore recommended that human and physical resources for the teaching of science in girls' schools should be of the same level as those in boys' schools.

(f) Changing attitudes towards women and girls in technical education. In this connection, the seminar suggested that campaigns to enlighten the public on desirable attitudes should be mounted.

COMMONWEALTH CO-OPERATION IN TECHNICAL EDUCATION

One of the functions of the Commonwealth Secretariat is to encourage and promote co-operation among member countries in the field of education. The Education Division of the Secretariat carries out this function in two main ways: collecting and disseminating information; and organizing conferences, seminars, workshops and training courses.

It was pointed out that in performing its tasks, the Commonwealth Secretariat works closely with international agencies and with regional and national organizations, thus avoiding unnecessary duplication of effort. In addition, the Secretariat tries to keep in touch with teachers' associations, particularly in their task of fostering educational development not only on a national basis but also among Commonwealth countries.

Attention was drawn to some recent Secretariat activities in technical education. It was noted that following the recommendations of the Seventh Commonwealth Education Conference of Ministers held in Accra in March 1977, the Secretariat convened a meeting at the Kenya Polytechnic in Nairobi in December 1977 to discuss the formation of a Commonwealth Association of Polytechnics in Africa. Copies of the report of that meeting (the Report of the Planning Meeting proposing a Commonwealth Association of Polytechnics in Africa), it was further noted, would be made available on request. Again, the Secretariat has followed up one other recommendation of the same Ministerial Conference, namely the setting up of a working group to explore the feasibility and the modus operandi of a Commonwealth Exchange Scheme for Industrial Training and Experience on a basis similar to that of the Commonwealth Scholarship and Fellowship Plan. The report of this working group is also available.

Other topics highlighted were the Commonwealth Fund for Technical Co-operation - its nature, terms of reference and operations, and the Secretariat's new initiatives aimed at teaching about the Commonwealth.

Following the lengthy and lively discussions that ensued, a number of recommendations were made. These included the following:

"The Secretariat is requested to review its system of disseminating information to ensure that it reaches individuals and all relevant institutions and organizations who might benefit from it.

"The Secretariat should consider publishing a journal of technical education for subscription by individuals and institutions in member countries. Such a journal should deal with the development of teaching techniques and educational experience gained in member countries.

"The Secretariat should consider establishing a Staff College or similar provision in Africa for the development of teachers and administrators in technical education institutions.

"Technical institutions should be encouraged to publish house journals for circulation in local colleges and industry, and externally.

"When the proposed Commonwealth Association of Polytechnics in Africa is formed, one of its initial activities should be the organization of an annual technical education week."

5. LEAD PAPER

PARTNERSHIP: THE NATIONAL FRAMEWORK

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WORLD PERSPECTIVE OF APPRENTICESHIP

Historical Background

Apprenticeship is one of the oldest social institutions; its origins are lost in the mists of time. From time immemorial, every master craftsman, builder, sculptor, weaver, metal worker has had his own apprentice to whom he has passed the knowledge and skill of his craft. In the mediaeval period in Europe, apprenticeship was formalized and became the normal method of entry to a craft guild. A boy was "bound as apprentice" to an established member of the guild, who undertook to teach his craft to the apprentice. In addition to the transmission of knowledge and skill, the master undertook to supervise the moral welfare of his charge, to provide him with food, lodging, clothing, medical attention, and "all other necessaries". In return for these considerations, the apprentice was legally bound to serve his master for a period of seven years, and in most cases received little or no wages. The typical master craftsman of the middle ages had his workshop attached to his dwelling house, and the apprentice usually lived with his master's family. The period of apprenticeship was followed by several years as a journeyman when he received small wages. Eventually, he started his own business, became a member of a craft guild, engaged his own apprentices as his master did, and completed the loop.

The Industrial Revolution brought in the factory system which was to have far-reaching effects on social change in Europe. One such change was that the firm traditions and controlled training systems of the European guilds broke down. Training in the crafts was disorganized; in industry and commerce, it was left to chance and paternal tradition. Shortages of skilled labour developed because of neglect of training and of emigration overseas.

It is in this climate that the reform movement started and the fundamental structure of modern apprenticeship began to take shape. One feature of the reform movement was that benefits in kind were replaced by wages, at first payable to the parent or master. The deed or contract of apprenticeship embodying the terms and conditions was executed by the two contracting parties, the employer, and the apprentice and his guardian; but the contract was purely voluntary on both sides. A second feature was that the trade unions filled the vacuum left by the waning influence of the old craft guilds and started exerting their influence on the conditions of employment of apprentice. The introduction of the third element in the form

of trade unions into the apprenticeship system was to have a far-reaching influence on the craftsman's competitive position in the labour market on the one hand, and on the other, on industrial relations. A third was that the increasing application of science and technology to industry led to greater complexity of organization of production and in the job structure of industry. As a sequel, many traditional crafts were de-skilled and new specialized skills were demanded. The latter in turn required of the apprentices a higher level of educational preparation and adaptability to technological changes. The result was that the age of entry into apprenticeship rose, and training on the job was reinforced by instruction in technical institutions. The establishment of Mechanics Institutes, for instance, catering primarily for apprentices on a part-time basis was a significant development. The apprenticeship schemes specifically provided for day-release or block-release of apprentices to attend technical institutions.

All these fundamental changes notwithstanding, apprenticeship has remained over the centuries the main source of skilled manpower for industry. It is essentially a "contractual relationship between an employer and a worker under which the employer is obliged to teach the worker ... and... the worker is to serve the employer... on stated terms".* Apprenticeship is thus a matter between two parties and consists of two elements, the reciprocal obligations between an employer and his apprentice. The document setting out the terms of the agreement came to be known as an "indenture" because of "the practice of writing out two copies on one sheet of parchment which were torn apart on signing, one copy being held by the master, the other by the apprentice". Traces of this custom may be found in the 19th century indentures where the upper edge is cut to a wavy or serrated shape.**

Development of Modern Apprenticeship

The years between the two World Wars witnessed other basic changes in apprenticeship throughout Europe, including the United Kingdom. Social reforms led to varying degrees of state control over apprenticeship through legislative enactments. For instance, new Apprenticeship Acts were introduced in Denmark (1921), France (1915), the Netherlands (1919). The Weimar Constitution in Germany (1919) made specific provision for the part-time education of all young persons below 18 working in industry.

The increasing application of science and technology to manufacturing shifted the focus of the skills in industry from the shop-floor to the design office, development department, production planning department, testing and quality control sections, costing and estimating office and ultimately to management. The shift demanded a wide spectrum of technical and professional personnel - technicians, engineers, production specialists, managers and so on. All these personnel needed to be trained and equipped with practical experience and knowledge of their specialities. The concept of apprenticeship, therefore, extended beyond the training of craftsmen and assumed new dimensions covering a wide spectrum of professional workers for industry. The technical education system in different countries of Europe responded to the shift and reinforced practical training in industry with a variety of part-time, day-release and evening courses which helped apprentices at different levels to acquire recognized qualifications. A notable example of the response is the further education facilities offered

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* Apprenticeship 1925

** Crawford, S., and Sterland, E.G., Apprentice Training, Institute of Personnel Management, Management House, London.

by technical colleges in Britain, the courses and examination for technological certificates conducted by the City and Guilds Institute of London and the National Certificates instituted by the British Ministry of Education. The well-known sandwich courses in which a student spends stated periods in industry and in a technical college in alternate layers is another fine example of co-operation between industry and education. (The system of sandwich courses developed in a big way only after World War 2.)

After the Second World War, apprenticeship developed all its present characteristics as an organized system of education within industry and started playing a more decisive role in economic development processes. The years of post-war reconstruction witnessed acute shortages of skilled labour, including engineers, technicians and managers. Even in the conventional commercial fields, the demand for clerks, accountants, secretarial assistants, office machine operators, etc. grew in a big way. All these requirements could be met only by expanding apprenticeship and improving its quality and standards.

Several other factors also influenced the pace and direction of the process of apprenticeship both in developed and in developing countries. Foremost among them was the direct intervention of state authorities through legislation to ensure that apprenticeship did not become a convenient cover for the exploitation of cheap labour and that the training was conducted under controlled conditions according to well determined standards and procedures. Next, social reforms led to equalization of educational opportunities, and the economically weaker sections of society started receiving increasing access to higher education. Rising income made it possible for parents and youths to forgo the short-term advantage of taking up jobs without training directly after leaving school. Apprenticeship came to be regarded as the transition of adolescents from full-time education to adult work through a predetermined period of training in employment. Third, the increasing size and complexity of industrial organizations and rapid advances in technology gave a new dimension to apprenticeship. In addition to the traditional craft apprenticeships, technician student, graduate and commercial apprenticeships became common. Lastly, new training methods and techniques reinforced by off-the-job preparatory training at separate vocational centres shortened the actual period of apprenticeship and improved the quality of the manpower trained.

With a long unbroken tradition, apprenticeship today has become the principal means of providing technical and vocational education by utilizing the resources of industry. It is thus a part of both social and economic systems. Over the centuries, however, it has undergone basic changes in response to the forces of social and economic change in each country. We therefore see many patterns of apprenticeship throughout the world. There are different organizational arrangements for training, instruction and trade examinations, and different administrative frameworks of apprenticeship, including financing, in different countries. Considered in a world context, apprenticeship is a system in transition with new problems arising as existing ones are solved. Nevertheless apprenticeship is becoming firmer conceptually and more rigorous in practice. Even more important, it is elaborating, adjusting and adapting a centuries-old tradition to a modern technological world. All these differences and problems of transition notwithstanding, there are common characteristics which have made apprenticeship universally acceptable.

Common Characteristics of Apprenticeship

Apprenticeship is essentially a voluntary, contractual arrangement between

an employer and a worker under which the employer is obliged to teach the worker and the worker is obliged to serve the employer on stated terms. The system is generally regulated by administrative rules which are framed under apprenticeship legislation. The legislation generally provides for apprenticeship in all trades and occupations, indenture, minimum age for admission, duration of training, related instruction, mutual obligations of apprentices and employers final examinations, administrative machinery for supervision and control of apprenticeship, financing of training, and related basic issues. The participation of employers' and workers' organizations in the bodies set up to administer apprenticeship is an important feature of the system.

Apprenticeship is not confined either in concept or in practice to the training of skilled workers. Thus, the system includes, in addition to craftsman apprentices, students apprentices, technician apprentices, graduate apprentices and management apprentices.

Craftsman apprentices who constitute the bulk of trainees are, on average, between 15 and 18 years old and have eight to nine years of general school education. The period of apprenticeship varies from one to five years, but the median duration is three years. Consequently, most trainees complete apprenticeship at the age of 18 or 19 though this may be as high as 21 or 22 in some countries.

The normal feature of a well-organized apprenticeship system is that preparatory training in basic skills with associated instruction in mathematics, drawing and engineering principles is given to apprentices at separate vocational training centres before they are sent for on the job training on the shop floor. The vocational training centres are maintained by industrial firms, individually or collectively. In some countries the training centres are maintained by the state authorities.

As the period of compulsory full-time school is extended in many countries, so the proportion of apprentices, with secondary education is increasing. In addition, pre-vocational training at the school stage motivates young persons towards apprenticeship, rather than towards joining the active labour force immediately after leaving school.

The organizational structure of apprenticeship is based on a list of trades approved by public authorities or by collective agreements between employers and unions. The apprenticeable trades are further regulated by training standards, examination requirements and certification for skill competency. The number and description of apprenticeable trades may vary from country to country, depending upon the state of industry and commerce in each country and on the occupational pattern of the labour force. The present range is 100 to 500, which includes in addition to engineering or industrial trades, commercial, agricultural and personal service occupations. It is, however, axiomatic that the integrity of apprenticeship as the principal means of entry into a skilled occupation has to be preserved by revising the list of apprenticeable trades on a continuing basis in response to technical changes in industry and commerce. The system has to guard itself against the danger of obsolete and dead-end trades. It has also to overcome the resistance to changes in training techniques and regulations which may be put up by trade-oriented unions and guilds in their monopolistic practices.

Another important aspect of a continuous review of apprenticeable trades is the increasing tendency to limit narrower specialization and to emphasize skill areas that facilitate worker mobility within industry and widen the field of recruitment. In this process, many related trades are

being coalesced and made into a smaller number of composite fields of training. Further, there is an overall trend away from artisan trades apprenticeship towards training in the industrial trades and commerce.

Legislative provisions or administrative instructions regulate training in apprenticeship by laying down detailed job description, training programmes and examination standards for each trade. These regulations too are being revised and elaborated on a continuing basis to ensure improvement in skill competency in the light of changing technological needs. In addition, in most countries, the central training authorities concerned also provide to industry detailed training manuals, audio-visual aids and other training materials which are developed through extensive pedagogical research.

Apprenticeship is essentially training on the job. Those who decry the system parody it as "sitting next to Nellie" or "Jane learnt from Nellie and Nellie never knew". Although there is some force in the criticism in as much as the apprentice not only learnt what his master knew but also picked up his bad work habits, over the centuries the system has produced best craftsmen for industry. Nevertheless, it is being continuously improved and the two main directions in which improvement is being affected are:

(a) Part of the training is being moved out of the workshop or factory to separate training centres where practical and theoretical instruction could be given under controlled conditions and according to good pedagogical practices.

(b) Apprentices are being given regularly day release each week to attend a technical school to reinforce their shop-floor training with related theoretical instruction.

The commonest form of organized day-time instruction is for apprentices to attend classes one or one and a-half days or two half-days each week. A variant of the system is to give block release for several weeks each year for apprentices to attend full-time courses. As for the first reform movement towards separate training workshops for apprentices, particularly for engineering apprentices, the specific advantages claimed are:

(a) The training workshop, which is separated from the dangers and pressures of regular production or maintenance work, makes it easier for the apprentice to transfer from the school life to the active, working life or the adult.

(b) Certain basic skills can better and more systematically be taught under the close supervision of experienced instructors who apply modern didactic methods and use efficient teaching aids.

(c) Good working habits are learnt more easily in a training workshop than under the pressure of production.

(d) The production process in highly organized large undertakings (piece work and assembly production lines) leaves journeymen and foremen little time for taking care of the apprentice and teaching him. A young apprentice without basic skills and without at least rudimentary technical knowledge of what is going on, is likely to be a disturbing element in the production workshop.

Apprenticeship generally terminates with examinations for testing the trade competency or skill level reached by the trainees and for the award of certificates. The examinations may be at different levels as, for instance, a higher examination at the master craftsman level after a journeyman has had several years of additional experience in the trade and also undergone further technical courses. The City and Guilds of the London Institute system provides for three levels of examination corresponding to craft, advanced and full technological certificates. The last two can be equated to lower and higher technician positions. These are taken by "student" and other equivalent types of apprentices.

The examinations are conducted by different agencies in different countries depending upon the provisions of their respective apprenticeship legislation and the organizational structure of their apprenticeship system. Generally, the examinations are controlled by boards of examiners composed of representatives of industry or persons nominated by industry, public authorities, chambers of commerce and trade, and experts. A parallel arrangement for higher levels of apprenticeship is the membership examinations conducted by professional bodies as, for instance, the Institutes of Civil, Mechanical and Electrical Engineers in Britain.

In a number of countries, a national framework has been evolved for the organization and administration of apprenticeship, which is supplemented by regional, state and local bodies and authorities. This reflects a trend towards greater centralization of authority over the educational content of apprenticeship for the protection of youth in employment, and for ensuring that the technical content of training is adequate for the requirements of the industries and fields of economic activity concerned. As a sequel to various forms of central control by the state, the public authorities also share with the employers the cost of apprenticeship. The state's share generally includes the cost of part-time related instruction, basic and complementary practical instruction in full-time courses, preparation of training and examination standards, holding of examinations, and inspection services. The employer bears all expenditure on training within the undertaking, including the wages of stipends or allowances to apprentices.

All these and other characteristics which, in each country, have been influenced by educational changes, social legislation and trends in manpower policies, have given apprenticeship its basic vitality. The system today has not only preserved its traditional central position in the work-oriented education for out-of-school youth, but has expanded into new areas of economic activity. This is so, primarily because of the great flexibility of apprenticeship and because of its capacity to change. Despite the great volume of laws, regulations and agreements existing in each country, there is always considerable freedom of action permitting the employer and controlling authorities to adjust training plans and methods to new technical requirements and the demands of new groups seeking training.

CONTEMPORARY APPRENTICESHIP SYSTEMS: THE NATIONAL FRAMEWORK

United Kingdom

As the home of apprenticeship, Britain has witnessed several phases of evolution and development of the system, all of which are a part of British industrial and social history. The different phases which are of historical interest are:

(a) Guild Apprenticeship from the 12th century to 1563.

(b) Statutory Apprenticeship set up by the Statute of Artificers, 5 Eliz, 1563 and ended by its repeal in 1814.

(c) Voluntary Apprenticeship, from 1814 to 1964. In 1964 the more important and current phase started; the Industrial Training Act was passed by the Parliament and apprenticeship was brought under effective state control.

The main circumstances which led to the Apprenticeship Act are as follows. The post-war problems of British industry and society demanded large numbers of skilled manpower. This could be more effectively met at the national level only by organized and co-ordinated effort, instead of the traditional British way of relegating to employers the responsibility for preparing people for work. There was also widespread concern about the quality of training under voluntary apprenticeship, particularly the informal, on the job training called "Sitting next to Nellie". Many firms were poaching, that is doing no training themselves, but hiring away skilled workers from other enterprises. The Education Act of 1944 brought about a social revolution by equalizing educational opportunities and giving underprivileged sections access to higher education. This resulted, in the 1960s, in a big "bulge" in the number of 15 year olds and above leaving school and entering working life. This "bulge" compelled the state to accept responsibility for ensuring that the large numbers of young men and women at all ages leaving school had adequate opportunities of obtaining training for skilled employment.

