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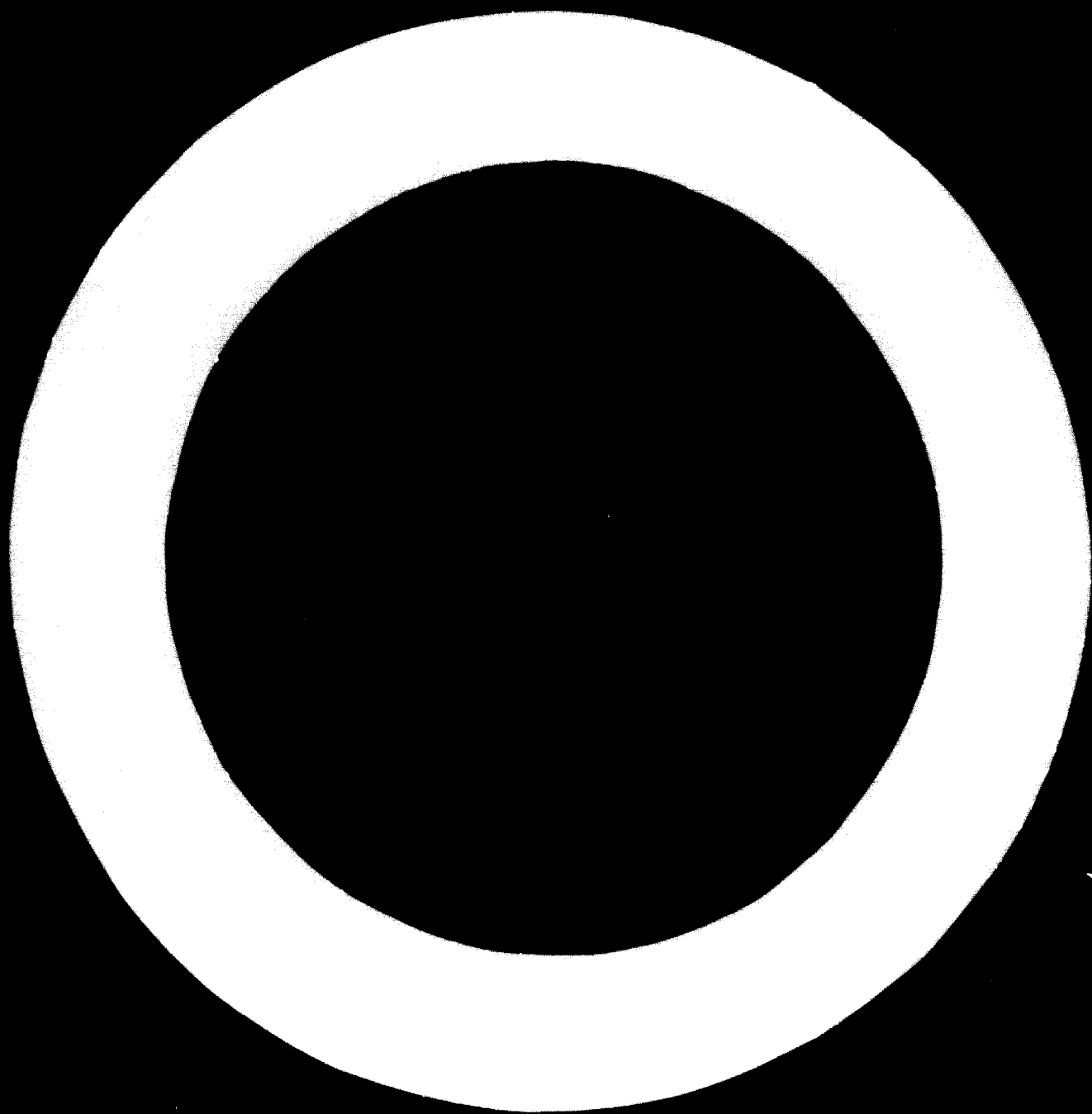
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TRAINING OF TECHNICAL PERSONNEL FOR
INDUSTRIALIZATION IN THE DEVELOPING COUNTRIES



I. INTRODUCTION

1. It has been frequently stressed that economic and industrial development depends in the last analysis on the development of a country's human resources. Human resource development has been described as the process of increasing the knowledge, the skills and the capacities of a country's working population. It is only within the past few years that economists have called attention to the importance of human resource development, and particularly investment in education and training, in contributing directly to industrial growth. Moreover, the accumulation of human capital (through education, training, etc.) is increasingly being recognized as of equal, if not greater, value than capital accumulation in its impact on economic development and industrialization.¹

2. This paper will be concerned with various problems and issues related to the educational and training approaches to human resource development. It will be primarily concerned with two aspects which are

¹" . . . Experience and research have shown that only a comparatively minor part of economic progress can be attributed to the input of the material or physical factors of production - more capital, more labour, more land, more natural resources. Most of it is due to what economists have begun to call the 'intangible factor' or 'residual factor'. This is really the human factor - better quality of labour, better education, better training, more knowledge, better housing, better nutrition, better organization, etc. This realization has opened up new approaches - through education, training, community development, use of idle manpower and eradication of disease - to using the vast latent human resources of the developing countries." H. W. Singer, "The Notion of Human Investment", unpublished paper presented at the twenty-fourth meeting of the Catholic Economic Association, New York, December 1965.

considered vital for planning the development of skills to sustain and accelerate industrial development.² These are: (a) an analysis of manpower requirements and (b) an analysis of the systems and methods of formal education and of training, including the institutions closely connected with the development of human resources. Lastly, policy oriented recommendations are suggested for implementation by the developing countries.

