UNITED NATIONS

ECONOMIC AND SOCIAL COUNCIL

Distr.
GENERAL

E/3901/Add.1
3 June 1964

ORIGINAL: ENGLISH

Thirty-seventh session
Agenda item 12

TRAINING OF NATIONAL TECHNICAL PERSONNEL FOR ACCELERATED INDUSTRIALIZATION OF DEVELOPING COUNTRIES

Report by the Secretary-General

The Report consists of three parts. Part One of the Report is presented as document E/3901 and contains the Introduction and Summary of the Report and recommendations. Part Two is contained in document E/3901/Add.1. It consists of Chapters 1 through 5. Part Three is contained in document E/3901/Add.2 and contains Annexes to Chapters 1 through 5.

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CHAPTER 1

THE DETERMINATION OF THE NUMBERS TO BE TRAINED FOR INDUSTRIALIZATION

I. BASIC PRINCIPLES AND GENERAL CONSIDERATIONS

1. During the last few years, an increasing number of developing countries have attempted to evaluate their present and future manpower situation. In the majority of cases, these studies have formed part of the preparation of a broader plan for economic and social development or have been based on such a plan, seeking to determine its manpower implications. In a few countries where no plan had yet been drawn up, efforts were made, nevertheless, to assess manpower needs in relation to trends in the changing structure of the economy and of society.

2. 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.

3. For these reasons, 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 by 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. Indeed, since most developing countries have requirements that exceed their capacity to meet them rapidly, such information may be sufficient in the initial stages as a basis for allocating investments in education and training.

4. In view of all this, it may be useful to summarize some basic principles to be observed and general considerations to be kept in mind when preparing estimates of future manpower requirements. These remarks are based on the experience acquired in this field by both industrialized and developing countries, and on the results of research.

(a) Basic Principles

5. Several of the principles to be observed in making manpower estimates stem from the purposes for which such estimates are made. Since the present report is concerned with manpower estimates as a basis for planning educational and training programmes, particular attention will be given to the principles that have special relevance to this end. It must be pointed out, however, that assessments of the manpower situation and trends often have other objectives in addition to that of throwing light on educational and training requirements. Reference can be made in particular, to the use of manpower information in determining requirements for employment creation, in guiding measures to encourage or slow down the geographic mobility of workers, in establishing policies that affect labour force particularly of groups such as women and young or older people, or again in detecting imbalances in the labour supply that may be due to such factors as the structure of wages and other incentives. While these aspects will not be dealt with here, it should be remembered that they are highly relevant to the formulation of a comprehensive human resources policy, and that an assessment of the manpower situation and trends should be concerned with these questions as much as with the evaluation of educational and training requirements.

6. When considered from the angle of those responsible for planning the development of education and training, there are clearly certain conditions that manpower requirements estimates should fulfil.

7. In the first place, they should, so far as possible, express requirements in terms of educational and training needs, and not merely as the number of workers required for different occupations. This raises certain difficulties which will be dealt with at greater length subsequently in this chapter.

8. In the second place, the estimates should be concerned with new requirements for trained people (resulting from growth or change in demand or from replacement needs). This involves estimating the total future requirements of the economy (suitably broken down by categories), and balancing these out against the present supply, from which the number of people expected to leave the labour force as a result of death, retirement or for other reasons, should be deducted. A related aspect - on which very little information is available now - is the extent to which new requirements will be met without organized training programmes, by promotion from within or by horizontal transfers, since this natural flexibility in the labour supply has repercussions on the amount of education and training to be provided. Although the present chapter is mainly concerned with the methods of estimating gross future requirements for personnel of the higher and intermediate levels, it is important to not lose sight of the other steps involved in presenting net requirements for education and training.

9. Thirdly, unless the estimates cover the requirements of the whole economy - not merely those of certain sectors, e.g., industry or even modern industry - they are of limited value to the educational and training authorities, who will not know the total requirements they should seek to meet. Although, as required by General Assembly resolution 1824 (XVII), the report concentrates on the assessment of requirements resulting from industrialization, it must be remembered that these represent only a portion of the whole.

10. Fourthly, the estimates should make it possible to plan any required expansion or reorientation of educational and training programmes sufficiently in advance to produce results when desired. At the present time, most estimates of future manpower requirements do not give sufficient recognition to the time lag involved in educating and training qualified manpower at the higher and intermediate level, which ranges between three to five years for elementary skills and fifteen to twenty years for high level skills. There are several reasons which necessitate looking ahead as far as possible. The expansion of the numbers to be trained at

higher levels usually involves, particularly in developing countries, in addition to measures designed to increase the capacity and efficiency of educational and training facilities at that level, the previous expansion of the numbers trained at lower levels: thus, in order to increase the number of university graduates, it is often necessary as a first step to expand secondary education, from which students of higher educational institutions are recruited. Also at all levels of skill, the initiation (or expansion) of a training programme requires that the necessary teachers, training facilities and organizational arrangements shall be available beforehand, all of which requires time and, therefore, advance planning. Other restraints may be of a material and financial nature, or may result from the slowness of administrative decisions, and there may be social, psychological or cultural obstacles as well which can only be overcome gradually. An additional factor is the time required to change substantially the existing stock of personnel in the categories concerned.[1/]

11. Another condition which estimate requirements should meet relates to the amount of detail provided. There are two conflicting considerations here: on the one hand, educational and training authorities must have an idea of the types and number of facilities and programmes they will need to provide; but on the other hand, because a margin of error is unavoidable, it is desirable to deal as far as possible with broad categories and to avoid spurious precision in detail. Accordingly, it is the minimum requirements of educational and training authorities that should dictate the amount of detail provided.