The Industrial Training Act, 1964, is designed precisely to meet these special circumstances and introduces a number of entirely new principles in a century-old apprenticeship tradition. For the first time, the state takes a hand in industrial training, not just by offering classes for those released voluntarily by their employers but by imposing certain statutory obligations on industry. Second, it stresses the fact that training is needed by all in employment and not only by grades of highly skilled employers. For this purpose, an adequate quantity of training in industry should be secured in all occupations and at all levels. Third, it recognizes that preparation for work is an educational activity and that a large share of its organization and administration must therefore be borne by educationists. Fourth, it ensures that all firms which benefit from the employment of trained workers must share the financial burden of training.

The Act empowers the Minister of Labour, after consultation with the employers and workers concerned, to set up for each industry an Industrial Training Board consisting of representatives of employers' and workers' organizations and a certain number of educationists. The main functions of the Boards are to stimulate, develop, administer the finance training within the major industrial classifications. To this end, each Board has been given two statutory powers which have put "teeth" into the new system. First, the Boards are responsible for ensuring that everybody in an industry - from managers down to the lowest grade of worker - receives appropriate training. This does not mean that there is one prescribed training for all; on the contrary, the content and length of training must be related to the skills to be mastered. Second, each Board must impose a levy on every firm within its scope in order to meet the costs of training. It is entirely for the Board to decide the basis on which the levy is to be determined, and once the basis is approved by the Minister of Labour, each firm has to pay according to the levy prescribed by the Board. The Boards apply the income from the levy to training either within the

firms, wherever the firms have adequate training programmes, or at separate training centres. In the former case, grants are made to the firms after a careful appraisal of their overall training activities, including the expenditure incurred by them.

The levy/grant mechanism which is the crux of the new system has a two-fold purpose - to stimulate the quantity and improve the quality of training, and to equalize the costs of training among the various firms in an industry. Formerly, many training-conscious firms spent much time and money in training only to find their employees taken away from them by firms which did not bear the burden of training. Now the training costs are distributed equitably among all the firms. Since grants are paid only to those firms whose training conforms to the standards laid down by the Boards, the Boards must make recommendations regarding the nature, content and length of training for which they will be prepared to pay. There is no compulsion on any firm to train workers, but those that do not will still have to pay the levy and will have no grant to put on the credit side. This acts as encouragement to smaller firms to group themselves together so as to offer an adequate joint training scheme.

The levies have been set in various ways. The Engineering Board, for instance, has set its levy rate at 2.5% of the total pay-roll, choosing this figure partly on the basis of the surveys of the actual costs of training already taking place, and partly on the basis of the calculated "stock value" that this levy may have in making firms "sit up and take notice". Most levies are now set as a percentage of pay-roll, with the rates ranging from 0.35% in electricity supply to 3.8% for British Air carriers, the rates varying with size and with industrial classification and occupational factors.

The other activities of the Industrial Training Boards are complementary to the levy/grant mechanism. These include publishing of training recommendations, conduct of training centres set up by individual boards, development of educational programmes in co-operation with technical colleges and universities, and conducting or supporting research and providing advisory or consultancy services. For instance, the Engineering Board has developed a modular system of training apprentices which has had the widest impact and has been adopted by several other Boards. According to the modular system, apprentices in all engineering trades take their first year of module in common, covering such basic concepts as blue-print reading, shop mathematics, tools and materials. After the first year, apprentices in individual crafts pass through various combinations of modules meeting the requirements of each particular trade. Some of this training may be performed by individual firms (especially in years two, three and following); some (typically the first year) is likely to be carried out off the job at a training centre, often operated by groups of firms co-operating in this effort. The modular system has produced better trained craftsmen in less time, typically four years rather than the traditional five years.

By 1969, 30 Industrial Training Boards had been set up under the Act which through levies covered about 850,300 establishments employing over 15 million workers out of a labour force of 25 million. The cumulative growth of the Boards from 1964 to 1969 is given in the following table:

Table 1: Cumulative Growth of British Industrial Training Boards
(Figures as of 1969-1970)

Boards Established		Establishments (Cumulative	Employees (Cumulative	Levies (Cumulative
Year	Number	Total)	Total)	Total)
1964	5	82,252	5,472,000	109,631.000
1965	6	91,960	6,564,000	123,592,000
1966	7	334,957	8,931,000	131,012,000
1967	5	346,604	10,681.000	142,012,000
1968	5	800,301	14,783,000	158,892,000
1969	2	850,301	15,323,000	159,162,000

Source: BACIE, Progress Report No.5 (October 1970). As of the date of this report, 30 "Boards" had been established including Hairdressing (terminated in 1971); Foundry, (a committee of the Engineering ITB); and Local Government, (a voluntary programme under the Act and so not listed by the Government in the source for Table 1).

The main achievement of the Boards has been in creating a new climate of interest on the part of management. By direct persuasion, by stimulation of management training, and through the financial implications of the levy/grant system, they have done much to improve training in British industry, both quantitatively and qualitatively. The Industrial Training Act has been aptly described as "a part of continuing manpower revolution, an effort shared by the Government, Industrial Training Boards, technical colleges, universities, consultants and industry itself".

The British apprenticeship system is also distinguished by a variety of training from the craftsman to technologist. This distinguishing feature is represented schematically in Table 2.

West Germany

The tradition of European apprenticeship was established in West Germany where the system started in the middle ages and underwent several changes under the impact of industrial development. The customary indenture of an apprentice to a master craftsman, practised for centuries, was unable to satisfy the steadily increasing demand for better and more skilled workers. The larger and more progressive industrial enterprises took the initiative and began to employ apprentices to assist specialists on certain jobs, thus giving them the opportunity of advancing gradually towards becoming skilled workers. There was, however, no prescribed duration for apprenticeship, nor were there any well defined standards of training. The enterprises were free to terminate the training of an apprentice by holding an internal examination and weeding him out. In the course of time many leading industrial firms found this arrangement unsatisfactory and began establishing training

Table 2: Apprenticeship in Britain

Education	Age of Entry into Industry	Entry Qualifications	Type of Apprenticeship	
University	21 or over	University degree	Graduate Apprenticeship	Technologist Apprenticeship
Secondary Grammar or Technical School	18	University entry (probably 3 G.C.E. "A" Level passes plus a number of G.C.E. "O" Level passes)	Undergraduate Apprenticeship	
	18	2 G.C.E. "A" Level passes plus a minimum of 3 G.C.E. "O" Level passes	Student Apprenticeship	
	16	5 or more G.C.E. "O" Level passes		
Secondary Modern School	16	3 or 4 G.C.E. "O" Level passes Technical School Leaving Certificate	Technician Apprenticeship	
	16	Possibly School Leaving Certificate Otherwise no formal qualification required	Craft Apprenticeship	

workshops to train apprentices according to well defined standards. The training workshops now function like actual production shops of the industrial enterprises and provide the necessary practical knowledge and experience required by the apprentices. The German apprenticeship system is based on practical training in training workshops maintained by industry, and part-time vocation at schools maintained by public authorities. The training workshops and vocational schools co-operate closely with each other.

The overall plan of German apprenticeship is administered by two organizations: the German Council for Industry and Commerce (Dentscher Industrie- und Handelstag - DIHT) representing at the national level 81 Chambers of Commerce and Industry, and the German Association of Chambers of Artisan Trades (Dentscher Handwerks Kammertag) representing 45 artisan chambers. The former is responsible for apprenticeship in industry and commercial trades, and other standard training materials which are prepared by the Central Office for Industrial Training sponsored by the DIHT in collaboration with the Federation of German Industry and the German Confederation of Employers Associations. The same functions are carried out for artisan trades by the Institute for Training in Artisan Trades and the Institute for Artisan Trades Technology sponsored by the German Association of Chambers of Artisan Trades.

The German apprenticeship system is practically autonomous, but with a set of self-governing principles and rules built into the system by industry, and with supervision and control vested in the Chambers of Industry, Commerce and Trades. At the federal level, the Ministry of Economic Affairs approves training regulations.

The German apprentices start their training normally after nine years of elementary education (i.e. at the age of 15). The duration of training is three to three and a half years for skilled workers. The training is based on the "Berufshild" (i.e. the trade specification of the respective vocation which has been recognized by the Federal Ministry of Economics). The basic principle of specifications is that apprentices shall be trained to a uniform level everywhere. During apprenticeship each trainee also attends a vocational school one day a week for related education.

The indenture is drawn up between the training firm and the apprentice (or his legal representative) and registered with the relevant Chamber of Commerce and Industry or Trades. The Chambers are bodies incorporated under public law, and membership of a Chamber is compulsory for each and every firm.

Elaborate arrangements exist for vocational guidance to young persons in choosing the correct type of industrial occupation according to the principle that "in a twentieth century society a vocation is not only a means of earning a living, but determines to a very large extent social structure and human interrelations". After being chosen for apprenticeship, a trainee is given a three-month induction into his vocation and the enterprise where he is going to work. This is followed by systematic training for at least a year at the apprentice shop. During this period, the apprentice gradually becomes accustomed to his vocation and the reality of his field of activity, and he begins to recognize his later function and position within the working process. At the same time, his personality, attitudes to work, and inter-personal relations and adaptability are formed.

As soon as the apprentice has acquired basic technical knowledge and skilled in a particular field, he is transferred to the enterprise for training on the job under close supervision. At the end of the three to three and a

half year training, an apprentice takes the final examination conducted by an examination board of the particular Chamber of Commerce, Industry or Trade and, if successful, is certified by the Chamber as a fully qualified skilled worker. He also receives from his training firm about his performance in training, conduct and work.

An important modification being tried out, especially in the metal working trades, is the "Stufenplan". This consists of training in three steps. Each step is concluded by an examination which prepared workers for jobs needing different levels of skill and qualification. After the first year the apprentice is expected to reach a level approximating that of a semi-skilled worker. If he wishes he may continue and reach, at the end of the second year, a level approaching that of a skilled worker. The best among the trainees may enter the third step at the third year to reach the qualification of a highly skilled worker.

The German apprenticeship, which is regarded as an established and well developed system of vocational education, is also distinguished by a variety of industrial education programmes organized by industrial enterprises. The most important of these is designed for the training of Foremen (Vorarbeiter) and Supervisors (Masters of Industry) who play a very important role in industrial organizations.

United States of America

Apprenticeship was a basic educational institution in colonial America. Town officials resorted to involuntary apprenticeship to meet their obligations to orphans and poor children because, through apprenticeship, these young people could ultimately become self-supporting. Throughout the nineteenth century, however, American industry depended wholly on highly-skilled European immigrants for its manpower. During the same period the industrial revolution made big strides in mechanical technology with the consequent specialization of labour. These two factors combined to limit apprenticeship in the United States in the early stages of industrial development. When in 1872 Hoe and Company, printing press manufacturers, started what was probably the first on-the-job training for its employees, it was set up as an apprenticeship system. Other companies like the Westinghouse Machine Company, the General Electric Company, and the Baldwin Locomotive Works soon followed with their own apprenticeship programmes.

Subsequent restrictions on immigration made it necessary for American enterprises to train their non-skilled manpower, and the National Association of Manufacturers (NAM) Convention in 1904 recognized formally the importance of industrial training and education for workers. At first the NAM maintained that trade schools were enough to train the needed craftsmen. At that time vocational education had received a big support from the Federal Government under the Smith-Hughes Act and spread widely throughout the country. American organized labour, however, had looked down on trade schools with the ubiquitous attitude that "he who knows does; he who can't, teaches". While American labour was against trade schools, the NAM was for it. But by 1910 the NAM changed its stand and took the position that "industrial education must consist in skill and schooling. These two parts are of equal importance, they must be organically connected and each will co-ordinate and supplement the other".

It is this fundamental idea of a combination of on the job training with related technical training (schooling) which characterizes the American

apprenticeship system. The system is also based essentially on voluntary co-operation between management and labour, industry and government, the shop and the school. This voluntary co-operation is reflected by national joint labour apprenticeship committees set up by national employer associations and international labour unions to work out suggestions and methods for the development and improvement of apprenticeship and other training within their respective trades or industries. Similar co-operation in apprenticeship - involving management, labour, education and government - exists at the state level. Since the employment and training of apprentices takes place in the local community, the work of national and state apprenticeship groups is directed towards stimulating interest in training on the part of local employers and employees.

The greatest advance for apprenticeship in America came from the Fitzgerald Act (also known as the National Apprenticeship Act) of 1937 which authorized and directed the Secretary of Labour "to formulate and promote the furtherance of labour standards necessary to safeguard the welfare of apprentices, to extend the application of such standards by encouraging the inclusion thereof in contracts of apprenticeship, to bring together employers and labour for the formulation of programmes of apprenticeship... and appoint national advisory committees... to... include representatives of labour, educators, and officers of other executive departments, with the consent of the head of any such department". This is the basic federal Act governing the organization of apprenticeship in the United States; it calls upon the Secretary of Labour to promote more apprenticeship programmes in private industry and to encourage the use of the highest standards in training programmes. The law contains no provision for penalties or levies; its sole purpose is to promote voluntary co-operation between industry and labour, and to offer technical assistance and guidance. The Act is administered on the assumption that the role of the government is restricted to the stimulation of voluntary action on the part of management and labour, and that the primary responsibility for organization and carrying out the training lies with the employers and workers concerned.

No federal financial aid is given to industry or to the states under the Fitzgerald Act. However, the Bureau of Apprenticeship and Training set up by the Department of Labour stimulates and assists in the development, expansion, and improvement of apprenticeship, and provides continuing technical assistance after the programmes are put into operation. To this end, the Bureau has made available to management and labour the services of its expert staff in developing and improving apprenticeship and other industrial training programmes. In the performance of these functions, the Bureau is guided by the Federal Committee on Apprenticeship which consists of leaders of management, labour and vocational education.

The basic principle of the Bureau of Apprenticeship is that schemes of apprentice training should be satisfactory to both employers and workers. Recognizing that apprentices are employed in a large variety of trades and that conditions vary, the Federal Committee has recommended standards which are general in scope and intended to represent the essential provisions that an apprenticeship programme should include, namely:

(a) The starting age of an apprentice should be at least 16 years.

(b) An apprenticeable occupation should require 4,000 or more hours to learn. (For most engineering trades, 8,000 hours, equivalent to three to four years are prescribed.)

(c) A schedule of work processes to be learned on the job should be drawn up.

(d) Organized instruction of a minimum of 144 hours each year, designed to equip the apprentice with knowledge in technical subjects related to his trade, should be provided.

(e) A progressively increasing scale of wages for the apprentice, which should average approximately 50% of the journeyman's rate over the period of apprenticeship, should be established.

(f) The terms and conditions of the employment and training of each apprentice should be stated in a written agreement and registered with the State Apprenticeship Council.

(g) The apprenticeship scheme should be jointly established by the employer and the employees.

(h) Adequate supervision and the keeping of records should be required for all apprenticeship programmes.

The Bureau of Apprenticeship of the Department of Labour is responsible for carrying out the provision of the Fitzgerald Act and the policies and standards formulated thereunder, and acts as a clearing-house for the operation of the national apprenticeship programme in the different trades. But the Federal Committee on apprenticeship, which is the joint management-labour policy-making body for the Bureau is regarded as the keystone of the American Apprenticeship system. It has brought together various trade and sectional interests into one apprenticeship programme and set a pattern of labour-management committees throughout the country.

India: the Pre-Independence Period

Though apprenticeship was deeply rooted in the arts and crafts of the Indo-Aryan civilization dating back to more than 2000 years, the present concepts and forms of apprenticeship were derived mainly from European systems from about the middle of the nineteenth century. The first effort in this direction was reflected in apprenticeship in the Indian Railways, as they started spanning the sub-continent, adopted an extensive system of apprenticeship for training craftsmen, chargemen, foremen and mechanical engineers. It was reinforced by education in special technical schools established by the railways near their workshops.

Not long after the Indian Railways started apprenticeship, the ordnance factories of the Defence Department also introduced apprenticeship in their works for craftsmen,foremen, supervisors and other categories of production process workers. Other important subsequent developments included the establishment of a Board of Apprenticeship system which is a landmark in the Indian setting designed and implemented by the Tata Iron and Steel Company Limited in Jamshedpur.

India: the Post Independence Period

Industrial Training Institutes

When India became independent in 1947, the country embarked upon a com-

prehensive programme of national development through successive Five-Year Plans. It was also realized by India that the success of the plans depended upon adequate supply of technical manpower. The Government therefore formulated and implemented various programmes to train the needed manpower at all levels. These included the establishment of a large number of Industrial Training Institutes (ITIs) for the training of skilled workers at the craftsman level. These ITIs were subsequently to have a decisive effect on apprenticeship since they formed the basic training on which apprenticeship was built up as a system of education within industry.

There are in India today 357 Industrial Training Institutes which have over 150,000 training places in 30 engineering and 22 non-engineering trades. Till 1966 the duration of training in engineering trades was 18 months at an ITI followed by six months of in-plant training in industry. For non-engineering trades the duration of training was only one year. The minimum educational requirement for admission to most engineering and non-engineerin trades was eight years of general school education, and for some engineering trades like Draughtsman, Electrician, Instrument Mechanic, Refrigeration and Air-conditioning Mechanic, Radio Mechanic, etc. candidates were required to have passed the matriculation examination (ten years of school education).

Initially the main purpose of the ITI courses was to train fully fledged skilled workers in different engineering and non-engineering trades. So the curriculum laid emphasis on intensive skill development in the workshops attached to the ITIs. In addition, instruction in the relevant trade theory, mathematics, drawing and blueprint reading was included in the curricula. The total instruction and practical work of the courses lasted about 3,000 hours, consisting of 500 hours of theoretical studies and 2,500 hours of practical work. The six-month in-plant training was to expose the candidates to actual industrial working conditions and to give finishing touches to their skill development.