II. THE DETERMINATION OF THE NUMBERS TO BE TRAINED FOR INDUSTRIALIZATION

3. Industrialization requires a different level and type of skills from those traditionally available in developing countries, hence the emphasis that needs to be placed in developing these new skills through appropriate education and training programmes, if the industrialization targets outlined in national development plans are to be attained. For these reasons, during the last few years an increasing number of developing countries have attempted to evaluate their present and future manpower requirements.

4. Various approaches and methods for ascertaining the requirements of trained personnel are currently being used in the industrialized as well as in the developing countries. Such methods include:

- (a) establishment inquiries concerning specific industries, with a view to establishing the current and short-term requirements for intermediate and higher-level personnel in various industry branches;

²This paper is based on the Secretary General's Report on Training of National Technical Personnel for Accelerated Industrialization of the Developing Countries. E/3901, Add.1 and Add.2.

- (b) manpower forecasting which relates social and economic targets established under a given plan to occupations, and occupations to educational and training backgrounds, so as to determine the educational and training requirements, for the planned period;
- (c) the education-output ratio approach which omits the intermediate "occupational" step of the manpower forecasting method and attempts to derive educational and training requirements directly from social and economic targets; and
- (d) the "indicators" method which utilizes a number of indicators of educational and training development in relation to indicators of economic growth.

5. Generally speaking, however, the art of preparing estimates of future manpower requirements is still relatively new in most countries and undoubtedly the most widely accepted conclusion based on experience to date relates to its complexity. Indeed, the problems and difficulties which have been met are by no means peculiar to the developing countries, although some are felt more acutely, in particular those resulting from the inadequacy of basic data. However, improved statistical and other information on manpower is not the only condition for increasing the reliability of the estimates. Progress in this area depends also in large measure upon progress in forecasting the future course of other factors which influence manpower supply and demand, e.g., demographic, economic, social and technological factors.

6. Thus, it is highly unlikely that any estimate of future manpower requirements prepared in the present state of knowledge and with the help of currently available methods would prove fully accurate -- except

ty accident. This does not mean that such estimates should not be attempted. In the first place, it is in the process of preparing them that specific types of information to be developed become apparent and that methods are gradually refined. Moreover, a close scrutiny, as the future unfolds, of the results of the forecasts in the light of actual events may help to create a better understanding of the causes for change and to eliminate errors in basic assumptions. Clearly, this cannot be done until a first estimate, however rough, has been prepared. Thirdly, even though, in the present state of affairs, little reliance can be placed on detailed quantitative figures, the estimates can at least provide an indication of priorities in, and orders of magnitude of, the needs to be met.

7. An attempt is made in the Secretary General's report on Training of National Technical Personnel for Accelerated Industrialization of the Developing Countries to estimate requirements of technical personnel necessary for accelerating the process of industrialization in the developing countries.⁵ These estimates by no means should be considered as definitive. They do however serve to indicate rough orders of magnitude involved in the efforts of the developing countries to accelerate the process of industrialization. Estimates are given of industrial employment by main regions in 1960 and for 1975, in the light of the targets mentioned in the development plans of the countries in the region and on the assumption that planned growth rates can be maintained until 1975. The calculations seem to indicate that approximately 400,000 engineers and scientists and 1,000,000 technicians need to be trained by 1975 in

⁵The Secretary General's Report on Training of National Technical Personnel for Accelerated Industrialization of the Developing Countries. / 50-1, Add.1 and Add.2 and Corrigenda.

order to meet the requirements of industrialization (and "Africanisation" in Africa).⁴ It must be remembered that these represent only a portion of the requirements of the whole economy.

⁴Ibid. On the basis of the above number of scientists, engineers and technicians required for the fifteen-year period, and on the basis of actual or planned future cost estimates for various levels of education and training in selected countries and regions, it is estimated that a total expenditure of U.S. \$2.6 billion will be needed. This would amount to an annual expenditure of approximately U.S. \$177 million for all the developing countries. The regional allocation of the total 15-year expenditure estimate is shown as follows: Asia - \$1,155 million (\$957 million recurring cost and \$198 million capital cost); Latin America - \$966 million (\$852 million recurring cost and \$114 million capital cost); Africa - \$536 million (\$366 million recurring cost and \$170 million capital cost). It is important to point out here that these estimates are subject to a number of difficulties, such as the reliability of the estimates of the required number of technical personnel, the lack of adequate and sufficient data on cost estimates per pupil, etc. Thus, such estimates represent basically rough orders of magnitude and are presented in the Secretary-General's training report for illustrative purposes only.