As the programme of Industrial Training Institutes was implemented the Government of India considered it important that a central authority should co-ordinate all aspects of vocational training at national level, lay down standards, institute National Trade Certificates for craftsmen and advise the Government on the overall training policies. (The need for such a national agency had also been recommended by the Ananthashayanam Iyyangar and Shiva Rao Committees). Accordingly, the Government set up a National Council for Training in Vocational Trades (NCTVT) with the following main functions:

(a) To establish and award National Trade Certificates in engineering, building, textile, leather and other trades.

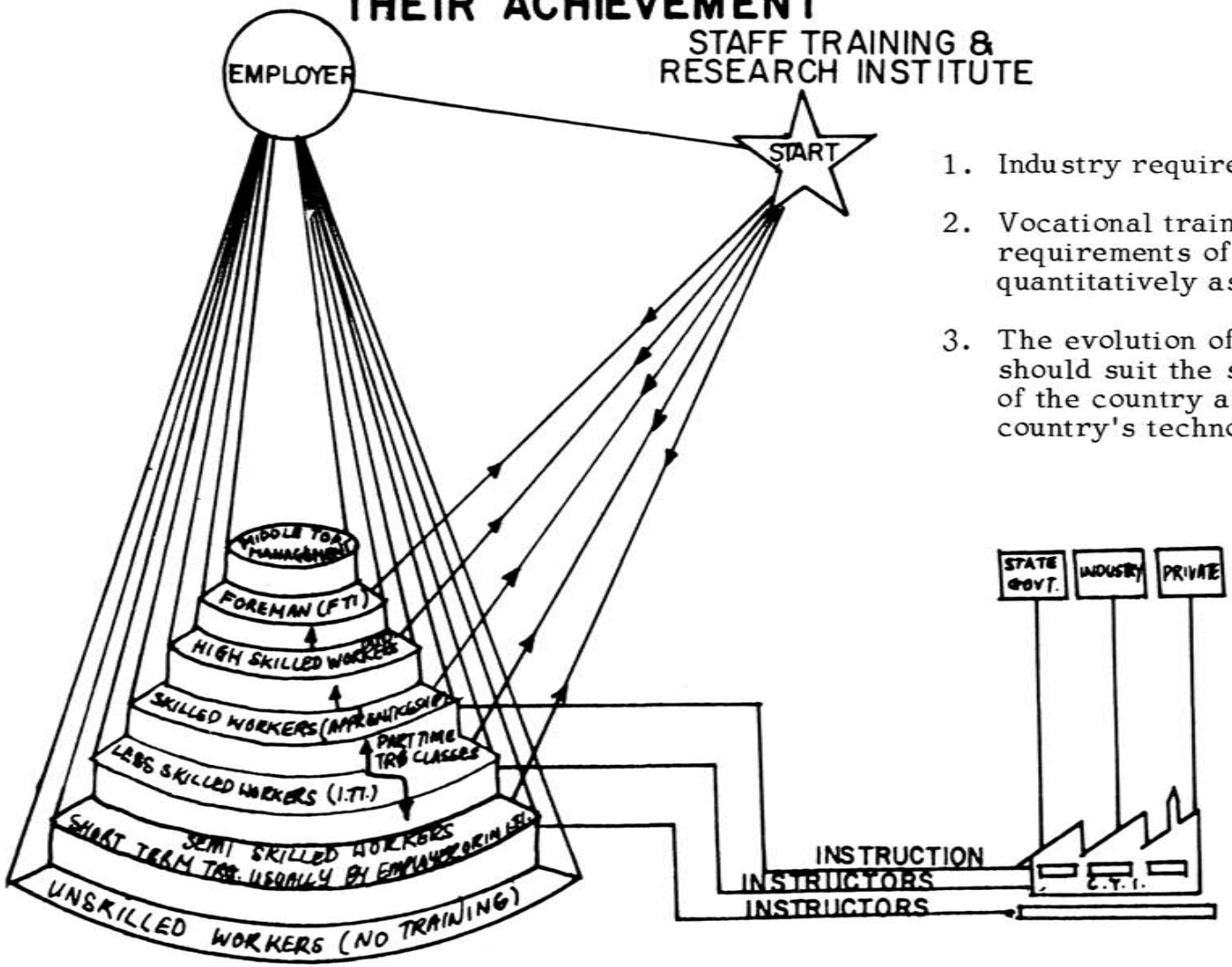
(b) To prescribe standards in respect of syllabuses, equipment, accommodation, duration of courses, methods of training and qualifications of staff.

(c) To arrange trade tests and lay down standards of proficiency required for the award of National Trade Certificates.

(d) To arrange periodical inspection of training institutions in India to ensure that the standards prescribed are being followed.

(e) To recognize institutions for the grant of National Trade Certificates.

SCHEMATIC REPRESENTATION OF THE LEVEL OF SKILL REQUIREMENTS AND THE ROLE PLAYED BY THE VOCATIONAL TRAINING PROGRAMME IN THEIR ACHIEVEMENT



1. Industry requires workers at different levels of skill.
2. Vocational training programme should reflect the requirements of the employers for workers both quantitatively as well as qualitatively.
3. The evolution of the vocational training programmes should suit the social economic and cultural pattern of the country as well as the developments in the country's technology.

Legend

ATI. Advance Training Institute
CTI. Central Training Institute for Instructors
FTI. Foreman Training Institute
ITI. Industrial Training Institute

(f) To advise the Central Government on all aspects of Vocational Training.

The Council, presided over by the Union Minister for Labour and Employment, is fully representative of all interest concerned - Ministries of the Central Government, State Governments, employers' organizations, workers' organizations professional bodies, women's organizations and education.

Since its establishment in 1956, NCTVT has been chiefly responsible for the determination of the standards of training in different trades in the Industrial Training Institutes, preparation of training manuals and other instructional material, holding of trade tests for the award of National Trade Certificates on an all-India basis and for co-ordinating the development of vocational training in India. It is also this organization which over the years has assessed the requirements of industry for skilled workers and formulated training programmes in the ITIs. More important, recognition of apprenticeship as the main means of skill development by NCTVT led to the formulation of a new Apprentice Act and its implementation by the Government of India.

After conducting these 18-month trade courses at the Industrial Training Institutes for over ten years, the National Council for Training in Vocational Trades realized that fully fledged skilled workers acceptable to industry could not be trained in this manner and that a basic departure was needed. This view was also reflected in the decision of the Government of India that apprenticeship was essential to skill development which resulted in a new Apprentice Act in 1961. The National Council therefore decided in 1966 to reclassify the trades into six groups and to reduce the duration of training to one year for some trades and to extend the duration to two years for others. The main reason for these changes is the recognition of apprenticeship as the main means of skill development and that the Industrial Training Institutes should provided only basic training upon which industry may build real professional skills through well-organized apprenticeship. These changes also implied that the ITI courses would produce only semi-skilled or less-skilled workers. This new role of ITIs and how their courses are structurally related to apprenticeship are given in a schematic representation of skill levels by the Directorate-General of Employment and Training. This is reproduced in the diagram on page 44.

In line with these objectives, the re-structured two-year courses are divided into two parts. The first part covering the first year of the course is devoted mainly to basic training in the trade concerned along with related instruction in engineering drawing and mathematics and science as applied to workshop practice and materials. The content and standard of engineering drawing, mathematics and science have also been improved to give a better theoretical foundation to trade training. The second part which covers the second year extends the basic training for intensive practice in the skills of chosen trade.

It is also visualized that during this part the trainees should perform the various operations of their trade on useful jobs and carry out production work on modern machines. In addition the course provides for more advanced instruction in engineering drawing, mathematics and science.

Thus in India the ITI courses have now become a form of pre-apprenticeship training for basic skills under controlled conditions. Although they are outside the school system they have the structure and content of vocational education and therefore represent a diversified form

of educational preparation for gainful employment in life. This is precisely what Wood and Abbott visualized in their Report in 1936, notwithstanding the fact that they made, albeit unsuccessfully, a neat distinction between Junior Technical Schools and Industrial/Vocational Schools.

The Industrial Training Institutes have, not by design but by a process of change in response to new circumstances, come to bridge the gap between school and working life and to provide the foundations of apprenticeship in industry. The total absence of any other form of vocational education within the Indian school system underscores the dual function of the ITIs.

The Apprentice Act, 1961

India is a federal republic and the Constitution of India spells out clearly the legislative and other powers of the Union and the Constituent States in different spheres of national life. According to the Seventh Schedule of Article 246 of the Constitution, "Union agencies and institutions for - professions, vocational or technical training, including the training of police officers... " is a central subject. The same schedule also provides "vocational and technical training of labour" as a concurrent subject. Therefore, the Apprentice Act (see apprendix) reflects the relative constitutional responsibility of the central and state governments for vocational training. The Government of India is responsible for implementing the Act in railways, major ports, mines, oil fields; in all establishments owned or controlled by it; and in companies in which not less than 51 per cent of the share capital is held by it, or partly by it, and partly by state governments. The state governments are responsible for implementing the Act in all establishments owned or controlled by them, and also in industrial and commercial establishments in the private sector located in their respective states. But all the rule-making powers are vested in the central government. These cover such major aspects of apprenticeship as designating the apprenticeable trades, determining the ratio of apprentices to workers, prescribing the duration of training and entrance requirements for apprenticeship, determining the minimum rates of stipends for apprentices, and prescribing the syllabus and other details of practical training. In making the rules, the central government has undoubtedly to consult the Central Apprenticeship Council. Nevertheless, according to the Act, the central government is for practical purposes the overall authority for the control of apprenticeship in India.

There are many points of similarity between the Indian apprenticeship system as visualized under this Act and the apprenticeship systems in other countries. For instance the contract between an apprentice and an employer is purely voluntary, but unless it is registered with, and approved by, the Apprenticeship Adviser of the central government or a state government, training cannot start. The overall control over apprenticeship, including co-ordination of standards of training, is vested in the central government. The central government exercises control by designating the apprenticeable trades, prescribing the duration, content, methods and standards of training determining the number of apprentices to be trained by an employer in each trade, inspecting the establishments where training is imparted and by certifying the apprentices after training. All these imply that within an official framework there is complete centralization of authority for apprenticeship in India today.

Again, like those in other countries, the Indian apprenticeship system prescribes basic training before an apprentice is sent for on the job training in an establishment. It also prescribes that the establishment itself, if it employs 500 or more workers, shall provide the basic training, and that

for this purpose, the establishment should set up a separate centre, according to the standards laid down by the central government. Where an establishment employs less than 500 workers, the basic training of apprentices should be conducted at training institutes set up by the government. All these provisions are designed to ensure that pre-apprenticeship training that is so necessary for correct skill development, is conducted under controlled conditions. Further, the Indian Apprentices Act requires all employers to give related instruction to apprentices appropriate to their trades to equip them with adequate theoretical knowledge.

Another central point of similarity in the Act is the fact that all employers who are notified by the Government, shall train apprentices according to the directives issued. This provision is specifically to secure an adequate quantity of training in industry, on the one hand, and, on the other, to ensure that all firms, which benefit from the employment of trained workers must share the financial burden of training. However, unlike the British Industrial Training Act of 1964, the Indian Act does not provide for a levy/grant mechanism to equalize the cost of training among the various firms in an industry.

The sharing of the costs of training as visualized in the Indian Act reflects the special circumstances obtaining in India. First, the government has spent huge sums of money on setting up the Industrial Training Institutes and providing institutional training facilities to large numbers of young men and women who may later on proceed to apprenticeship for limited periods. The Government has already incurred expenditure on their basic training and also on a part of their specialized training in the respective trades. Second, Indian industry is still in a developmental state and there are large numbers of small and medium firms. A balance has to be maintained between their capacity and that of larger firms to bear the cost of training. The Act therefore requires all firms irrespective of their size to bear the full cost of training (including stipends) in respect of apprentices, who have already undergone institutional training at an Industrial Training Institute. As for other types of apprentices, a firm has to bear the full cost if it employs 500 persons or more; if it employs less than 500 persons the cost is to be shared by the firm and the Government in equal parts. Further, the Act apportions the cost of related instruction for all apprentices, irrespective of the size of the firms where they are undergoing training, to the Government.

In practically all industrially advanced countries the concept and practice of apprenticeship have been extended to the training of engineers, technicians and even managers in real industrial situations. The Indian Apprentices Act 1961, however, specifically excluded all these categories of apprentices and restricted itself to the training of skilled workers. The precise reasons why this important legislation was made restrictive are not clear. It has been suggested that one reason is a possible lack of co-ordination and co-operation among the different government ministries with responsibility for vocational and technical training, and the education of engineers and technicians. Another reason may be the sharp distinction which the Constitution of India makes between education and training.

Whatever may have been the reasons however, one can say that for many years the apprenticeship of engineers, technicians and skilled workers remained fragmented since there appeared to be a lack of an integrated approach to manpower development for industry. This resulted in a situation in which hardly any facilities were provided to apprentices in industry for part-time studies for engineering degrees and diplomas either on a day-release or a block-release basis. All the facilities provided were for full-time courses.

Fortunately this was changed in 1973 when the Indian Parliament approved amendments to extend the Apprentices Act to include "graduate and technician apprentices" and bring their training within the national framework. According to the amendments it is obligatory on an employer to provide for the practical training of engineers and technicians in his establishment. Further, "graduate and technician apprentices" have been defined to mean not merely those apprentices who have taken degrees and diplomas; it includes all those apprentices who are studying for degrees and diplomas (i.e. "student" apprentices). Thus, the amended Act brings Indian apprenticeship close to the British and other European systems in its broader concept of education in industry.

According to the amended Act, the number of graduate and technician apprentices to be trained by an establishment is determined by the Central Apprenticeship Adviser on the basis of the number of managerial persons (including technical and supervisory persons) employed and the totality of the training facilities available in the establishment. For trade apprentices, however, their number is prescribed by the central government in a ratio to the skilled workers employed in each designated trade.

The centralized control over graduate and technician apprenticeship is also reflected in the sharing of the cost of training. According to the amended Act, the establishments have to bear the full cost of training, except for stipends. The cost of stipends paid to apprentices is to be shared by the central government and establishments in equal parts.

As for the duration and other details of the programme of training, these have to be approved by the central government in consultation with the Central Apprenticeship Council. The Central Apprenticeship Council will award certificates of proficiency to graduate and technician apprentices on satisfactory completion of training.

Apprenticeable Trades and Duration of Apprenticeship

The Government of India has so far notified 201 different industries to which the provisions of the Act will apply. These include food, textiles, chemical, metallurgical, engineering and other manufacturing or processing enterprises.

In these industries the Government has designated 61 trades as apprenticeable under the Act. They fall under 18 groups. The citeria on which the apprenticeable trades have been identified are: they represent the chief technical or vocational occupations in which the majority of skilled labour force is employed; they are the occupations in which trained personnel are required for economic development; and they are the occupational areas in which training on the job is indispensible to ensure an adequate supply of manpower. The groups cover all the important engineering, metal construction, chemical, printing, hotel and catering and commercial trades.

For almost all trades in engineering, metal, chemical, building and printing groups the duration is uniformly three years, except for a few trades for which the duration varies from one to four years; for the trades in hotel and catering group the duration varies from three to four years; for textile trades it is six months, and for all commercial trades one year. The medium duration of apprenticeship is three years.

In earlier years there were three types of apprenticeship - a short-term apprenticeship of six months, and two long-term apprenticeships of 18 months and three years. The first was intended for those persons who had undergone an 18-month training at an ITI and needed six-months of in-

plant training to qualify for the National Trade Certificate of NCTVT. The second type was also intended for those persons who had undergone the ITI training but wished to have a fully fledged National Apprenticeship Certificate. The last type was meant for all other apprentices who had not had any previous institutional training. As explained earlier, the ITI has since 1966 been re-organized into one-year and two-year pre-apprenticeship courses. Therefore, the six-month and 18-month apprenticeships have been abolished and all those who have undergone the re-organized ITI training have to complete the balance of the prescribed period of apprenticeship.

Ratio of Apprentices to Workers

A crucial part of the apprenticeship structure is the number of apprentices that an establishment should engage for training. Upon this number depends the manner in which the resources of industry are mobilized for the system as a whole.

On the basis of the facilities available in Indian industry and in consultation with the Central Apprenticeship, the central government has determined the number of apprentices to be trained in each trade in proportion to the number of skilled workers employed in that trade in the establishment concerned. They vary from 1:1 to 1:100, but for most engineering trades the proportion is one apprentice to seven workers. The lowest proportions (1:50 or 1:100) are entirely in the textile trades, and the highest (1:1 or 1:2) in the engineering group.

Basic Training and Related Instruction

In a well-organized system of apprenticeship, basic skills in young apprentices must be developed under controlled conditions to ensure that the apprentices acquire correct work habits and also achieve adequate understanding of the scientific principles underlying their future trades. The basic training must also give a firm foundation on which subsequent on the job training could be conducted in progressive stages to produce a fully fledged skilled worker who is able to use the machines, tools and operations of his specialized trade competently and with confidence. For all these purposes, separate centres are needed for basic training.

In line with these principles, the Indian system prescribes how an establishment may organize basic training for its apprentices. If the establishment employs 500 or more workers it should set up a separate centre for basic training. This implies that on an average of one apprentice for every seven to ten employees, the basic training centre of an establishment with 500 workers will have 50 to 70 apprentices. Two or more establishments may also join together and set up a common training centre for all their apprentices. The same joint effort is permissible for on the job training so that the establishments may put their resources together and move the apprentices around among themselves.

For establishments employing less than 500 workers, the system prescribes that the apprentices should be sent for basic training to government training centres, which are usually Industrial Training Institutes. The duration of basic training is one year, and it is compulsory for all apprentices except those who have had their pre-apprenticeship training at an ITI or institutions recognized by NCTVT.

Related instruction is compulsory for all apprentices throughout the apprenticeship period and covers the theoretical aspects of their trades. For instance, for engineering trades the subjects of related instruction are:

Trade Theory	:	Two hours each week
Workshop Calculation and Science	:	Two hours each week
Engineering Drawing	:	Two hours each week
Social Studies	:	One hour each week

The total instruction during a three-year apprenticeship extends over 1,050 hours.