III SYSTEMS AND METHODS OF TECHNICAL EDUCATION AND VOCATIONAL TRAINING FOR TECHNICAL PERSONNEL

8. It is generally agreed that the lack of adequate training facilities for technical personnel in the developing countries constitutes one of the major bottlenecks to accelerated industrialization. The equally important problem of the efficient utilization of existing industrial training resources has, however, received relatively less recognition and attention. It would appear that the essential problem is not simply to develop training facilities to the maximum, but to ensure that they are adapted on a continuing basis through appropriate training systems and methods to the evolving needs both of the economy and of the labour force.

9. There is a need to have a clear grasp of the objectives of training if the necessary arrangements are to be made for efficient and properly co-ordinated action concerning systems and methods for the training of technical personnel. As regards the levels of qualification, the distinction is usually made between three main categories of technical personnel: skilled workers, technicians, scientists and engineers. In practice, this is not sufficient from the viewpoint of organizing training and this leads to the following classification of personnel to be trained:

- semi-skilled workers
- skilled workers
- foremen and supervisors
- assistant technicians
- technicians
- engineers and scientists

10. As regards the content of training, the fundamental objectives may be defined as:

- (a) the acquisition of the mathematical, scientific and technological knowledge required for understanding and in some cases innovating the principles underlying the construction and functioning of machine and instruments;
- (b) the acquisition and development of manipulative and practical skills appropriate to the level of training required;
- (c) the adaptation of trainees to the conditions of work in enterprises;
- (d) adaptation to standards of industrial output, particularly as regards speed and quality of production.

It is evident that the specific nature of these objectives will depend in each case on the occupation involved and on the circumstances in which it is practiced.

TRAINING SYSTEMS

11. There are three main types of training systems:

- (a) systems of an institutional character, i.e. when training is given in appropriate institutions organized for the purpose, either within or outside the framework of the general system of education;

- (b) systems of in-plant, but not necessarily on-the-job training;
- (c) combined systems which combine training in an institution and training in an enterprise.

A. Institutional systems

12. In most of the developing countries, schools for technical and vocational training are an integral part of the general systems of education and these are invariably patterned on the experience of the industrialized countries. While these schools are essentially intended to train young people for their future occupations they often also provide the basis for programmes of further training of persons already in employment.

13. The vocational or trade schools in the developing countries aim at training craftsmen and skilled workers; thus, they are, in general, meant to provide a terminal training. However, in countries where primary education is of limited duration, the vocational schools may also be required to provide a good measure of general education.

14. Technical secondary schools usually offer a basic cycle of advanced general education together with vocational training in a given craft. This first cycle may be terminal; the main difference between the training given and that given in a trade school may therefore be the greater amount of time allotted to general subjects. Examples of this type are the technical preparatory schools in the United Arab Republic which require completion of six years of primary education and offer a three-year course. In many cases, however, the

first cycle of the technical schools is not terminal but comprises a course of general secondary education with some vocational or technical bias and specialization comes in the second cycle.

15. Industrial training provided through vocational and technical schools has a number of advantages. It can, for instance, provide pupils with a reasonably comprehensive background of general knowledge particularly in the sciences as well as providing the basis for more specialized technical training. In addition, the institutional character makes it easier to ensure a regular and systematic progression in the instruction. Experience has shown that it is particularly suitable for basic training covering a broad range of skills and lasting a considerable time.

16. Technical and vocational training through public schools in developing countries frequently suffer, however, from a number of shortcomings. The main ones are:

- (a) the serious lack of balance between the numbers trained for a particular occupation and the number entering that occupation, since the majority of those trained often seek and obtain employment in other sectors, such as the army or the administration;
- (b) the considerable wastage during training, which considerably increases the cost per pupil trained;
- (c) the insufficient adaptation of the training to conditions of work in enterprises, as well as to the speed and quality required on the job;

- (d) the shortage of personnel and incompleteness of equipment, since the funds available are not always adequate for the needs of technical institutions; and
- (e) the inadequate qualifications of teaching staff, particularly workshop **instructors**.

17. There is clear evidence, therefore, that in many developing countries, training provided through the type of systems described above will require a large number of urgent reforms and closer co-ordination with other systems of training if it is to be used effectively for a specific accelerated programme of industrialization.

18. Another form of institutional training is accelerated training in centres for adults. A typical system of this kind appears to be of particular interest for industrializing countries. The essential aim of the centres under the system is to meet urgent needs for skilled manpower and to accelerate industrialization, to adapt manpower to technical progress, and to facilitate the transfer or promotion of workers in employment or the vocational rehabilitation of the unemployed.

19. The system has been mainly used hitherto for training skilled workers in such basic occupations as metal and woodworking trades, building and office work. The aim is to bring adults to this level of qualification by means of training which varies in duration from 1,000 to 2,000 hours. The effectiveness of the training is ensured by very strict selection of candidates, teaching methods appropriate to the age of the trainees and the objectives of the training and by appropriate pedagogical training for teaching staff.