Related instruction is imparted at the ITIs or other institutions which have facilities for the purpose. Apprentices are released to attend the institutions on the basis of either one full day each week or a whole week in block every six weeks. The system also permits an establishment to impart related instruction to its own apprentices if it follows the prescribed syllabus, has the required qualified staff, and provides for a minimum of seven hours of instruction each week.

Testing and Certification

The Apprenticeship Rules have prescribed detailed procedures and forms for maintaining the record of training of apprentices for carrying out periodic assessment of their performance, and for submitting reports to Apprenticeship Advisers. These are designed to facilitate control by establishments over the progress of apprentices, on the one hand, and, on the other, to give an overall assessment of their performance for final certification. The reports also enable Apprenticeship Advisers to watch over how the establishments are conducting the training programmes.

The progress reports must give full particulars of each apprentice in respect of his trade of specialization and educational and training background, the number of days spent on practical training and related instruction, the type and number of operations performed each month according to the prescribed scheme of training and grading both in theoretical subjects and practical work. On the basis of these reports an apprentice is sent up for final testing and certification by the National Council for Training in Vocational Trades at the end of his training.

The final trade test is held twice a year (March and September) in the following subjects: practical work in the trade concerned, trade theory, workshop calculations and science, and engineering drawing. In addition the essential work, the work diary and progress reports of apprentices during their apprenticeship are assessed. This assessment is taken into account in final certification. The test papers, including the required bill or materials, special tools, instruments and gauges for each trade, are prepared by a central committee of experts. The committee also lays down detailed procedures for the assessment of the apprentices at the tests.

According to these instructions, the tests are conducted at a network of centres which include ITIs and industrial establishments. A local Board of Examiners consisting of experts is appointed for each centre to supervise the tests, assess the performance of apprentices and declare the results. Those who pass are awarded the National Apprenticeship Certificate (under the authority of the Central Apprenticeship Council).

APPENDIX: THE INDIAN APPRENTICE ACT, 1961

In 1961, the Indian Parliament passed a new Act to bring apprenticeship under state control and direction. The main provisions of the Act, which give the legal form to apprenticeship, are summarized below:

(i) All employers, who may be notified by the Central Government, shall engage apprentices to undergo training in the designated trades in their establishments. Several employers may, however, join together to provide practical training to the apprentices by moving them among their respective establishments.

(ii) The Central Government, in consultation with the Central Apprenticeship Council, shall designate the trades in which apprentices shall be engaged and also determine the ratio of apprentices to workers (other than skilled workers) for each trade. Each employer shall engage apprentices according to the prescribed ratio. He is, however, free to engage more than the prescribed number of apprentices.

(iii) Every employer shall make suitable arrangements in his workshop to conduct a course of practical training for apprentices according to the programme approved by the Apprenticeship Adviser, and also provide qualified supervisors. The Apprenticeship Adviser shall be given all reasonable facilities to assess and test the work of apprentices to ensure that the practical training given to them is in accordance with the approved programmes.

(iv) No person shall be engaged as an apprentice to undergo training in a designated trade unless he:

(a) is not less than 14 years of age;

(b) satisfies the prescribed standards of education and physical fitness;

(c) he/his guardian enters into a contract of apprenticeship and the contract is registered with the Apprenticeship Adviser. The contract may contain such terms and conditions as may be agreed to between the parties concerned.

(v) The contract shall prescribe the period of apprenticeship which may be determined by the National Council of Training in Vocational Trades in respect of apprentices, who have passed the trade tests conducted by the National Council and by the Central Government in respect of other apprentices.

(vi) The contract may be terminated by either party with the approval of the Apprenticeship Adviser if the other party fails to carry out the agreed terms and conditions. Where the contract is terminated for the failure of the employer, the employer shall pay such compensation to the apprentice as may be prescribed. For failure on the part of the apprentice, the apprentice or his guardian shall refund to the employer the cost of training which may be determined by the Apprenticeship Adviser.

(vii) Those apprentices who have not undergone any institutional training recognized by the National Council for Training in Vocational Trades shall, before admission to a workshop for practical training, undergo a course of basic training. Where an employer employs in his establishment 500 or more workers, he shall provide the basic training to the apprentices by setting up a separate training centre for the purpose. Two or more such employers may join together and set up a common basic training centre for their apprentices. Where an employer employs in his establishment less than 500 workers, the basic training shall be imparted to the apprentices at the training institutes set up by the Government.

(viii) The syllabus of, and the equipment to be used for, practical training, including basic training, shall be prescribed by the Central Government in consultation with the Central Apprenticeship Council.

(ix) The employer shall pay to every apprentice during the apprenticeship period stipends according to the rates prescribed by the Central Government.

(x) The training costs (including stipends) in respect of apprentices other than those who have passed the trade tests conducted by NCTVT, shall be borne by the employer if he employs 500 or more workers; the employer and the Government in equal parts if the employer employs less than 500 workers.

(xi) As for apprentices who have passed the trade tests conducted by NCTVT, the training costs (including stipends) shall be borne by the employer irrespective of the number of workers employed in his establishment.

(xii) All apprentices shall, during their practical training, be given related instruction appropriate to their trade so that they may be equipped with adequate theoretical knowledge. The details of the related instruction shall be prescribed by the Central Government in consultation with the Central Apprenticeship Council. The cost of related instruction shall be borne by the Central Government or State Governments depending upon the nature of the establishment.

(xiii) It shall not be obligatory on the part of the employer to employ any apprentice who has completed training in his establishment, nor shall it be obligatory on the part of the apprentice to accept employment under the employer, excepting where the contract specifically provides for such employment.

(xiv) There shall be a Central Apprenticeship Council consisting of representatives of the Central Government and State Governments and experts in matters relating to industry and labour. There shall also be a State Apprenticeship Council in each State similarly constituted. The State Apprenticeship Councils shall be affiliated to the Central Apprenticeship Council.

(xv) The Central Government shall appoint a Central Apprenticeship Adviser and the State Governments shall appoint State Apprenticeship Advisers. The Governments concerned may appoint other officers to assist their respective Apprenticeship Advisers.

(xvi) Every apprentice, who has completed the prescribed training, shall appear for a test conducted by NCTVT to determine his proficiency in the designated trade, and, if he qualifies at the test, shall be granted a certificate of proficiency by NCTVT.

PARTNERSHIP: EDUCATIONAL INSTITUTIONS AND INDUSTRY

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The Commonwealth Asian Regional Seminar on Technical Education and Industry held in Hong Kong in October 1976 put forward a comprehensive range of recommendations relating to partnership between technical education and industry. In the short time that has elapsed since then the issues identified at that seminar have sharpened. In developing and developed countries alike, the need for changes in educational systems are even more clearly recognized than before, and it is accepted that systems and models that have been regarded traditionally as necessary no longer satisfy the changing needs of society. The acute shortages of skills and of technicians, coupled with under-employment in the developing countries, have their counterparts in developed countries. They, too, have a chronic shortage of skills in some areas, and unemployment, especially amongst the young and the less able.

Criticism of education for not delivering the goods is much more in evidence than it was; there is no longer a willingness on the part of politicians or the general public to give an almost unquestioned social priority to education. The aims and objectives, and especially the cost effectiveness of education, come under increasingly close scrutiny. If it can be said that there is one common theme in the questioning of education it is that the education service should be responsive - responsive, that is, to the needs of society, to personal needs, and to the needs of industry. Response and responsibility are the two key requirements of education. A good part of that response and responsibility has to be seen as a search for a partnership with the various interests that education serves.

In the United Kingdom in recent months there has been a wide-ranging debate on objectives and methods in schools, culminating in the publication of a consultative document Education in our Schools. There has been a discussion document on Education, Industry and Management sponsored by four government departments. The Manpower Services Commission has initiated a substantial programme to help alleviate problems of youth unemployment and has made proposals for dealing with training for skills in areas of vital need. There has been an important government report on demographic trends in higher education, and a significant report on management of higher education. Each one of these initiatives would be impressive in itself; coming together, they indicate not only a new and challenging climate for education and training but an emphasis upon the need for partnership. This paper attempts no more than a brief survey of some of the concerns that relate to partnership between educational institutions and industry and some reference to some of the relevant steps that have been or are being taken in the United Kingdom.

The Schools

The so-called "great debate" on education in the UK, which still continues in the consultative phases, was basically concerned with issues of curriculum and especially with the relevance and applicability of knowledge and attitudes engendered through the curriculum. The recent Taylor Report on governance and management of schools has made strong recommendations for much greater involvement by parents and by those who might be said to bring into schools something of the dimensions of the world of work. The recommenda-

tions do not go as far as seeking to take away from teachers the control of curriculum but, inevitably, they move in a direction in which there would be greater questioning of curriculum by outside interests. What is apparent, both in the "great debate" and in the issues discussed at length in the Taylor Report, are concerns about standards in schools, about curriculum and about relationships between schools and society. The three most essential questions seem to be: One, are standards adequate? Two, does the curriculum provide the right balance of content and skills to fit young people to meet the demands that will be placed upon them? Three, how can schools develop and maintain those necessary relationships with the community and society at large to ensure that they are responsive to need? Faced with questions like these it is easy to take refuge in generalities and platitudes, and to draw up demands that would place intolerable burdens upon teachers and administrators alike. Indeed, it is possible to point to too many instances, in too many countries, of generalized recommendations aimed at improving the curriculum in schools, or interaction between schools and industry, that have come to nothing precisely because they were too generalized or lacked the means for effective follow up. I will refer to three initiatives in the United Kingdom, not because it should be claimed that these are applicable in other countries but because they seem to identify areas of general concern and illustrate a practical, although limited, response to those concerns.

Schools Curriculum

The first set of initiatives is in relation to the schools curriculum. Action here has been at two levels. Firstly, the need has been recognized for developing in schools a better understanding of industry in relation to society. Both the Schools Council and the Confederation of British Industry are actively at work producing teaching materials which, it is hoped, will be of benefit to schools in bringing about a better appreciation of the basis of our industrial society, the social effects of technology, and the importance of industry to the economy as a whole. It is not remarkable that, in an industrial society, the need should be felt to indicate in some way the nature of that society in the schools curriculum. What is remarkable is that it does not seem to have been done before.

These initiatives need not necessarily relate to the basic curriculum. It is here that work of the Engineering Industry Training Board, amongst others, is of significance. The Board has proposed examples by which the basic mathematics curriculum can be related directly to engineering. This work is important in that it illustrates how effective bridges may be built between theory and practice at a non-sophisticated level. It could be said that this is precisely what good teaching has always meant. Perhaps that is so, but there have been too many examples in recent years of a divorce between the basic curriculum and its application. The EITB initiative is a good example of the sort of partnership between industry and schools that illustrates how help may be given in practical yet imaginative ways. In the same connection reference should be made to a survey carried out of the use of basic numeracy skills in industry. In other words, what arithmetical, mathematical tasks are called for in the world of work? This question is an important one for all employees and particularly for the well-being and the job satisfaction of young employees. The survey - which was a limited and inexpensive one - has rightly emphasized the factors that the curriculum ought to reflect rather than the examinations that so often dominate the curriculum.

Schools and Industry

The second set of initiatives is concerned with both curriculum and attitudes.

The Standing Conference on Schools Science and Technology, through a number of regional organizations, is bringing about a wider appreciation of the need for more bridges between schools and industry. The results of the work of these organizations is to be seen in curriculum projects, in project work in industry, and in joint studies of curriculum by staff from schools and industry. The British Institute of Management has sponsored a number of "twinning" arrangements in which a senior manager links with the head of a school so that the two organizations are brought closer together in an understanding of mutual problems and needs. This is not a device for helping in the recruitment of staff for industry: it is an arrangement that helps to form attitudes which close the unfortunate and unnecessary gap between schools and the world of work.

Teacher Training

The third set of initiatives is aimed at opening up the closed cycle of teacher training. Far too many teachers, especially those in school, have no experience of a work situation outside of education. The cycle from school, to college or university, and back to school is a closed one. However open and receptive teachers may be, all too often they have a very limited understanding both of the demands of industry and of the working environment outside of education. Some efforts are now being made to bring about a better understanding by having students in a teacher training course spend a period of time in an industrial setting (regarded as a part of the total training period within the course) and by placing lecturers from the colleges in industry for curriculum development projects. The latter placements are additionally important in helping to bring together the teacher trainees and the training staff from industry. Exchanges of opinion on pedagogic methods used in training in industry and in teaching in colleges and schools are certain to be fruitful, even if initially they are a little difficult.

The Post-Secondary Sector

The initiatives mentioned above are important because they are based on practical co-operation at a level at which co-operation brings about better mutual understanding. When the post-secondary system is considered, many examples of partnership between industry and education can be seen. Indeed, by the very nature of many of the courses, there has to be a much more direct relationship between education and the world of work. But before considering the post-secondary system, let us stop to ask ourselves about the nature of the partnership between education and industry. For it is a partnership that is challenged in some quarters on two grounds. The first of these is that it is not the task of education to produce fodder for machines. That may seem a crude way of putting it, but the argument is often put crudely. Put another way, the claim is that in seeking to meet the needs of employers (whether these are private or the state) the freedoms that must be inherent in education are circumscribed and the opportunities for personal development are curtailed. Or, at another level, the claim is that vocationalism results in crabbed and restricted curricula. The second ground upon which partnership is challenged lies in the failure of manpower planning to forecast future needs correctly and with confidence. The claim made is that there are great dangers in gearing the education system to meet the future needs of the economy as they are perceived now, since this will mean educating for unemployment. Expectations will be aroused that cannot be met given the impossibility, using present techniques, of accurately forecasting future manpower needs.

Both of these arguments must be taken very seriously and they must be answered; indeed, they can be answered, and the answers will show us

something of the nature of the partnership that should exist between education and industry.

The Need for Partnership

In considering the arguments for partnership, let us very briefly begin by referring to some of the considerations that are basic to post-secondary education. First of all, there can be no evasion of responsibility for application of knowledge and techniques. Those who teach techniques and skills, those who impart knowledge, and those who discover new knowledge, must in teaching these things to mature adults accept a responsibility for the ways in which these things will be applied. It would be foolish to claim that teachers must accept total responsibility. That is not what is being said. But, at the very least, there must be an understanding of what is happening in that world outside of education, and a concern about the way that knowledge and skills are put to work. That requires some continuing contacts, some effort at mutual understanding. Indeed, where the professions are involved, there must be a deeper and greater responsibility. Professional competence is certified, apart from the teaching profession itself, by authorities outside of education. But those who teach for a profession have a direct responsibility for the standards of that profession.

Second, in whole areas of interest, especially in the technologies and the professions, advances in knowledge and the development of skills take place outside educational institutions. If teaching staff were cut off from direct contact with the world of work, they themselves would quickly become hopelessly out of date and their teaching would become unreal. Indeed, there are too many instances where this does happen. Individuals, as well as the curriculum, become out of touch, stale and unimaginative. Third, it is undeniable that a high proportion of those students who enter post-secondary education do so in order to obtain saleable skills. Indeed, many claims are made by those who recruit students into post-secondary courses about the value of the saleable skills provided by their courses. Such claims can only be sustained if those who make them have direct relationships with the market they are claiming to serve. Fourth, there is an argument of accountability. The post-secondary system, where it is financed by public money (as it usually is) is accountable for its spending. There are many arguments about the nature of that accountability. But it is not acceptable for post-secondary educational institutions to take public money and then proceed in isolation from the society that provides it. There can be claims for freedom, yes, but not claims for isolation. There must be interaction, and there must be an account given of the stewardship of public money.

Even when the interests of industry are not taken into account, a partnership between education and the world of work is necessary to keep teaching staff well motivated and effective in their teaching and to keep course curricula up to date and alive. This needs to be said because, all too often, there is a reluctance to recognize the true nature of the necessary partnership between education and industry. It is indeed a partnership, not a master-servant relationship or a demand-supply relationship. Having said this, let us return to practicalities. What initiatives in the post-secondary sector might be of interest and value? Again, examples are taken from the UK for no other reason than that these are the ones the writer is most familar with. It is hoped that they illustrate some principles of general applicability.

Course Validation

My first reference may be considered surprising by some, given the emphasis in some of the more stirring exhortations to develop relationships between

education and industry. It is concerned wtih validation of courses.

It is common enough for colleges to set up advisory committees, with a strong representation from employers, to advise upon the development of courses. Such committees can play a useful role in encouraging relationships between colleges and the world of work. But it is a limited role, although a most necessary one. In the UK a clear distinction is made between the advisory functions excercised by advisory committees (in which there will be, often enough, a substantial industrial presence) and validating functions that are concerned with authorizing a course in terms of its standards, its content and its resources. That authority is largely vested (apart from the involvement in some courses of professional bodies) in three national bodies: the Council for National Academic Awards, the Technician Education Council, and the Business Education Council. The first is responsible for the award of degrees and postgraduate qualifications on a massive scale in non-university institutions; the other two are concerned with qualifications at technician level. In all three there is a substantial involvement of persons from industry and commerce and from the professions. In making decisions upon standards and content, and in regularly monitoring them, those from industry, commerce and the professions come into regular and direct contact with teaching staff and with the colleges. The value of this partnership in developing curricula and course objectives cannot be over-rated. This direct relationship with the colleges is different from the partnership relationship existing, for example, in and through the City and Guilds of London Institute, for that body is largely concerned with prescribing curriculum and standards, a most valuable and valued activity but one which does not involve such a direct relationship with teaching and with the development of resources as do the other bodies. Validation in the non-university sector in the UK is dependent, therefore, upon a substantial involvement of those from industry, commerce and the professions. Without this involvement, the validation process would lose credibility.

However, external validation is not the only activity in which those who are directly involved in education are involved. Increasingly, colleges, and especially the polytechnics, are calling upon outside advisers, from industry, to be directly involved in the initial planning of courses. This involvement is valuable because it brings in, at a very early stage of thinking, the views of those outside the institution who are professionally involved in the subjects under discussion. The assistance of outside contributors has been particularly helpful in the development of multidisciplinary courses.

Education and Training for the Less Able

A great deal of attention has been focussed over the past years upon the transition from school to work. In any society, this can be difficult, particularly so for the less able young person. Where there are well developed training schemes in industry, with associated courses of post-secondary education, these are generally for the more able. It is with the needs of the less able in mind - those who have not generally received any systematic training or regular post-secondary education - that a number of current initiatives in the UK are concerned. Of considerable interest among them are pilot schemes of unified vocational preparation now being worked out and implemented by a number of colleges in association with representatives of industry and with the help of the Manpower Services Commission, the careers service, and industry training boards. The significant features of these schemes is that they combine educational elements with training. Work experience runs alongside basic relevant education, and all that is done is seen to be relevant to a job. Such schemes can work only by being based upon the closest co-operation between employers and a college and by

having a close analysis of job needs. Motivation of the student is all important and teaching staff, too, must be fully committed to teaching students not previously recruited into colleges. These schemes are helped by the work of the Further Education Curriculum Review and Development Unit, which has been established by the Department of Education and Science to provide a central focus for aspects of curriculum development in the post-secondary sector.

Visiting Staff

It is common practice in colleges to make use of visiting staff who undertake teaching as a part-time activity whilst having a major commitment in some other area of employment. All too often such staff are made use of in a somewhat restricted role and do not participate in a significant way in the development of curriculum or of policy for academic development. Also in many cases, opportunities for strengthening contacts with industrial and other organizations, through visiting staff, are not pursued with any determination on either side. This is a great pity. The presence of visiting staff, many of them having positions of responsibility in industrial and commercial organizations, should be looked upon as a great asset to be nurtured and made use of for mutual benefit. Such staff should be brought more into curriculum and course development, and their views and help should be sought, on a more regular basis, to strengthen relationships between a college and the various interests it serves. Where this has been done in colleges in the UK - for example by a direct involvement in course planning committees, in advisory committees, and by creating opportunities for visiting staff to meet with senior management of the college - a great deal of benefit has accrued.

Short Courses

In one particular area of activity, partnership between education and industry and the professions has been found to be essential. This is in providing short courses for updating purposes. These courses are an important means of bringing people from industry and the professions into colleges; they also bring together teaching staff and their professional counterparts from outside education; and they may well be a source of considerable income which may be put to work elsewhere within the college. However, these courses must be planned carefully in terms of resources, staff development and areas of need. Some colleges and polytechnics in the UK have found it helpful to have a small central unit concerned with the planning and provision of short courses. Others leave the task to teaching departments, whilst maintaining a close central monitoring on what is achieved year by year. What is clear is that a considerable service can be offered to industry, commerce and the professions through short courses, and that involvement in short courses can make a significant contribution to staff development within the college. In a similar way, consultancy by staff from industry can contribute both to the needs of industry and to staff development. Again, some colleges have found it helpful to centralize some part of their activities in this field.

Sandwich Courses

Sandwich courses (and part-time courses) have long been regarded as the epitome of partnership between industry and education. There are now in the UK some 55,000 students following sandwich courses in higher education, and there is some evidence to indicate that the capacity of employers to provide training places (alongside their other very considerable commitment to training) is approaching the point of saturation. Partly because of this, and also in order to ensure that those involved with sandwich courses are

able to make the best decisions about their future development, the Manpower Services Commission in the UK, after discussions with the Department of Education and Science, has established a Sandwich Course Information Committee. This small, national committee will assist and advise the Manpower Services Commission in making available an analysis of relevant information and statistics on industrial and educational trends. The committee has only recently been established, and it will be some months before its first bulletin is published. It is hoped, however, that the information and analysis it will provide will enable colleges and employers to be more aware of trends that must influence the availability of training places, the demand for places, new industrial needs, and other issues that have a direct bearing upon the provision and development of sandwich courses.

These examples of partnership between industry and education in the post-secondary sector in the UK are intended neither to be exhaustive nor to be held up as examples for others to follow. They are illustrative of the kind of initiatives that, in one way or another, must be developed to involve employers, colleges and national bodies. They have been referred to in order to underline the need for a variety of actions to be taken in strengthening the necessary partnership between education and industry. The very diversity of action taken indicates the range of needs to be met. These needs are significant, whether we are concerned with a buoyant growth in high technology, a stagnant industrial economy, or a developing economy with its changing mix of labour-intensive and capital-intensive needs and limited base of existing technician and craft skills. At the earlier meeting in Hong Kong a number of significant recommendations were made which have yet to be acted upon firmly and in their entirety. Much remains to be done to restore or to establish the primacy of vocational education. This is a task which has to be undertaken imaginatively, sympathetically and with vision at all levels of education. We, who are concerned with education and training of technicians and of craftsmen, are not desirous of putting education into a strait-jacket of utilitarianism. Our tasks are to liberate education from a narrow and abstract isolation, to encourage flexible attitudes and skills, to provide for full personal and national economic development, and to ensure a responsiveness to the needs of society. These tasks are ongoing and demanding; they call for continual re-appraisal of methods, content and relationships. In this reappraisal, we can, by sharing our experience, help to promote a closer partnership between education and industry throughout the Commonwealth.

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TECHNICAL EDUCATION IN AN INDUSTRIALIZING SOCIETY

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INTRODUCTION

In general terms, education constitutes a social system within which technical can be regarded as a sub-system. Given a different frame of reference, technical education by itself can be regarded as a social system. If a further delimination is made to a particular country, any social system may be vividly characterized by a consideration of the roles of its major instrumental organizations or institutions, or of the major policies dominant in the particular social system.

Major policies dominant in an educational system commit the educational system to definite goals, set the strategies for reaching those goals, and determine the long-range destiny of the educational system. Major policy decisions are not just any decisions but are those that have major impact, those that mould the educational system's future. In short, major policies are guides to "critical" decisions not merely to routine ones. However, cognisance must be taken of the fact that issues that seem minor at one point may later prove to be decisive and vice versa. In any case, major policies are those decisions that bind the educational system to important courses of action.

Formulation of major policies imply not a long-range plan, but long-range planning. It is a continuous process being constantly adapted and updated as new information comes to light, new opportunities or needs arise, and services offered are no longer needed. Its value lies in providing advance notice of future serious problems, and in inducing a sensitivity in the leaders of the educational system toward the determinants of future educational system's character in order to make effective direction possible.

In relation to educational systems, major policies may relate to such things as: (a) financing educational expenditure (the relative proportions to be borne by national, state and local governments, as well as by parents, employers and others); (b) administrative sub-systems articulation (as between various levels and types of education); and (c) manpower development targets and institutional enrolments.

A fair proportion of this paper deals with an aspect of institutional roles in an educational system. Because misunderstandings about institutional roles are a common source of difficulty, a proper identification is very important in the design or review of educational systems.

One feature of an institutional role that needs to be clarified is its description. An institutional role is more than a statement of specific educational programmes, it is a set of expectations placed by the educational system on the particular institution in the role. This is so even if the institutional role has been created by the institution itself. If it is an accomplished institutional role in an educational system then the educational system has recognized it, explicitly or implicitly accepted it, and this recognition implies expectations. In turn, these expectations must be communicated to the institution in the role. This means that the general statement of institutional role must indicate what the role is for, what the institutional role occupant is expected to achieve, what objectives are

involved, as well as what activities are required or permitted. The statement must also indicate what access to resources are used. Without such a statement about resources, the definition of an institutional role is incomplete, for activities cannot be carried out unless there is access to the resources that make them feasible.

In other words, the functional content of an institutional role may take the form of general expectations, allocated into the institutional role from external sources or self-induced by the institution in the role. Self-induced expectations are valid if they come within the limits of the general accountability of the institutional role set by the educational system. Otherwise, they should appropriately be 'agreed' with the institution's beneficiaries and/or sponsors. In each case, the basic features of general expectations should be a matter between the institutional role-occupant and its beneficiaries and sponsors. This point becomes very significant when a multiplicity of expectations come from more than one source and the question of priorities arises. It is essential that difficulties are resolved (or disagreed) between the institution and its beneficiaries and sponsors, rather than just left. If left, they fester, and misunderstandings and recriminations are inevitable. If recognized, action one way or the other can be achieved.

THE NEEDS OF INDUSTRY AND THE INDIVIDUAL

There are significant links between education and economic change in general and between technical education and industrial development in particular. That there are such links is undeniable; that this form and relevance are more difficult to define is also abundantly clear. Part of the difficulty arises from the various functions of educational institutions. There is the view of education as a desirable object of consumption by students, and the view of education as an investment in human resources by the community. There is also another distinction, that of the complimentary functions or principles of matching and monitoring based on manpower planning which perhaps is most helpful for the purposes of clarifying institutional roles. The concern here is with the matching principle.

Technological changes in the manufacture, distribution, marketing, etc. of new products and new services result in changes in skills required in the labour force. And as these processes require skill change, the components of education and training offered to the labour force by institutions predicted on the matching principle of the tertiary sector of the educational system must also change. This is an example of the matching principle of education, to minimize the differences between the education and training required by industry, commerce etc., and the education, skills and knowledge that people have. The matching principle provides a basis for analysis both of economic structures now existing and those proposed for the future. It is able, albeit in an approximate way, to relate the supply of labour to the demand for labour in various industries.

The matching principle is several stages beyond a crude vocationalism in both conceptual content and logistic detail. The idea of matching is not in any sense meant as fitting people into slots. A curriculum based on it does not presume to tell individuals what to do, far less imply crudely restricted training for one or more of the areas of activity. In other words, teaching the application of knowledge should not be thought as determined only by the needs of individual students.

In conceptual content, a curriculum based on matching should not be identified with training people for today's jobs. To carry out a function

effectively in A.D. 2,000 requires a type of education that is oriented to change since there is no means of telling what the problems of A.D. 2,000 will be. It requires an ability to identify situations and abstract problems from these situations; the problems themselves may (or most likely may not) be identified with normal disciplines of the conventional curriculum.

Within a curriculum based on the matching principle, it is no use teaching only concepts, the ability to recognize and evaluate counterconcepts must be as effectively inculcated. Thus in business education it is no use simply teaching students to deal with marketing within the present social structure; students must be introduced to the ideas of what might be the equivalent function of marketing in a completely different social structure. Marketing par excellence implies sensitivity to social change, of course; but so do many other areas of operation. They should not be predicted on the assumption of an invariant socio-economic structure.

The key features of the matching principle which shape the orientation of higher education in the polytechnics are:

(a) To enable students to acquire new approaches so that in future situations in which they find themselves they will be able to define and solve problems in a broad context (social, economic, technical, etc.).

(b) To enable present and future students to develop their own answers to the question "In which direction shall we go?" Opportunities - and, at the crunch, capital resources - are matched to the likely development of all activities, not only the growth of manufacturing industries. There is, therefore, a large difference between a curriculum based on the matching principle and narrow training for some single and specific industrial function.

The vital role of educational programmes based on the matching principle of higher education in general and the polytechnics in particular is to cause knowledge to be applied in matching the needs of industry and of individuals.

The idea of making the application of knowledge the central role of technical education institutions has four important consequences. First, at the point of implementation, application of knowledge takes place on an individual basis and the educational programmes offered by the institutions should pay special attention to individual needs. Second, the application of knowledge takes place in a social context. It requires a broad understanding of the behaviour of people, or the moral, ethical and social patterns which - as far as is presently known - give a good indication of the way people behave. Technical education institutions need to provide as much opportunity as possible for students to mature in a real-world context and not in one limited to considerations of the intellect alone. Third, the centrality of the application of knowledge emphasizes the development of initiative, at least in terms of action. This implies that more has to be done by the technical education institutions on the communication of action (coupling) as distinct from the communication of facts. Finally, the idea of teaching and learning how to apply knowledge means that the student should develop those skills that will enable him in future years to apply any further knowledge he acquires. This implies a life-long process of acquisition of knowledge in order to use it.

In summary, the instructional programmes of the technical education institutions span many technologies, many arts and many skills. The technologies related to engineering, environmental design and management, and the basic sciences come readily to mind. There are creative and

expressive arts and skills - painting, sculpture, fashion, textiles, industrial design, architecture, music, theatre and so on. There are also the professional arts and skills - accountancy, business, economics, management, marketing. There are the skills of the community worker - technical teacher, social worker, librarian.

In realization, it is more than that: it is many arts, many skills, for many people. One of the expectations of technical education institutions is that their educational programmes should provide an equal welcome for three kinds of students. As well as those who want full-time and sandwich courses leading to registerable professional qualifications, there are many people looking for an education leading to other qualifications - diplomas and certificates, internal or external - and there are many young people who are already at work and are looking for an education on a part-time basis, by day-release from work or by evening study. It is good for all concerned to have the kind of teaching and learning community which such a mix of students creates.

From all that has been said it should be evident that the role of the technical education institutions is characterized by a dual concern for high academic standards and vocational guidance. Their diverse enabling activities have a bias towards objective creativity and the application of knowledge which is thought to be particularly appropriate to the needs of the times.

Major Policy Considerations

National policies can be broad and relate to the establishment of educational systems or be narrow and relate to specific programmes. For instance, a policy statement may say that every individual has a right to appropriate tertiary education, or it may set out detailed and wide ranging objectives. The former relates to a broad national concept of the type of education needed to achieve broad objectives. The latter implies a much closer and detailed analysis of manpower and related needs. It should not be inferred that the first statement does not have implicit objectives. Constraints relating to the economy, manpower required by industry, commerce and government, and needs seen by different sectors of the public, will generally guide the direction of an educational system. In contrast the objectives in the latter example are explicit.

Major policy statements are usually formulated following the work of an ad hoc group. (These may go under one of such names as Committee, Commission, Working Party, Task Force etc) established to undertake an in-depth study of a defined problem area. Groups of such a nature are usually set up by governmental agencies although there are examples of similar ones set up by non-governmental "voluntary" agencies that have induced equally far-reaching results. Ready examples of the first type (commissioned by governmental agencies) from Commonwealth countries are typified by the following three reports published in the early sixties:

(a) BRITAIN - Robbins Report. Committee on Higher Education, Higher Education: Report of the Committee Appointed by the Prime Minister under the Chairmanship of Lord Robbins, 1968.

(b) AUSTRALIA Tertiary Education in Australia: Report of Committee on the Future of Tertiary Education in Australia. Committee appointed by the Prime Minister under the Chairmanship of Sir Leslie H. Martin, 1964.

(c) NIGERIA - Investment in Education: Report of Commission on Post-Secondary Education. Commission appointed by the Federal Government under the Chairmanship of Sir Eric Ashby. 1960.

Of the second type (commissioned by non-governmental 'voluntary' agencies), similar examples are typified by the following three reports published in the mid-sixties:

(a) BRITIAN - Technical Teacher Training. Policy Statement by the Association of Teachers in Technical Institutions.

(b) KENYA - After School What? A report published by the National Christian Council of Kenya on the establishment of Village Polytechnics, 1966.

(c) NIGERIA - Skapski Report. Comparative Technical Education Seminar Abroad. Report of the Comparative Technical Education Seminar Abroad and Recommendations for a National Plan of Vocational and Technical Education in the Republic of Nigeria. Prepared with support from the Ford Foundation, 1966.

The common threads running through all six examples which are to be noted are:

(a) They are usually ad hoc groups

(b) They are usually established to provide solutions for a reasonably short-term problem with some provision to permit easy extension of the system at a later date.

(c) As conditions change or need to be changed radically new ad hoc groups are established.

(d) Whilst all recommendations are not necessarily accepted, the reports usually provide a solid basis for future development.

Most of these reports related in a large part to manpower needs to achieve national objectives and gave due recognition to the needs of industry. In certain cases, the number of training places to achieve national objectives and the available student input into specific institutions to fill those places were of importance. Thus there were three variables in the equations - the manpower needs in different vocation areas; the number of specialist training places to provide the output to meet these needs, and the input required at various levels and in various areas into the educational institutions to give the required output.

It is suggested that these are basic variables in policy considerations regarding the balancing of "the needs of industry and individual choice". In the economically more developed countries, particularly in times of affluence, the controlling factor is often not the input required to give target outputs but the demand by students for different types of courses in technical education institutions. Where there are no constraints on input, this seems to be the general pattern. The demand for places is probably influenced by the student's general area of interest together with his evaluation - often incorrect - of the long-term market demand for the particular skills. In a reasonably stable economic climate, this situation is probably acceptable.

However, there are severe limitations where the market is comparably small and the required numbers with the particular skills fluctuate. For example, several years ago the number of students opting into geology courses at a particular Commonwealth country's area technical education institution was small. With a local mineral boom there was a shortage of geologists although the total number required was small. Vacancies were advertised at inflated salaries. The immediate result was a big influx of students into geology courses. In the meantime, the market became saturated with imported or expatriate geologists so that the graduate group had great difficulty in obtaining positions. This lag between supply and demand is a fault of the laissez-faire system of matching manpower supply with manpower demand as depicted above.

As resources are usually limited, quotas need to be imposed in various disciplines of study. Once again, in developed countries these are often based on student demand and are determined by the educational institution itself. However, with the current world-wide situation where funds available for education are restricted and there is a questioning regarding the returns from funds invested in education, it is highly probable that limitations will be placed on the inputs into various study areas in developed countries.

In developing countries one of the scarcest commodities is adequately trained manpower, and one of the great needs seen by the population is for education. Here a government will undoubtedly see a balanced development of the country's resources as its prime responsibility, and consequently is almost certain to have a fairly clearly defined development programme which will include manpower required and methods of obtaining it. Priority will be given to methods of obtaining this manpower. It will probably do this by regulating the number of students entering different study areas, by providing appropriate educational training places to achieve its ends, and by ensuring that students enter the training places available. Unfortunately, individual preferences and national aspirations (usually strongly influenced by the needs of industry) will not always coincide.