20. It would seem desirable, however, for developing countries, to bear in mind the following characteristics of this system of training:

- (a) The cost of training tends to be high as a result of the quality requirements specific to accelerated training programmes. It is essential for teaching staff to have had industrial experience and for their salaries to reflect this experience. It is necessary for trainees to receive allowances or remuneration at a sufficiently high level for them to be able to meet their needs as adults, who may be responsible for families. The initial expenses involved in setting up the centres, and particularly those covering premises and equipment, may not be justified if the training programmes have to be adapted rapidly to sudden fluctuations in the employment market.
- (b) The value of accelerated training centres has been shown mainly in countries in which the level of industrial employment is steadily rising. Their value is, however, doubtful when the rate of unemployment and under-employment is high and plans for industrialization are limited in scope and slow in implementation. In other words, accelerated training requires short-term outlets for employment on the basis of plans which are reasonably certain of fulfilment.
- (c) In countries in which the levels both of employment and of labour force qualification are low and stagnant, efficient accelerated training for adults tends to lead

to the unemployment of the less qualified workers who are displaced by the better qualified workers trained. While the introduction of accelerated training may be useful economically in such cases, therefore, it does not necessarily help to reduce the social problems of unemployment.

21. Accelerated training has also been used for training semi-skilled workers. Colombia and Chile, for instance, have developed accelerated training programmes at this level for textile and clothing workers. These experiments have tended to show the usefulness of accelerated training methods and to gain the confidence of the industrialists.

22. Finally, a form of institutional training which would appear to be of particular interest for countries which are short of technicians or engineers and cannot meet their needs rapidly enough with the existing training facilities is that provided through centres for basic and further training organized by groups of employers or workers.

23. The training of workers in such group centres may be of particular interest for small-scale industries since the enterprises concerned are unlikely to have the resources of personnel required for organizing full training in their plants. If they combine forces, however, the cost to each firm is reduced and the training can be organized on a satisfactory basis. This method has been used with conspicuous success in Japan where a substantial proportion of enterprises consist of small-scale industries.

B. In-plant training

24. In-plant training for skilled workers can be organized partly or wholly in workshops separate from production. In the latter case, this really amounts to having works training centres. This system of training is applied mainly in large establishments such as railways, petrol producing companies, textile factories, motor manufacturing firms, metal and chemical factories. In some respects, centres under the system resemble the centres in institutional systems of training. They vary from them, however, as a result of the naturally closer adaptation to employment conditions and the skill needs of the enterprises concerned. A recent development has involved the extension of existing in-plant training schemes, which were essentially for the initial training of workers to cover all personnel employed and with emphasis on further training. Under this system specialized training services are established which are responsible for analysing needs for further training, for preparing the training programmes and for carrying them out in co-operation with the other departments of the enterprises concerned.

25: The development of permanent in-plant services for further training requires the prior existence of certain conditions. The first of these conditions is certainly the unreserved support of management without which training action cannot be envisaged. It may appear paradoxical but this is a difficult condition to realize, because the management of enterprises, particularly in developing countries, does not always give to training problems the attention and attribute to them the importance which they deserve. It is, of course, also necessary that the enterprise should provide acceptable production and working conditions and should have supervisory and

management staff who can benefit from further training. If these two conditions are not fulfilled the problems which need to be solved if productivity and efficiency are to be improved can only be influenced by training activities to a slight degree and improvements of another character should be made before embarking on training action.

26. In-plant training programmes are being rapidly developed at the present time in highly industrialized countries. The situation is less favourable in developing countries where enterprises have shown much less interest in training. In recent years, however, a number of these countries have taken action to develop in-plant training schemes, frequently with international or bilateral aid. This has been the case, for instance, in Brazil, Chile, India, Iran, Mexico, Pakistan, Peru, Senegal, Tunisia and Turkey.

C. Combined systems of training

27. The main difficulty with institutional systems of training is that, while they are in a better position than enterprises to give instruction, they are not in a position to provide adaptation to a working environment or the speed of industrial work. The contrary applies to systems of in-plant training. There is thus the fundamental problem of how the two systems can be combined, in order to ensure the maximum efficiency of training.

28. Various ways of combining the two systems have been developed over many years. Some countries have attempted to solve the problem by organizing training in two successive stages, the first in a school or centre, the second in an enterprise. When this is done the trainee frequently attends the school or centre for theoretical instruction at intervals during the period of in-plant training.

29. In other countries the existence of new economic structures has made it possible to envisage more radical solutions. In countries with a market economy, large nationalized sectors of production such as mines, power and transport have, for instance, organized training facilities which combine the advantages of both systems. They have done so by establishing training schools or centres within an enterprise or an industry, these training establishments functioning for the enterprise or enterprises concerned.

30. In centrally planned economies, such as the USSR, the vocational schools are closely linked with industry. Each school has a so-called "patron" enterprise or group of enterprises in which its pupils obtain practical experience. The strengthening of the links between education and life, of which this association between school and enterprise is an example, has become one of the most fundamental principles in educational policy of the USSR Government.

31. A combined system of training, which seems of particular interest for industrializing countries, has been established in Latin America as a result of the pressure arising from industry's growing needs for skilled workers. The common features of this system in the countries concerned may be summarized by saying that the authorities of these countries wished to meet the needs for skilled workers by:

- (a) organizing training facilities for young persons who could not attend vocational schools and who were to start or had already started work;
- (b) introducing programmes of combined training involving successive periods of training in a school and in an enterprise;

- (c) obtaining employers to accept the pupils as apprentices throughout their training and to pay them as such during this period;
- (d) financing and managing the system independently under the general control of the State. The system is financed by means of a contribution from the employers which varies between 1 per cent and 2 per cent of their payrolls.

32. The necessary action has been taken within the framework of national training services established for the purpose. The first initiative was taken by Brazil when it established the National Industrial Apprenticeship Service (SENAI). The apprenticeship service in Argentina, (later incorporated into the National Committee for Technical Education (CONET), the National Apprenticeship Service in Colombia (SENA), the National Institute for Co-operation in Education in Venezuela (INCE) and the National Service for Training Industrial Workers in Peru (SENATI) were subsequently established. Chile established a vocational training service, under a slightly different form, which is attached to the Institute for Economic Development (CORFO).

33. These bodies have been mainly concerned hitherto with the training of skilled workers. Several of them, however, particularly SENAI in Brazil and SENNA in Colombia, are beginning to orient their programmes towards the further training of intermediate cadres in industry, (technicians, foremen and supervisors) and of highly skilled workers such as those in maintenance and repair services. This extension of the objectives of these institutions, in conjunction with their flexible nature and financial autonomy, would seem to make them

particularly suitable for meeting the needs of industrialization. Developing countries may therefore find it to their advantage to evaluate the principles governing these new training services, the way in which they operate and the results obtained by the combined forms of training which they have organized.

TRAINING STANDARDS AND METHODS

34. Training standards and methods are reviewed in this paper within the framework, among other things, of the overall categories of technical and managerial personnel.

Training of workers

35. In order to ensure a maximum return from training programmes, one of the main problems to be solved is that of achieving balance between the level and content of training and the requirements of employment. It is clearly undesirable, from both the social and economic points of view, to place on the employment market workers whose qualifications do not correspond to industry's needs. Unfortunately, this is what happens in some industrializing countries. There is frequently a tendency to adopt training standards and programmes which are inspired by those in use in industrialized countries. It is evident, however, that the structure of the labour force, occupational practice and the level of general education vary widely from one country to another and that standards and programmes will not be sound unless they are based on the analysis of occupations as practiced in the country in which the standards and programmes will be used.

36. It would be therefore desirable to take a number of steps in order to get over this difficulty. These steps include:

- (a) determining the occupation for which national standards of qualification are considered necessary or desirable;
- (b) analysing these occupations with a view to the preparation of training programmes;
- (c) establishing such standards and programmes, on the basis of these analyses.

37. It is necessary to point out that the steps outlined above can be adequately executed only if stronger linkages than hitherto are established between the educational authorities and those officials charged with the planning and implementation of industrialization programmes.

38. The use of programmes and methods of high pedagogical value will help considerably to secure the necessary return from training systems. Considerable progress has been made in this field in recent years in developing countries.

39. The improvements in teaching methods have come about by the increasing acceptance of various methods: experimental method, active method, use of audio-visual aids integrated into instruction, the global method which is used particularly for accelerated training and which concentrates all theoretical instruction around the practical exercises and programmes' instruction which makes use of appropriate machines.

40. Similarly, very considerable progress has been made in the preparation and application of teaching programmes as a result of the improvement in teaching methods, of developments in the analysis of occupations and the levels of qualifications, of the establishment of training standards and of the increased account which has been taken of the level of general education of both pupils and teaching staff.

41. The particular difficulties which developing countries sometimes encounter in using teaching programmes and series of practical exercises are due to a number of causes. The use of unsuitable training programmes is often evidence that a training system is old and traditional. While these programmes can be improved the desired improvement in the quality of training will not be achieved if action is not taken simultaneously on such matters as relevant renewal of equipment to meet current training needs, the training of teachers, and the acquisition of audio-visual material.

The training of technicians

42. Some observations concerning training standards and methods in respect of workers apply also to technicians. The training in this category varies, however, according to the category of technicians and the duties they perform. Furthermore, at this level it is more difficult to define or de-limit occupations as precisely as can be done in the case of skilled workers. Nor is it in many cases possible or desirable to lay down national norms and standards for technicians' occupations because rapid development of technology usually brings with it considerable changes in functions and duties. It is therefore necessary to look at the actual content of the course.