Where in an effort to satisfy the needs of industry, government wishes to firmly direct students into appropriate programme, what can governments do while accommodating the principle of individual choice?

Where the application for positions exceeds places and where the prospective student is entirely dependent on government for his education and his upkeep during his programme of studies, he can be offered support provided he opts to enter a certain area. There could be opposition to such a scheme in more developed countries. A further possibility is for the government to ear-mark funds so that non-priority courses are minimised or eliminated. A further method of direction - less by coercion and more by persuasion - is to use a system of scholarships to students opting into priority areas.

Status, Remuneration and Job Satisfaction

One of the problems in connection with manpower policy as it relates to reconciling 'the needs of industry and individual choice' particularly in developing countries, is the aspirations - often quite unrealistic in terms of ability of so many students - to want to go to the top level of the work-force. It is significant that one does not see demands to the same extent in economically advanced countries where the responsibility of different levels of the workforce is accepted. Generally speaking, workers are

required at all levels be they unskilled, craftsmen, technicians, professional or management areas in the national development plan. Government educational policy and other policies relating to national salary/wage structure, influenced by other factors will determine this mix.

Status or respectability of different levels of the work force is hardly a matter for legislation. It is suggested that is more a matter for occupational or professional associations of workers (Technician Society, Draftsmen Society, Society of Engineers, etc.) who can and will work for the betterment of the group as a whole and its image in Society. However, governments can assist by avoiding the giving of an impression of elitism, Government must ensure that the educational institutions and instructional programmes for each workforce level are adequate and of good quality, and that the remunerations received will ensure the right proportions of the various levels of manpower.

The crux of the matter is that to the minds of many, the role of formal education is closely linked with the creation of urban elites. It is expected that parents and children will continue to look to urban wage employment for the fortunate few who get through secondary school. The assertion is that so long as fewer than 10 per cent of the age group in a country complete secondary school, and so long as jobs in the modern sector (however scarce these jobs may actually be) pay five to twenty times the country's per capita income, schools will be elitist no matter what they teach.

About less developed countries, one frequently hears the cliche that "school children are unwilling to work with their hands". Clearly, the incentive structure makes it highly undesirable for children to return to the unreformed peasant agriculture or handicrafts of their parents when other opportunities seem to be available. A related latter-day phenomena is one whereby highly qualified technologists practice their specialty (which may be connected with design, construction or manufacture) only for a minimal period and opt for the more lucrative fields of general business middlemen and commissioned agents largely in the import/export trade where the returns are higher through wheeling and dealing.

The situations just depicted call for clearly thought-out and imaginative interventions on the part of government in the national incentive structure so as to assure better returns for money invested in the education and training of scarce specialised manpower.

The Special Needs of Small Industries

See annexure I.

GROUP (C) TOPICS: RELEVANCE TO (SPECIAL) NEEDS OF THE ECONOMY

Environmental

Generally speaking, in each less economically developed country, some parts of the country have had long experience of urbanisation, but the post independence years have seen the phenomenon of rapid urbanisation in these previously urbanised areas and many other new areas. The casual observer might, at first glance, see little evidence of any realistic physical planning in the very great majority of towns in less developed countries and the picture presented is generally one of urban disarray.

Rapid urbanization creates numerous problems of a social, environmental and infrastructural nature requiring, amongst other things, technological and managerial skills for their solutions. In the task of environmental planning, development and management, it is a race against time. There is a great deal to be done to provide reasonable living conditions and an acceptable minimum range of services for those who are already living in the urban areas - in itself a gigantic task, but the needs of the new immigrants to the urban areas also have to be covered.

The process of environmental planning, development and management raises questions regarding the specific plans of development chosen and open up the possibility of others. It touches on the final choice of goods and services as well as on the methods by which these will be produced and consumed. It should induce us to identify the most appropriate technologies, as well as other factors such as location of activities; by which, waste can be minimized, recycling of materials, and the use of natural resources can be made more efficient.

The first point to be considered in environmental education (i.e. technical education for effective environmental planning, development and management) is that problems should not be taken in isolation. Whether one considers the control of disease, pollution, urban squalor, the provision of shelter and meaningful work, or the adequate conversion of the energy on which virtually everything depends, one finds problem interlocked with problem, professions working with and against one another, questions of resource allocation, legal controls versus economic regulation, the needs of one community set against those of another, and long-term aims in conflict with short-term expedients. Technological manpower cannot do much on its own. Any approach needs to be concerted, collaborative and comprehensive. All must take part in it.

The presence in technical education institutions of academic staff who possess expertise in one or more areas of environmental and behavioural science and who have deep motivation for work in problems concerning the interface beteeen man and the environment, invest the institutions for technical education with a capacity to launch on projects which are given an added complexity by the need to take societal attitudes into account. For example, the solution of some of the problems of living in an urban environment will require the co-operative efforts of technological manpower and of social science-based manpower. The climate in which the capacity to work together on complex interacting facets of a problem can and should be fostered in our institutions for technical education so that when environmental projects are undertaken, competent and understanding personnel are available to attempt solutions which take both technological and environmental factors into account.

The plea for a concerted, collaborative and comprehensive approach does not mean that there is global uniformity either in the scale and nature of environmental problems or in the necessary response of technical education. The first thing that must be recognized is that every global region, sometimes every country, has a different mix of problems, different priorities and different educational infrastructures. International and regional collaboration does not imply simple transfer of learning resources, course content and programme structure.

A key factor in developing an effective environmental education for technological manpower is the availability of suitable learning resources, in profession and variety. These would include such things as case-studies designed for participation and active learning by students, games and

simulations, independent-study units for the learning of definable factual information and skills, and the outlines of possible projects with lists and collections of relevant source materials. The preparation of such resources calls for creativity and experimentation. It takes too much time for most teachers working in isolation, and interest should be stimulated in the possibility of setting up networds whereby the production of such resources can be shared on a regional basis. A consideration of learning resources leads to the question of teaching staff development for technical education. A new approach, stressing active and open-ended learning, calls for a switch of teaching skills which is more than some teachers can make without guidance, support and encouragement. The use of resource materials brings new opportunities for the student, but the preparation of such materials also involves the teacher in active learning. As he writes, shares and evaluates materials, as part of a national or regional network, he learns about environmental education from his colleagues in ways which may be more effective than the routine reading of learned journals or attending courses on teaching methods. In other words, he finds himself in an open learning system similar to, and overlapping, that which he is trying to devise for his students.

The need for updating curriculum content and ascertaining its relevance to changing conditions is an issue that is raised more often than any other. Various curricula in technical education are crowded with content whose modification is strongly opposed (for a variety of reasons, practical and conceptual) and the pressures to add even more content grow every year - including the plea now being made for the relevance of environmental education. This issue must be clearly recognized. However, there should also be ready agreement that the fundamental principle underlying considerations of the core curriculum should be the preparation of people who are competent to enter their chosen professions or occupations. Two additional points should be considered by the relevant authorities before they conclude that there is insufficient time for environmental education in technical education courses. The first is that educational technology can offer substantial savings in the time taken to learn some parts of the core curriculum. Each institution should ask itself if it is doing all that it could in the light of modern methods. The second point concerns the size of the core curriculum. Certain questions need to be asked, year after year: "Do our students (still) have to learn this? Can they not learn it later, if they need it, when they need it?" These questions highlight the necessity to assign priorities to the various components of the curriculum content.

The orientation of the content of environmental education is also important. The content should not be uniform for, say, students of mechanical, chemical and civil engineering. As motivation is of crucial importance, the approach should be professional, and the student should see the relevance of the educational content to his future role, to the demands that will be made upon him and to the responsibilities he will be expected to shoulder. This rules out the encyclopaedic, something-of-everything approach in which too much is attempted and too little can be integrated in the minds of the students.

As well as being professional, the education should be ethical. This does not mean simply offering of lectures on ethics in general or even on, say, engineering ethics in particular. It means handling ethical problems as part of the more general process; learning to consider the ultimate implications of engineering decisions and building up a coherent set of values which can be taken into the world and revised and added to in the light of experience. Its success depends on an educational environment in which teachers accept the existence of ethical problems and do not pretend that technical education is value-free.

A consideration of the programme structure for environmental education should first be in relation to the general education of all technological manpower, regardless of speciality. There should be ready acceptance that changes in formal education (which is relatively short) cannot be the whole story. Life-long informal education and re-education (which follows after formal education) cannot be ignored, partly because of changes in technology and partly because we cannot wait until current formal education programmes have their effect. All levels of technical education - certificate, ordinary diploma, higher diploma, professional diploma and post-experience - must begin to reflect environmental problems in the broadest sense, and here we must not forget the contribution which professional bodies can make through their influence and authority and such means of dissemination as their professional journals and meetings. Also related to programme structure of environmental education are matters of academic organization and management. If changes are to occur, attention must be paid to the mechanics of collaboration and support between departments; to the incentives and rewards which human beings need where new efforts and sacrifices are required.

Production and Safety Standards

Product Standards

A clear definition of standards is possible in terms of the process of standardization. In turn, standardization is a discipline by which human activities of all kinds can be ordered and regulated, on the basis of experience and technological development. According to the definition given by the International Organization for Standardization (ISO), standardization is:

> The process of formulating and applying rules for an orderly approach to a specific activity for the benefit and with the co-operation of all concerned and in particular for the promotion of optimum overall economy taking due account of functional conditions and safety requirements.
>
> It is based on the consolidated results of science, technique and experience.
>
> It determines not only the basis for the present but also for future development it should keep pace with progress.
>
> Through standardization:
>
> (a) Standards are draw up which relate to: definitions, terminology or symbols: fundamental or derived units; specifications with regard to quality or operation; procedures for testing requirements (physical or chemical tests, etc.); procedures in general (registration, calculations etc.).
>
> (b) It is ensured that these standards correspond to the economic level of the environment in which they will be applied, in the hope of raising that level and benefiting the community in general.
>
> (c) Maximum efficiency and yield is obtained from raw materials; processes and products.

The less developed countries are now facing, or have in the past had to face many problems in connection with standardization. These can be summed up as the following set of conditions: inefficient industry and high

cost of production; lack of technical development in industry and education; low quality of output; high prices; markets limited by high prices; high rate of repair for products.

In the less developed countries, recognition must be given to the important role of standardization, introduced at an early stage, in accelerating the industrial process in developing countries and avoiding waste of capital and human and other resources in disorderly growth. Standardization has another part to play in the transfer of technology by providing organized information and by codification and classification of data on a uniform basis.

Efforts in international and regional collaboration in standardization could minimize production inefficiency in engineering industries and reduce repair, maintenance and servicing costs of equipment by ensuring that plant components are easily interchangeable with the minimum of spare parts. The expansion of export markets and the substitution of domestic products for imports would both be facilitated by the acceptance of standards ensuring consistent quality and in products packaging for exports and also by giving the local consumer confidence in domestic products. In the latter case, standardization should assume an aducational function, making the consumer aware of the level of quality and performance he is entitled to demand. There is no better starting point for this type of consumer education than in the technical education institutions.

Safety

Somewhere in the chain of circumstances which lead to injury, we find the human factor. The challenge of true accident prevention is to change attitudes of mind by efficient and regular safety training for all levels of technological and managerial work force. The aim must be to make every individual in industry have more regard not only for his own personal sefety but also for the safety of others.

Attention to safety in education institutions has two main aims: to ensure that the actual working conditions are safe, and to inculcate in the students a knowledge, of, and a respect for, the principles of accident prevention as a preparation for their later life in industry where safety training is essential for everyone in any industrial undertaking - operators, supervisors as well as top levels of management.

Finally in respect of the needs of industry for safety, what proportion of wastage due to accidents derives from the involvement of the technological and managerial work force in road traffic accidents? What are the implications for formal education programmes in institutions and for continuing education programmes in both industry and institutions? What then is the place of driver education and road safety training in the various educational programmes?

Self-Employment

As indicated earlier, the function of technical education institutions is to meet the needs of the community (industry as well as individuals) for technical education with due regard to cost benefit. In this connection various problems may arise. For example, the need may be obvious but the demand lacking among the unenlightened needy. Again the need, though serious, may involve such a small group that even when the demand is clear, it is doubtful whether a viable provision can be made to meet it. In development work, therefore, those in charge of institutions (as distinct from manpower

planners who contribute to national development plans) will be faced continuously with the assessment of needs and should have a clear policy in taking action on such assessment. Where the need is clear and the demand is found to be sizeable, then there is justification in going ahead with the provision even though the demand is still not fully developed, provided steps are taken to stimulate demand. If, however, the demand is small and is not likely to increase, consideration should be given to the idea of using existing facilities in other establishments, These cases are relatively simple to tackle. The real difficulties arise in dealing with latent needs, that is, needs which will clearly arise in the future as the economy develops. Vigilant and competent adivsory committees with strong representation from employers should be set up to consider the demand for each need and to determine the appropriate and opportune time for actually introducing a training course to meet the need.

In order to meet the manpower needs of the high productivity sector or modern sector of industry effectively, economically and without frustration, institutions should devise an education and training system that, quantitatively, relies less on statistics and long-range forecasts and more on signals emanating from the day-to-day workings of the employment market (i.e., the economy's capacity to absorb labour into productive employment). These signals include salary trends for specific occupations, employment experience of the products of the technical education institutions, improved data on unemployment, periodical employment market information, and establishment surveys.

There is no doubt what the Ashby Commission had in mind when it commented, "It would be a short sighted policy to allow the educational system of a country to be controlled solely by 'consumer needs' for manpower. However, it is part of the duty of an educational system to meet these needs, and in a young country particularly they must be given prominence." It is increasingly being realized that the "consumer needs" include the stimulation of self-employment. There must be a studious and detailed examination of the real requirements for self-employment, of those activities most probably related to the production of new wealth, and of the curriculum content and training methods best suited to these requirements.

The terms self-employment and entrepreneurship are often used interchangeably. It is true that, both are "agents" of economic development - important contributors to the rate of economic growth. But the term "entrepreneur" should be used only in reference to a type of business activity and not to the ownership of the means of production. It is not just about the capitalistic entrepreneur - it is about the man who undertakes or "enterprises", and such a man may be in the public sector or in the private sector.

In other words, the entrepreneur may be, but need not be, the one who furnishes the capital. It is leadership rather than ownership that matters. Therefore capital investment risk bearing is no part of the entrepreneural function. The capitalist bears the risk, the entrepreneur brings about the changed production function. The two may, or course, be done by the same man and often are in today's world. Probably, there is no single more confusing distinction today than that between entrepreneurship and risk taking generally. The entrepreneur clearly takes great personal risk in the process of bringing about the introduction of often traumatic new production functions. The entrepreneur may also put his own money into the new project and thereby becomes a financial risk taker - probably even self-employed.

The cause-effect testimony ready at hand is that a certain type of human motivation, which has been styled the Need for Achievement (N/A), is a link to economic development via the entrepreneur. That is to say, successful

entrepreneurs generally have more of this particular human characteristic. There are six converging lines of evidence which lead to the conclusion that N/A is essential for really successful entrepreneural performance and hence contributes to economic development. They are:

(a) Men with high N/A prefer to take moderate risks and do better when they are operating under a condition of moderate risk. This line of evidence came from technical laboratory and theoretical work in psychology over a 20-year span.

(b) A high concern for improvement or doing well is associated quite generally with rapid rates of economic growth. This line of evidence came from longitudinal studies of popular literature on achieving and non-achieving societies - both historical and contemporary.

(c) Minorities who have played key roles in most economic development were higher in measures of the N/A characteristic. For example, certain groups of Jew in the West are cited as having demonstrably higher N/A.

(d) Businessmen score higher on N/A than professionals of comparable education such as lawyers, doctors, priests and bureaucrats. Within the business group, those who have higher N/A tend to do better in the sense of being promoted faster.

(e) Business concerns in the private sector headed by men with higher N/A grow faster. This line of evidence derives from a Scandinavian field study.

(f) Training aimed at injecting some N/A into businessmen leads to relatively rapid growth of the focal businesses whose subsequent activity could be followed. The training programmes have been used in certain parts of Asia, North America and Africa for several years.

Special Training Needs of Women and Girls

It is important that increased opportunities should be provided for women and girls to benefit from technical education. A fuller participation of women and girls in technological and managerial careers is vital, not only in terms of fuller utilization of their capability, but in terms of the humanizing effect that they bring to the jobs, the work place and the social processes at large.

Amongst constraints reported as operating against fuller participation of women are: differential wages and salaries, hardships involved in the job, other cultural factors whether at the conscious and sub-conscious levels, and lack of training facilities and training support.

Remedial measures or actions known to have been taken include:

(a) Identifying occupations where the participation of women and girls is deemed unsatisfactory and requiring active support.

(b) Organizational involvement of women in recruitment, promotion and other committees.

(c) Training.

(d) The creation of specific opportunities.

Steps need to be taken to promote the education and training of women and girls for a wide spectrum of technological manpower. For example, they should be trained not just as engineers but as technicians as well. Not only should the barriers in the way of participation of women and girls in technological and managerial occupations be overcome, but also active educational training and employment support should be given within the context of the social and cultural conditions.

On this matter, one view has been expressed that problems of developing countries might require a separate approach to that used for the developed countries. Another differentiation has been made between the problems of labour surplus countries and those of countries with labour shortages. In this context, it is worthy of note that one country where there were labour shortages, plans to depend more on "woman manpower" by stimulating their recruitment into jobs for which they are suited, and by inducing men to transfer from soft office jobs to active work in production.

Interdisciplinary Activity

See Annexure II.