43. For the combined group of technicians including foremen, supervisors and assistant technicians, it would be advisable to provide part-time courses by which they could supplement both their general education and the background knowledge necessary for the efficient execution of their functions. The content of such supplementary courses would include improvement in the use of the mother tongue or the working language, workshop arithmetic and some elementary science. Technical subjects should convey practical knowledge of specific tasks and a general understanding of machines, tools and instruments. The courses should further provide instruction in works' organization and administration and last, but not least, in problems of human relations. The latter subject is of particular importance to all those acceding to the position of supervisor.

44. For the technicians at the level of assistants to engineers, the training course of from two to three years should, in general, include some general subjects, in particular a foreign language in common technical use if their own does not enable them to become and remain conversant with the development of techniques in their specialty. The course should also include basic sciences and general technical subjects such as applied mechanics, strength of materials, thermodynamics and the specialized technical subjects and practical exercises, in particular engineering drawing and construction, covering the chosen vocation. In addition, the course should provide for practical in-plant work, in order to acquaint the future technician with practical work conditions and requirements.

Training of graduate engineers

45. There is a growing recognition that attention needs to be given to a serious problem that exists in the developing countries, namely

a gap between the actual requirements of knowledge and skills by the industry and the supply of such skills as acquired by the engineers through the existing educational system. It is basically the problem of how to bridge the gap between the fundamental knowledge gained at the university and its application in industrial practice. In-plant training is one way of helping young engineers to bridge this gap. It is being increasingly recognized in many industrial enterprises in the developing countries that the solution of the problem should not be left to chance; in other words, that it would not suffice to attach the graduate as an apprentice to technical personnel and hope that he will obtain the required experience in a reasonable period of time. There is a need to provide systematic and closely supervised guidance to the graduates in applying the basic scientific principles learned at the university to the many practical problems arising daily in the factory.

46. A factor bearing on the type of in-plant training required is the extent to which practical technological education has been provided to the young engineer during his stay at the university. There is growing recognition in many countries that theoretical training should be combined with the practical during the undergraduate years, and, in leading schools of engineering, industrial practice has been made part of the curriculum along with the theoretical instruction. The main objective of these periods of practical work is to acquaint the student with the working conditions and atmosphere of industrial establishments and to give him the opportunity of observing the application in practice of engineering theory. The value of these periods is generally recognized, but a criticism frequently levelled by industry, universities and the students themselves, is that they confine the student to observation and do not let him play an active role, however modest it might be.

In contrast, in-plant training programmes emphasize the development of abilities, that is the acquisition of skills and the exercise of judgment in concrete cases rather than the addition to technical knowledge.

47. The United Nations Centre for Industrial Development has organized, in co-operation with several developed countries, suitable in-plant group training programmes for engineers and technical personnel in iron and steel, machine tools, manufacturing of electrical equipment and machinery, textiles, etc. The industrialized countries are providing financial support to the trainees within the host country during the period of training, thus sharing the cost of the training with the United Nations, and by making available their experience, physical training facilities and well-qualified staff. The participating countries are contributing to the cost of the training programmes by paying the local salaries of their own trainees during the training course and the United Nations is paying for round-trip transportation. Each programme is being tailor-made according to the facilities available in the host country and the particular needs of recipient countries.

Training of higher administrative and managerial personnel

48. The training of the higher administrative and managerial personnel to deal with problems of industrialization needs to be approached at two levels: at the level of formulation of policies and preparation of plans for industrial development and at the level of management of individual enterprises. The latter category is easily identifiable and recently its role in the efficient administration of the industrial enterprises has received considerable attention. The role of the

State, on the other hand, is very important in the developing countries. It provides a horizon in terms of development goals and creates an atmosphere in which industries can be established and operated. The role of the government and of economic administrators therefore, becomes more meaningful in aiding the process of industrial development. The economic administrators in the developing countries are already playing a vital role not only in initiating various industrial development projects, but also in influencing the pace of development through systems of allocation of foreign exchange, raw materials, licencing, etc.

49. The training of economic administrators, who deal with problems of formulation and implementation of industrial development programmes in the developing countries, has been so far intimately connected with training in economic planning. It is being increasingly realized, however, that the knowledge and skills required in this area require training which, in a way, attempts to provide technical background to economists and economic background to engineers and technical personnel working in government and semi-government institutions.

50. Training programmes in the above-mentioned areas are, to some extent, handicapped by the lack of data on feasibility reports and other data on implementation of projects which are often considered as confidential data by leading agencies, consulting firms and, in some cases, the governments themselves. To permit the adequate preparation of teaching materials in training programmes on project analysis, etc., the release of some of the data contained in the feasibility reports would be considered essential. Further work, both on the substance of the training programme and the ways and means of preparing teaching materials, needs to be undertaken as soon as possible.

5/ A separate report is submitted to the Symposium on the subject.

51. Learning now to the training of managers, experience in all countries in recent years has demonstrated the importance of qualified management personnel as a factor in industrial development. Developing countries are in considerable need of managers who can effectively direct the production of goods and services. It is now known that, contrary to earlier assumptions, management is based on knowledge and skills which can be learned. Moreover, with appropriate training and other development facilities the learning process can be vastly accelerated.