ANNEXURE I

POLYTECHNICS AS NUCLEUS FOR SMALL SCALE INDUSTRIES

(An extract from Polytechnic Resource Letter, July 1976,
Vol. 7, No.7, p.2-3)

G. D. Goray
Management and Marketing Consultant, Kanpur

Polytechnics, which are correctly imparting technological training to students only have a wider role to play. The small scale industry lacks the following facilities and utilities which are vital for efficient functioning and can be classified as under:

IN THE FIELD OF OPERATION

(a) Technical information.

(i) Technical reference material.

(ii) Specialized knowledge and ordinary knowledge of certain skills and techniques.

Problem solving in processing and manufacturing which includes engineering, technological and chemical problems.

(b) Production planning and control management.

IN THE FIELD OF PLANNING

(a) Planning and design of product. Information on norms and standards.

(b) Marketing information on product planning.

(i) Marketing information (marketing research or accumulated experience of marketing) about what product to produce.

(ii) What should be product characteristics.

IN THE FIELD OF QUALITY CONTROL

In this field two types of needs are revealed:

(a) Information on standards quality, i.e. what are the prevailing standards of quality. This will acquaint the small scale manufacturer with the standards by which his products are judged by others and unrecognized specifications.

(b) Making available the analytical testing and assessment facilities available to the SSI unit.

It is well known that many, rather most of the polytechnics have sufficient testing equipment, laboratories and qualified (many times experienced) people on staff who can undertake such testing and analysis work. It is also known that many of these facilities, equipment and talent lie dormant because it is not used.

This resource which exists must be exploited on the basis of selling this service at nominal cost and much of the difficulty of an SSI unit is about this respect.

We know that in most of the polytechnics a large amount of plant, equipment and machinery is, underutilized. This blockage of money on underutilized on macnines and plant and equipment which is partly in use is idle production capacity.

While the country suffers from shortage of power and lack of foreign exchange for import of sophisticated machinery we should consider whether better use can be made of machinery, plant and equipment capable of precision work.

The small scale industrialist lacks funds, facilities and time to acquire these machines. If such machines or plants are made available to him, his capital investment will be reduced and profitability (because of availability of more funds as working capital) increased. Machines, plant and equipment may be made available as follows:

(a) The Polytechnics offer the use of these plants, machinery and equipment on time sharing basis.

(b) The SSI unit sends its own personnel to operate the machines.

(c) The raw materials is supplied by the SSI unit.

(d) Or an alternate method can be evolved to employ paid efficient personnel in production and sub-contract the facility of the plant, machinery along with hire charges for the man.

IN THE FIELD OF MARKETING

The main difficulty with an SSI unit is that it lacks marketing knowledge. The entire profitability is dependent upon the selection of the right production, the current pricing and the use of marketing efforts (strategy included).

Polytechnics must develop facilities of management and marketing in order to help the SSI act efficiently. A little guidance by a management expert on organization, finance, personnel and profit planning can turn a closing unit into a profitable unit.

I have tried to enumerate broadly the aspect that require our attention. The earlier the polytechnics start the above facilities which are of two types- one conventionally technical and the other belonging to the group of management technology the better.

A small scale unit (SSI unit) will benefit immensely from the provision of these facilities. The Polytechnics can promote new SSI units and also help the existing units to survive.

ANNEXTURE 11

An Extract from

PAPER D. PROGRAMME DESIGN

by

Dr. Keith Legg
Director, Hong Kong Polytechnic

Paper written for

National Workshop on The Structure of
Instructional Programmes in Technological Institutions

5-10 September 1977
at the Polytechnic, Ibadan

BREADTH AND INTER-DISCIPLINARY STUDIES

General

Programmes of study can be classified under the following headings:

Uni-disciplinary
Multi-disciplinary
Inter-disciplinary

Programmes can be specialized or broad although the uni-disciplinary type tends to be the most specialized because of the greater time available to concentrate on the one discipline. In technical education great emphasis placed on the specific needs of industry and commerce, and there is a distinct trend to be over-vocational - a form of over-specialization, espeically from the student view-point. In general, most secondary and tertiary levels. However the basic aim must surely be to produce people who can think for themselves and who are equipped to do a useful job; but who are also capable of becoming good citizens and enjoying the cultural aspects of life.

In industrializing societies increasing industrial sophistication demands better standards in design, manufacture, handling and materials control. Furthermore there is the strong world influence for environmental conservation arising from such factors as excessive noise, air and water pollution, waste of all kinds, odious smells and deteriorating urban environment. All of these factors, together with the fact that small firms need more generalists than specialists, leads to a progression from uni-disciplinary to multi-disciplinary to inter-disciplinary educational programmes.

Breadth

There are good reason, therefore, to suggest that most educational programmes

should be approached from the standpoint of breadth of study. This implies thinking across disciplines and an institutional structure and organization that encourage breadth. (The systems approach discussed in Section 2 above indicates a way in which this can be achieved.)

The subject matter of the three classifications of programmes can be broken down into units and/or modules in such a way that study cores re present inter-disciplinary studies. Such cores, or parts of them, will be common to a number of different programmes. Specialization or further breadth can then be obtained by appropriate additional specific units and modules (see also Section 5 and Figure 4.). Such an approach is clearly economic whilst meeting the needs of the general community and the student. It also facilitates a rapid development from a broad base unto new areas of study through the addition of new units or modules as need arises. Thus a much quicker process can be achieved than by the more usual production of a fully tailor-made programme.

Inter-disciplinary Structure

The key to the provision of breadth and of inter-disciplinary study lies in the institutional structure. The convectional faculty/departmental structure centred on basic disciplines tends to produce a sense of "not belonging" amongst both students and staff. The two structures can be compared to function and project systems encountered in industry. A good solution is to adopt an interlinking system by superimposing a secondary-type structure of inter-disciplinary institutes, schools, and centres upon the more conventional faculty/departmental structure. Such a dual structure is outlined in Figure 3.

Institutes, schools and centres are relatively autonomous activity groups which bring the more basic disciplines together trhough multi-, inter- or trans-disciplinary study activity. Essentially they facilitate the process of cutting across the traditional boundaries of divisions and departments. Such needs can arise through a large broadly based servicing function, the co-ordination of scattered but related aspects of a broader based subject area or through a truly trans-disciplinary activity. This latter concept is of particular developmental importance placing considerable emphasis on synthesising a number of relevant disciplines, e.g. the synthesis of technology, urban planning, economics and social science into the broad subject area of transport studies.

Such activity groups generally function in close co-operation with industry, government agencies and public bodies and depend to a large extent on policies generated through strong advisory educational institutions. They generally contain permanent staff of an inter-disciplinary kind and include associated staff from relevant departments. Equally the permanent staff of inter-disciplinary activity groups can be associated with particular departments for more specific uni-disciplinary work. In this way, interactive staff attitudes are encouraged.

The decision concerning the designation of an institute, a school or a centre depends upon the type of level of activities and the extent to which department boundaries are crossed. However, the common requirements for all such groups must be an academic validation procedure meeting both the internal and external regulations of the Polytechnic. Hence for such purposes the groups are linked through the Academic Board, a Divisional (or Faculty) Board, or a Department according to the size and primary nature of their broad subject area. Clearly the larger institutes will have greater internal administrative, academic and other resources than the smaller centres.

It will be evident that there may be some confusion over the nomenclature through the use of the words institute, school and centre. This is not an uncommon situation for titles of various activity groups, e.g. a computer centre for a servicing activity group and a transport studies centre for an academic activity group. This indicates the advantage of defining institutional function in terms of activity group. For example:

	Functional Activity Group	Possible Nomenclatures
(a)	Education	Institute
	(i) Uni- or multi-disciplinary	School
	(ii) Inter-disciplinary	Centre
(b)	Practical/Training	Unit
(c)	Supporting services	Department
		Group
		Services

It is only then necessary to choose a consistent nomenclature to bring together the above two sets of functions and names.

The general definition of activity groups within an institution also has advantages in the costing and management information function.

COMMONWEALTH CO-OPERATION IN TECHNICAL EDUCATION

Paper Presented by the Education Division, Commonwealth Secretariat

This paper seeks to indicate areas in which the Commonwealth Secretariat can assist in promoting regional and Commonwealth Co-operation in the field of education, particularly technical education, and to identify the Secretariat's role.

The educational programme of the Commonwealth Secretariat can be described under two main heads: the collection and dissemination of information; and the organization of conferences, seminars, workshops and training courses.

Information

The Secretariat acts as a clearing house for information about educational developments in the Commonwealth. The collection of information is done in several ways; for example, through visits to Commonwealth countries, through correspondence, and through a large number of journals, periodicals, and documents which the Secretariat receives.

Whenever necessary, the Secretariat commissions specialists to obtain information in specialized fields. For instance, it was as a result of a commissioned study that A Survey of Technician Training in Commonwealth Countries in Asia was published.

The dissemination of information is achieved through reports of Secretariat seminars, workshops and conferences, as well as publications such as the Education in the Commonwealth series dealing with special areas of education e.g. correspondence education. Among other publications are titles such as Educating and Training Technicians and The Production of School Science Equipment.

Conferences, Seminars and Workshops

Commonwealth meetings dealing with Education are handled by the Education Division. They vary from triennial pan-Commonwealth conferences of Ministers of Education to specialist or study group conferences and smaller seminars and working committee meetings - all of which provide member nations of the Commonwealth with opportunities for the exchange of experience and information.

Training Activities

Training is provided and supported by the Commonwealth Secretariat in various ways. The following examples indicate the highlights:

(a) Bursaries: The Secretariat encourages Commonwealth countries to send personnel to train at centres which are already in existence. Emphasis in training is mainly on middle-level personnel, and awards have been made for a wide variety of courses in technical and professional institutions. Training awards are also available for high-level personnel. The Commonwealth Scholarship and Fellowship Plan as well as the Commonwealth Fund for Technical Co-Operation are the main sources of such awards.

(b) Regional Training: It is generally agreed that regional training is valuable for two main reasons. First, training takes place in the context of problems which are common to a particular region. Second, the cost of training can be reduced by avoiding the necessity of having a number of training centres for the training of a limited number of personnel. During the past two years the Secretariat has organized two regional courses, one in Africa on educational administration and supervision and the other in the Caribbean on book production. Later this month, a third course on educational administration and supervision for the South Pacific region is scheduled to begin in Suva, Fiji.

(c) Educational Visits: The Secretariat has in the past provided a number of travel grants to enable personnel from developing countries to travel to other developing countries to examine special educational areas of interest. These visits have generally proved most useful. However, the emphasis is now shifting to training attachments which are seen as having a greater potential value than short-term visits.

Commonwealth Association of Polytechnics in Africa (CAPA)

Many polytechnics, and their principals or directors personally, are far from clear about the curricula, organization and administration needed to attain their objectives, and feel somewhat isolated, especially where they are unique in their countries. Several have suggested some form of association, especially in Africa.

The Seventh Commonwealth Education Conference held in Accra in 1977 recommended that the Secretariat should make arrangements to examine the establishment of an association of polytechnics in Commonwealth Africa. Accordingly, the Secretariat convened a meeting at the Kenya Polytechnic, Nairobi, in December, 1977. It was attended by directors and principals of polytechnics or comparable institutions, and senior Ministry of Education officals from nine Commonwealth African countries. The planning meeting unanimously endorsed the formation of a Commonwealth Association of Polytechnics in Africa. The report of the meeting has been published, and is available on request; arrangements are in hand to launch the Association in due course.

Commonwealth Industrial Training and Experience Programme (CITEP)

It has become clear to Commonwealth governments that one major sourse of weaknesses in technical education is a failure to complement polytechnic and college courses with appropriate practical training in industry. This is true at the level of professional technologists as well as that of technicians. Furtheremore, when new technologies or new industries are introduced or about to be introduced into a country, the need for industrial training in another and probably more developed country arises. Existing international schemes for providing practical training and work experience in engineering and other areas involve movements mainly between developed countries or from developing to developed countries. Increased industrial-

isation in some of the developing Commonwealth countries has raised the problem of a new scope for more genuinely multi-lateral traffic.

The Seventh Commonwealth Conference recognized this problem and also recommended that "governments give their full support to a Commonwealth Exchange Scheme for Industrial Training and Experience". It recommended, however, that "the Secretariat should, in the first place, set up a working group to explore the feasibility and the modus operandi of this programme, on a basis analogous to that of the Commonwealth Scholarship and Fellowship Plan."

The Secretariat has followed up the recommendation. It convened in London in February this year a meeting of ten persons with special knowledge of the subject drawn from Britain, Canada, Hong Kong, India, Kenya, Nigeria and Tanzania. A senior official of the International Labour Organization also attended the working group meeting. The report of the meeting is expected to be published shortly.

Teaching about the Commonwealth

There is a great deal of ignorance in Commonwealth countries about what the Commonwealth is and what it has to offer to member countries. Recognizing the importance of the matter, the Heads of Government meeting in June 1977 endorsed the recommendation of the Accra Ministers conference that teaching about the Commonwealth should be undertaken as a programme by the Secretariat. Action is in hand to implement this, beginning with the African and Caribbean regions.

Commonwealth Fund for Technical Co-operation (CFTC)

The Commonwealth Fund for Technical Co-operation of which I have already spoken is the major instrument of the Commonwealth Secretariat in the area of development. The Fund was set up in 1971 by a decision of Heads of Government to provide technical assistance to meet the priority needs of the developing member countries, associated states, dependent territories and inter-governmental organizations and agencies. It represents a major expression of the technical assistance role of the Secretariat. The Fund provides assistance and expert advice in specific fields. What distinguishes CFTC from many other aid agencies is that it is essentially a programme of mutual self-help in which the recipients are also donors. More than one-quarter of the resources used by the Fund are contributed by the developing countries. Nigeria is the third largest contributor today after Britain and Canada.

The operations of the CFTC are conducted through three main programmes. The one that is of immediate interest to us at this seminar is the Education and Training Programme. Its main thrust is aimed at the training of middle-level personnel from Commonwealth developing countries in other such countries, usually in the same region. The programme supplements national programmes and other schemes of co-operation by providing awards to enable developing countries to share their education and training facilities and assist in each others' development. A wide range of training activities is supported under the Programme, the institutions concerned varying from universities to trade schools. They include training attachments, study visits and participation in seminars and workshops which are developmentally oriented and have a substantial training element. Support is not generally given to participation in conferences which are merely intended for an exchange of information.

Conclusion

The Secretariat would be prepared to consider requests for support of national training programmes in the field of technical education, and in any of the fields of Education described so far, either through the provision of consultants to help in planning the programmes or supply of operational personnel to assist with the actual training. But more important, we will be pleased to consider provision of assistance to regional and pan-Commonwealth programmes relating to partnership between technical education and industry.

ADDRESSES

ADDRESS BY PROFESSOR TEKENA N. TAMUNO

VICE-CHANCELLOR, UNIVERSITY OF IBADAN

Your Excellencies, Learned Participants, Distinguished Ladies and Gentlemen:

I am happy to join you at this opening ceremony of the Commonwealth Africa Regional Seminar on Technical Education, and I extend to you all a warm welcome to the University of Ibadan. I greet all of you gathered here this morning under the auspices of the Commonwealth Secretariat to exchange ideas and to consider how best to achieve fruitful partnerships between technical education (particularly technician education) and industry. This, I understand, is the main theme of this seminar, and an appropriate one at that, especially for those of us in developing countries.

As you know, our technicians and engineers are severely criticized for their inadequate integration of theory and practice. I am gratified to note that this aspect of the problem will be tackled at this seminar and that full use will be made of the international composition of the participants here to exchange notes and collate material on measures, activities, schemes and arrangements which have proved effective in some countries. Surely, most of these measures will involve innovations in the educational system which will in turn necessitate a process of curriculum development.

Actions already taken by the Federal Ministry of Education and the relevant state ministries show that the governments of our federation area aware of these problems and have been trying to find solutions to them. The recently introduced one-tier system for our polytechnics is a case in point. The Federal Government's new National Policy on Education provides further testimony of its efforts to integrate theory with practice.

Here at the University of Ibadan, the need to integrate theory with practice is fully appreciated; hence, industrial work experience is one of the course requirements in our Faculty of Technology. Your seminar is a very important one especially for countries that are still technologically backward. I hope that, at the end of this seminar, there will emerge concrete proposals to ensure a considerable improvement of the existing situation.

It is a mark of honour that this important seminar in Commonwealth Africa is taking place at our University. I also applaud the other signal honour in inviting me to serve as chairman at the opening session. We appreciate both these aspects of honour and thank the organizers for recognizing our humble efforts in the field of higher education in Nigeria.

Ladies and Gentlemen, let me once more bid you welcome to the University. I hope you will find time in spite of your busy schedule to see as much of our campus as you possibly can. It now remains for me to wish your seminar every success.

ADDRESS BY THE PERMANENT SECRETARY, FEDERAL MINISTRY OF EDUCATION ON BEHALF OF COL. A.A. ALI, FEDERAL COMMISSIONER FOR EDUCATION, NIGERIA

Mr. Chairman, Commonwealth Deputy Secretary-General, Your Excellencies, Distinguished Guests, Ladies and Gentlemen:

I have been requested by the Honourable Federal Commissioner for Education, Col. Amadu Ali, to represent him at this opening ceremony of the Commonwealth Africa Regional Seminar on Technical Education and Industry, being held at Ibadan. Col. Ali has requested me to express his regrets for his inability to be with you this morning.

I am pleased, on behalf of the Hon. Federal Commissioner for Education to welcome to Nigeria the participants in this Commonwealth Africa Regional Seminar on Technical Education and Industry. Nigeria is glad to play host to this seminar because it will give participants the opportunity to assess for themselves the vast strides we are making in industrial development, in accelerating the training of skilled workers, craftsmen and technicians who are required in much greater numbers than hitherto, and in the development of policies on technical education which are more relevant to the requirements of industry in Nigeria. Like most developing countries, Nigeria is grappling with problems of the reorientation of its educational system to provide the skilled manpower required for its rapidly developing industrial sector.

This seminar will deal with topics apposite to the policy on technical education contained in our new National Policy on Education. It will deal with the partnership between technical education and industry, the complementary roles of industry and educational institutions in educating and training technicians, and the participation of industry in the formation of curricula and syllabuses for technical education courses.

Technical education in Nigeria started early this century when the first technical school was opened in Kano in 1913. Apprenticeship training opportunities were also available in the Public Works Department, the Telegraphic Department, and the Survey Department. It became a subject of considerable concern to the Government as by 1945 when plans were made for the establishment of technical institutes, trade centres, and handicraft centres. The Yaba Technical Institute opened in 1947 and offered three full-time programmes for junior technical, senior technical and teacher training. The junior technical course was a four-year programme of secondary education with a technical bias, giving resident instruction in wood working, drafting, sub-professional engineering, commerce, and printing to students who had completed eight years of primary education. The senior technical course was a three-year with two years of residential instruction separate by one year of on-the-job training in industry. This course admitted students who had completed a standard secondary grammar school course and those who had completed the junior technical course. The senior technical course programme covered subjects like electrical, mechanical and civil engineering, a course for architectural assistants, and a course in economics. The teacher training programme was a two-year course for the preparation of teachers for handicraft centres and secondary school craft courses.

The Yaba Trade Centre enrolled its first students in 1947. Its objective was to produce skilled craftsmen. Students worked largely on an apprenticeship basis. Trade centres, technical institutes and technical

schools of the Yaba Trade Centre type now exist in all the States. The courses in the trade centres and technical training schools are of the sandwich type. There is also a substantial number of handicraft centres offering manual training courses for the development of mechanical skills as part of the general programme of education at the post-secondary level.

Technical education has come a long way since its beginnings in the senior technical courses in the Yaba Technical Institute in 1947. Yaba Technical Institute itself developed into Yaba College of Technology in 1963. Colleges of technology and polytechnics have been established to offer diploma-type courses originally modelled on the Ordinary National and Higher National Diploma programmes in Britain. In 1975, there were only eight colleges of technology in the country. None of them had an enrolment of much over 1,000. Now several States have their own college of technology, and the Federal Government has approved the establishment of six Federal colleges of technology with an anticipated student population of 5,000 each. Kaduna Polytechnic has an enrolment of about 6,000.

To produce a better quality of technicians and technologists, the Federal Military Government has abolished the Ordinary National and Higher National Diploma two-tier system of technical education in Nigeria, and replaced it with a single-tier Nigerian National Diploma programme of the same standard as the previous Higher Diploma course. It will consist of three years of study, covering lectures and practicals and periods of industrial training, plus one year of supervised industrial work experience - making four years in all.

New courses are being drawn up in consultation with industry and the various professional bodies. We are aware of the difficulty in expecting industry to co-operate in the provision of supervised industrial training because a large number of firms in industry are small and lack the necessary facilities to organize this type of training. In 1977, the National Board for Technical Education was set up to advise the Government on, and to co-ordinate all aspects of, technical and vocational education falling outside the universities, and to make recommendations on the national policy necessary for the full development of technical and vocational education for the training of technicians, craftsmen and other middle-level and skilled manpower. The Board will also determine the general programmes to be pursued by polytechnics and colleges of technology so as to maximize the use of available facilities and avoid unnecessary duplication, while at the same time ensuring that they are adequate to the manpower needs of the country.

We, in Nigeria, recognize that there is still much to do to improve technical education in Africa. This seminar should provide a unique opportunity for participants to contribute their thinking to the development of new strategies and policies for the reorientation of technical education. This in turn should increase in quality and quantity the output of technicians and technologists in industry.

Thank you.

ADDRESS BY MR. E.C. ANYAOKU
COMMONWEALTH DEPUTY SECRETARY-GENERAL

It is my privilege as representative of the Commonwealth Secretary-General, Mr. Shridath Ramphal, to respond to the words of welcome that you, Mr. Chairman, and the representative of the Federal Commissioner for Education of Nigeria have addressed to all of us who are here for this seminar. I am sure that I speak for all in expressing deep gratitude and appreciation for the excellent facilities that have been put at our disposal and for the warmth of the welcome that has been accorded to us since our arrival here.

If I may interject a personal note, Mr. Chairman, it is for some of us indeed a special delight to be back in the Ibadan campus and see so many signs of growth and development that have occurred over the years since we ourselves had the pleasurable experience of being part of its community. Perhaps the only regret is that we do not as of today have with us the company of the University's students. It is my strong hope that if not before, then perhaps not long after the end of this seminar, the temporary difficulties will be over, and the normal life of this campus will be fully restored.

Both the theme and the nature of the representation of this seminar illustrate two important aspects of the today's Commonwealth. Assembled here are representatives and observers from 12 African countries who wish to use the facility of the Commonwealth association in their search for ways of strengthening their national efforts in an area of great importance for sociological, economic and industrial development. Time there was, when the mention of the Commonwealth only too readily evoked a spectre of an essentially Anglo-centric association whose pursuits and interests were inadequately orientated to the up-to-date preoccupations of independent Africa. Today's Commonwealth, with its collective and independent Secretariat seeks to serve its 36 member nations in areas that matter not only to its members, but also the international community as a whole. Whether it is in respect of the now universally recognized tragedy of South Africa, or in respect of the current quest for a new international economic order, the Commonwealth has taken and continues to take collective measures that are supportive of the efforts of the OAU, the UN and those other bodies that articulate major international concerns. Among its member countries, the areas of continuing Commonwealth dialogue and practical collaborative programmes span politics, economics, science, education, law, medicine, youth, etc. Through the facilities of a multilateral Commonwealth Fund for Technical Co-operation, no less than 300 experts from different Commonwealth countries are now working in other Commonwealth countries at any given time.

But I must now turn in particular to the efforts of the Commonwealth Secretariat in the countries of Africa, as well as of Asia and the Pacific, in the field of education and manpower development. These efforts have been, and continue to be based on priorities identified by member countries themselves and implemented by the Commonwealth Secretariat in response to immediate needs.

The Commonwealth Scholarship and Fellowship Plan under which donor Commonwealth countries make scholarship awards available to nationals of the Commonwealth through places tenable in their local universities is probably one of our best known programmes. Nigeria is a worthy participant in this scheme and awards a substantial number of scholarships every year in its universities to candidates from Britain, Canada, India and other African countries. Likewise, Nigerian students benefit from this scheme in universities of other Commonwealth countries.

Under the Commonwealth Fund for Technical Co-operation which I have already mentioned and as part of the education and training programme, Nigerian personnel in various fields such as education, agriculture, engineering, economics, etc., have attended attachment courses or enjoyed visiting awards in other Commonwealth countries while in return nationals of other countries have done likewise in Nigerian institutions or vocational establishments. It is a case of sharing resources and experience of which member countries of the Commonwealth can be justly proud.

In all the efforts of educational collaboration among Commonwealth countries the Secretariat has given emphasis to activities and projects which make a distinct contribution to the efforts being undertaken by member countries themselves. I need hardly say, therefore, that the Secretariat ministers to the needs of its member countries with the conviction, and happily the experience, that such projects do in fact advance the efforts of member states themselves.

For example, Universal Free Primary Education which was launched by Nigeria in 1976 was hailed as a significant educational development not only because of its magnitude but because of the educational policies which it represents. In this connection the issue of free primary education in member countries has been identified as an area to be studied by the Secretariat drawing on the examples of member states in Africa and other regions of the Commonwealth. Nigeria's experience is certainly a valuable component of that study which the Secretariat hopes to undertake before the next Conference of Ministers of Education in 1980.

The emphasis of many Commonwealth governments on technology development and on the place of technical education in their thrust for economic advance is too well known to be stressed. In respect of technical education the emphasis often arises not only from the need to introduce new machinery but also from the need to keep in operation machinery already expensively purchased. The facilities that exist here and the abundant evidence of the Nigerian Government's emphasis on technical development and training are a sufficient justification for holding the present seminar in this country. It is our hope that Nigeria's experience can be shared with other Commonwealth countries of the Africa region- experience that I trust will have sufficiently demonstrated the need for indigenous technology.

In the field on which we are particularly concentrating today, that is in the field of partnership between education and industry which is the theme of our seminar, it is clear that programmes of action are unlikely to succeed unless the partnership is real and convincing. The concept of partnership in technical training was articulated as long ago as the Ottawa Conference of Commonwealth Education Ministers in 1964. Since then it has been accepted that the development of manpower through technical and technician training is an effort jointly important to governments and to private industries. I am glad, therefore, to note that delegates and observers at this seminar include a strong selection of men from industry and the private sector as well as those from government.

Mr Chairman, I should not like to conclude my remarks without thanking all those who have helped to bring about this meeting. First I must thank the Federal Government of Nigeria for its co-operation in placing resources and facilities at our disposal for this Africa regional seminar. I believe I speak for all participants today when I say that although we are only just beginning our seminar, we have chosen an excellent host country for it. The industrial situation in Nigeria has produced well developed institutions which exemplify the partnership between technical education and industry - institutions such

as the Industrial Training Fund, vocational bodies as the Council of Registered Engineers in Nigeria. These, as well as the teaching institutions that have developed industrial liaison arrangements, clearly provide a good background and support for our seminar.

I should like most warmly to thank the University for its welcome and the facilities it has placed at the disposal of the Secretariat, and particularly for having made us so welcome at a time of considerable stress and problems. I should like to assure it that we will endeavour to benefit as fully as we can from our various countries from these facilities they have placed at our disposal.

Lastly, on occasions such as this the spotlight does not always reach those who carry the heaviest burden, and for this reason I should like to take the opportunity to thank our two consultants. I should like in particular to congratulate in public Mr Rex E.O. Akpofure who became the Director of the Education Division of the Secretariat ten months ago and serves as Director of this seminar. Those of you who have seen him at work or who know of his achievements in the Nigerian Federal Service will no doubt share with me my pleasure at his appointment. The Secretariat is grateful to the Federal Military Government for releasing him to serve the Commonwealth on occasions such as this.

In conclusion, Mr Chairman, I want to wish all the participants in this seminar well and to express the hope that your deliberations in the next few days will result in concrete proposals for action; action that can and will contribute effectively to the capacity of the countries represented here for producing more of the technicians required for their development.

* * * * *

VOTE OF THANKS

At the conclusion of the seminar, a vote of thanks was delivered by Mr. C.L. Abayo (Tanzania) on behalf of the participants. Mr. Abayo said that the seminar had made a valuable contribution to creating a deeper understanding of the partnership that should exist between technical education and industry. Participants would return home with a fuller understanding of the benefits of technical education, with a desire to see the recommendations implemented at national and regional levels, and with a feeling of gratitude to the Commonwealth Secretariat for organizing the seminar, the Nigerian Government for hosting it, and their own governments for allowing them to participate.

ORGANIZATION OF SEMINAR

A G E N D A

Theme

Technical Education and Industry

Objectives

(a) to study information concerning legislation, organization and institutions in each country designed to prepare young people for skilled employment, paying special attention to training, co-operation between industry and the public education system, and relationships between industry and the education system;

(b) to consider how best to achieve fruitful partnerships between technical education (particularly technician education) and industry;

(c) to gather material on measures, activities, schemes and arrangements which have proved effective in some countries with a view to disseminating information on such developments to Commonwealth countries;

(d) to consider follow-up appropriate activities including new schemes for Commonwealth co-operation in this area.

Agenda Item I - Survey of the National Framework

(a) Legislative framework - apprenticeship and industrial training legislation - other relevant legislation - statutory requirements - statutory bodies.

(b) The machinery of government - responsibilities of labour/education/other departments - government agencies - manpower planning machinery - public/private sector consultative machinery.

(c) Financial framework - departmental responsibilities - industrial training boards/councils/funds - levy and/or grant systems - financing the supply of teachers and trainers.

(d) National advisory/co-ordinating bodies - professional/certifying bodies - examining bodies - representation of industry.

Agenda Item II - Partnership: Educational Institutions and Industry

(a) Division of responsibility for education/training - management influence - theory/practice integration - capacity of industry for in-plant/in-company/on-the-job training - assessment of training - individual or collective action - collective training centres.

(b) The product of the schools: employability, diagnosis - aptitude testing, selection, career counselling and job placement - employment

state - the role of the training officer - release for related technical education - sandwich/block/day/evening.

(c) Course content - the role of advisory committees - factors affecting the curriculum, the syllabus - whose requirements to be met? - external/local/internal examinations.

(d) Interaction between college and industry - representation of industry on educational bodies - supply by industry of part-time teachers - visits to colleges by industrial training officers/training staff/managers/skilled workers - visits or attachment to industry by teachers, students.

Agenda Item III - Technical Education in an Industrializing Society

(a) The needs of industry and individual choice - status and remuneration - job satisfaction - the scale of industry - the special needs of small industries.

(b) The professional development of the individual opportunities for further training (home/overseas) scholarship policy - re-education, continuing education and training policy.

(c) Relevance to needs of the economy - environmental, product and safety standards - self-employment - special training needs of women and girls - inter-disciplinary activity.

Agenda Item IV - Regional and Commonwealth Co-operation in Technical Education

Areas, mechanisms and schemes.

TIMETABLE

Monday 24 April	
0900-1730	Registration of Participants
Tuesday 25 April	
0900-1230	Opening Ceremony
1230-1400	Lunch Break
1400-1530	Country Paper (Plenary Session)
1530-1600	Tea Break
1600-1730	Country Paper (Plenary Session)
1800-2000	Reception (Federal Government of Nigeria)
Wednesday 26 April	
0900-1030	Country Paper (Plenary Session)
1030-1055	Tea Break
1100-1230	Country Paper (Plenary Session)
1230-1400	Lunch Break
1400-1530	Agenda Item I (Plenary Session)
1530-1555	Tea Break
1600-1730	Agenda Item I (Groups Session)
Thursday 27 April	
0900-1230	Visit to industries in Ibadan city
1230-1400	Lunch Break
1400-1530	Agenda Item I (Groups Session)
1530-1555	Tea Break
1600-1730	Agenda Item III (Plenary Session)

Friday 28 April	
0900-1030	Agenda Item III (Groups Session)
1030-1055	Tea Break
1100-1230	Agenda Item III (Groups Session)
1230-1400	Lunch Break
1530-1600	Tea Break
1600-1730	Agenda Item III (Groups Session)
Saturday 29 April	
0800-1400	Visit to Ife and Oshogbo towns
Sunday 30 April	
1400-1530	Agenda Item I (Plenary Session)
1530-1600	Tea Break
1600-1730	Agenda Item III (Plenary Session)
Monday 1 May	
0900-1030	Agenda Item II (Plenary Session)
1030-1100	Tea Break
1100-1230	Agenda Item II (Groups Session)
1220-1400	Lunch Break
1400-1730	Visit to Ibadan Polytechnic
Tuesday 2 May	
0900-1030	Agenda Item II (Groups Session)
1030-1100	Tea Break
1100-1230	Agenda Item II (Groups Session)
1230-1400	Lunch Break
1400-1530	Agenda Item II (Groups Session)
1530-1600	Tea Break
1600-1730	Agenda Item II (Plenary Session)

Wednesday 3 May

0900-1030	Agenda Item IV (Plenary Session)
1030-1100	Tea Break
1100-1230	Agenda Item IV (Plenary Session)
1230-1400	Lunch
1600-1730	Free

Thursday 4 May

0900-1030	Adoption of Draft Seminar Report
1030-1100	Tea Break
1100-1230	Adoption of Draft Seminar Report
1230-1400	Lunch Break
1400-1630	Free
1630-1700	Press Conference
1700-1730	Closing Ceremony
1730-1900	Reception (Commonwealth Secretarait

DISCUSSION GROUPS

AGENDA ITEM I

Group A

Mr. N.K. Opoku (Ghana) (Chairman)
Mr. M.F. Paps-King (The Gambia)
Dr. H.O. Oseni (Nigeria)
Mr. H.J. Jenkins (Sierra Leone)
Mr. Aubrey Brown (Swaziland)
Mr. C.L. Abayo (Tanzania)
Mr. Samuel Lubega (Uganda)
Mr. Dominic Mwimba (Zambia)
Engr. N. Abeles (Nigeria)
Mr. G. Fogam (ILO) (Observer)
Mr. K.A. Olaniyan (Nigeria) (Rapporteur)

Group B

Mr. Enan Wangai (Kenya) (Chairman)
Mr. James George (The Gambia)
Mr. S. Baholo (Lesotho)
Mr. Lim How Chen (Mauritius)
Mr. H.A. Tukur (Nigeria)
Mr. C.I. Eli (Nigeria)
Mr. Paul Lavaly (Sierra Leone)
Mr. W.H. Serukenya (Uganda)
Mr. G.M. Okufi (Nigeria)
Mr. B.C. Mbonu (Nigeria
Mr. John Noble (SWAPO) (Observer)
Mr. C.O. Salamy (Nigeria) (Rapporteur)
Prof. A.N. Sherbourne (Canada) (Consultant)

Group C

Mr. S.M. Mokete (Lesotho) (Chairman)
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Mr. D.R. Gichuru (Kenya)
Mr. H.M. Hurgobin (Mauritius)
Dr. P. Igharo (Nigeria)
Mr. M.J. Buisson (Seychelles)
Mr. M.V. Dlamini (Swaziland)
Mr. Ahmedi Athumani (Tanzania)
Mr. Z.H. Sikabbubba (Zambia)
Prof. E.K. Obiakor (Nigeria)
Dr. O.A. Essiet (Nigeria)
Dr. M.O. Chijioke (Nigeria)
Mr. O.A. Akinwusi (Nigeria)
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REFERENCE LIST

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ILO's Role in Technical Education (Mr. G. Fogam, ILO Area Director, Lagos).

Technical Education in Namibia (Mr. J. Noble, SWAPO).

Country Papers on Technical Education and Industry

The Gambia
Ghana
Kenya
Lesotho
Mauritius
Nigeria
Seychelles
Sierra Leone
Swaziland
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