52. Since the major developments in management education have taken place in the industrialized countries only within the past twenty years, it is understandable that the developing countries have a dearth of management training facilities.

53. The problems of management training in developing countries are, in the main, three-fold. First, these countries generally have a shortage of people with the required basis of a sound, general education. Secondly, they lack management education facilities. Thirdly, they seldom have enterprises in which managers can learn from good on-the-job experience.

54. During the past ten years, however, some of the developing countries have acquired new educational institutions designed specifically to provide management training. Nevertheless, it will be some time before their graduates make an impact on the economy of their respective countries.

55. Since the developing countries need to train managers as quickly as possible, they will have to emphasize the undergraduate level of

university education for some time. The curriculum of an undergraduate programme should include:

- social sciences such as economics, political science, sociology and psychology to provide the student with a good understanding of the culture of his society and the environmental determinants of industry;
- quantitative methods of analysis, with emphasis on statistical methods;
- principles and methods of the general process of management;
- the four main "specialties" of management; namely, economics of the firm, finance and management accounting; work study or industrial engineering; marketing; personnel management.

This type of programme is proposed to enable young graduates to become of service to industry fairly quickly in one or more of the specialized fields mentioned.

IV CONCLUSIONS AND RECOMMENDATIONS

50. It is clear that in many developing countries the existing educational and training facilities are patently insufficient to meet the need (managers, engineers, technicians, etc.) of large-scale industrial development programmes. Indeed, this implies the necessity in the long run for vast increases in such facilities in these countries. However, the problem is not simply the quantitative one of developing industrial training facilities to the maximum. Indeed, in doing so without relating the expansion of such facilities to a logical and consistent framework, it is possible that a country may invest in a type of education and emphasize training programmes so as to bring about an imbalance in developing appropriate skills for sustaining industrialization. The crucial problem for the developing countries, particularly in the short and medium term planning periods, appears to be qualitative; namely, the efficient utilization of existing industrial training facilities, involving the adaptation on a continuing basis to the changing needs of industry. The work in this connexion should, inter alia, take into account the analysis of the following relevant relationships and policy alternatives:

- (a) Identification and effective co-ordination of the activities of those institutions in the public and private sectors, which may be instrumental in building and developing technical skills (universities institutes, employing industrial organizations, etc.)
- (b) Analysis of the institutional structure for training for industrialization, at the national, regional and sectoral levels;

- (c) Analysis of occupations in industry with the view of formulating training programmes based on such occupations;
- (d) Programmes of up-grading and training industrial personnel in the manufacturing establishments;
- (e) The provision of incentives and counselling to persons in order for them to engage in the kinds of activities most needed for industrial development;
- (f) The provision of inducements to industrial establishments to operate their own training facilities;
- (g) Analysis of the capacity of different manufacturing enterprises to generate scarce industrial skills;
- (h) Linkage of efforts of industrial training and industrial promotion policies;
- (i) The relation between institutional training and training conducted by employing organizations; and finally,
- (j) The relation between formal education and training, (how much education and how much training and when, for various levels of required industrial personnel.)

Recommendations

17. The following measures are suggested to train the required technical personnel within the framework of programmes for accelerated industrialization.

- (a) Evaluate existing training facilities in the light of current and estimated requirements for technical personnel at all levels, from workers to engineers and management;
- (b) In making the above evaluation, review particularly the structure and organization of facilities for the three main levels of qualification, the use made of, and the return from these facilities, the extent to which methods and programmes are adapted to training objectives and the respective costs of the various training systems employed;
- (c) On the basis of the results of the above assessments, establish priorities in the light of a programme of industrial development resources available and the needs for the whole range of industrial personnel, based on the following possible measures:
 - (i) the improvement of existing training systems,
 - (ii) the use of facilities outside the national training systems such as immigration, training abroad, training by foreign companies, international or bilateral technical assistance and the more systematic organization of work and enterprises.

(d) The improvement of existing training systems with regard to:

(i) administrative organization and co-ordination at the national, regional and local levels, particularly as regards the links between the different training systems and the links between the authorities responsible for training and those responsible for education and economic development;

(ii) the structure of training systems and forms of training, their geographical distribution and their capacity in relation to needs for technical personnel, both short- and long-term;

(iii) the volume and distribution of training costs;

(iv) wastage and drop-out during training;

(v) the standards and methods used;

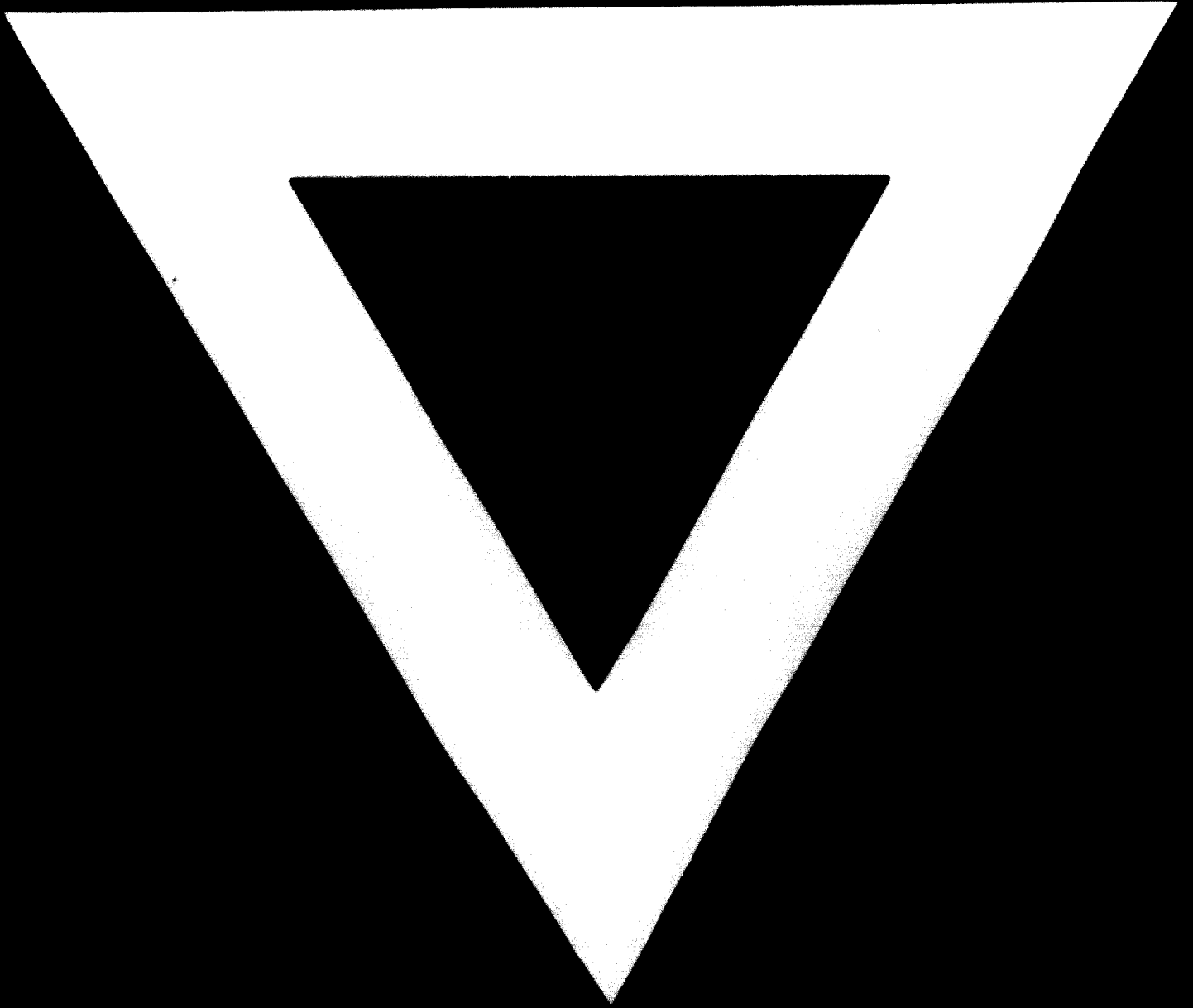
(vi) the relationship between training and employment possibilities and the links between training systems and industry.

(e) For countries in the early stages of industrialization, it is important that particular attention be given to determining the priority of the following:

(i) training programmes with a multiplier effect, that is for the training of trainers, particularly of teaching staff in institutional training systems and of supervisors and foremen in industry;

- (ii) training of persons in key functions or at key levels; for instance the training of management, the training of personnel in maintenance and repair services, and the training of lower and intermediate level supervisors and of technicians;
 - (iii) development of systems of training young persons and adults who are already in employment, for instance by organizing systems of in-plant training.
 - (iv) establish and develop programmes of further training as a means of improving the qualifications of the labour force as a whole.
- (f) For countries which have passed through the first stages of industrialization and have already developed their industrial and educational infrastructure, the following measures are suggested with a view to achieving the full and rational use of all human resources:
- (i) the extension of initial and further training facilities to the population as a whole, in accordance with their needs and those occasioned by economic and technical progress;
 - (ii) the establishment and development of high level training for new techniques, both for research and for production;

- (iii) the improvement of the links between schools and industry, in view of the increasing importance at this stage of industrialization of general and scientific culture as a basis for training and technical specialization;
 - (iv) the development of research on technological progress and the study of its repercussions on training, with a view to adapting training methods and programmes constantly to the prospects of industrial evolution;
- (g) The following measures are suggested in connexion with the training of management personnel:
- (i) the development, at the university and college level, of management education, both post-graduate and undergraduate, including management courses in technological education, for the longer-range supply of managerial practitioners and teachers;
 - (ii) the establishment and further development of training facilities to be provided by the industry institutes, technological institutes and management development centres for the more immediate supply of technical and managerial practitioners and teachers: such centres to offer comprehensive management and technical training for all levels of management and to cover a wide range of industries, including small-scale enterprises.



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