12. Obviously, short-term estimates need to be more detailed than long-term estimates, since decisions must be taken now as to the number of people to be admitted to various forms and types of training. For the medium (up to 10 years) and long-term (up to 15 or 20 years), much less detail is required, except in respect

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1/ One may, for example, take the case of a country where a yearly out-turn of thirty-six engineering graduates is sufficient to maintain the present stock of engineers at 1,000 (assuming a replacement rate of 3.6 per cent and assuming that all engineering graduates enter the occupation); even if the intake of engineering faculties were suddenly increased by as much as 50 per cent, it is only when the new engineering students would graduate, say after four years, that the out-turn would be modified. This means that it would take fourteen years to increase the stock by 180 engineers, or by only 18 per cent.

of occupations which require highly specialized training of a long duration and also in respect of what may be called "derived demand", i.e., the demand for teachers and instructors who must be available in time to train future trainees or students. Indeed, for all the occupations requiring a relatively short period of training and for which training facilities can be expanded with relative ease, there is little need for detailed long-term requirements estimates.

13. Some detail is also required as regards the geographic distribution of future requirements, since this is the basis for decisions regarding the places or regions where training facilities of specific types should be planned. In addition, in the case of long-term forecasts, some indication should be given regarding the volume and structure of demand at different times during the period considered, since, so far as possible, plans should be made to ensure that the supply is at all times in line with the demand.

14. Finally, estimates should be prepared in such a form as to enable users to find out how the results presented were arrived at. Estimates presented in this way have a greater force of persuasion and are therefore more likely to be accepted by all concerned as the basis for measures to meet future requirements. A clear indication of basic assumptions and the methods followed makes it easier to detect and correct any errors, and by a comparison of working hypotheses with actual developments, to reach a better understanding of the factors causing changes in the structure of the demand for and supply of, trained personnel.

15. In addition to these conditions relating to types of information to be presented in estimates of future requirements of trained personnel, the actual work involved in preparing the estimates should also be guided by certain principles.

16. Comprehensive planning poses important problems of co-ordination between the various authorities concerned. In principle, it matters little what agency or authority draws up the economic and social development plan, provided it is in a position to cover all aspects of planning. However, even centralized planning activities may remain ineffective unless there is consultation and co-operation between the planners and the authorities or bodies which can provide the information and advice on which sound decisions can be planned, and which in the last resort will be responsible for the day-to-day execution of the plan within their individual areas of responsibility. Only on that condition can the necessary adjustments be made between the targets set in different fields so as to produce a consistent and, if possible, optimal plan.

17. Another principle to be kept in mind is that the task of preparing the estimates is a continuing one. Estimates need to be kept under review and to be revised or refined as required. In addition, it is necessary to prepare "rolling" estimates, i.e., the period covered by the estimates should be extended year by year so that education and training authorities may at all times have the advance information they need for planning their activities and programmes.

(b) Some General Considerations

18. Before examining certain approaches and methods which have been used in the preparation of estimates of future requirements of technical personnel, it may be useful to review briefly certain general considerations that should be kept in mind.

19. One of the most important considerations relates to the flexibility of manpower demand under different conditions of supply. Thus, when manpower is relatively cheap and abundant in comparison with other factors of production, there exists a tendency to use more manpower than under conditions where it is relatively expensive and scarce. This factor appears to account to a large extent for differences in patterns of manpower utilization in different countries, as illustrated by annexes A and B, which show widely varying percentages of higher and intermediate personnel in the industrial sector of different countries, as well as considerable variations in the relative shares of engineers and technicians. The fact that employment ratios of higher personnel are particularly low in the developing countries appears to be due both to the shortages that exist in these categories and to a tendency to use low-skill manpower on a relatively larger scale than in the industrialized countries, where such manpower is less plentiful and more costly.

20. This factor should be taken into account when estimating future requirements for technical personnel in the developing countries. It seems very probable that as long as different conditions prevail in the developing and in the industrialized countries respectively, as regards the availability of the factors of production, including manpower, different patterns of manpower utilization will continue to be observed. It may be added that this is in accordance with the need for emphasizing labour-intensive production techniques in the developing countries in order to reduce unemployment.

21. It is clear, however, that the objective of maximizing employment must be reconciled with that of maintaining productivity at an adequate level, and this means, inter alia, raising the skill level and improving the skill structure of the labour force. However, estimates of trained manpower requirements should take account of the existing level of skill in the labour force and of the need for fixing realistic targets for education and training, having regard to the resources available for expanding existing facilities and programmes to the possibility of doing so rapidly.

22. Estimates of trained manpower requirements should also indicate priorities and this may raise problems of choice namely a satisfactory balance between the short-term and long-term needs. For example, if the objective of economic development is to increase substantially both production and productivity, it may appear more urgent to raise the skill level of the employed labour force by rapid training methods than to provide relatively more expensive facilities where a smaller number of persons not in the labour force would receive thorough training of longer duration. Yet, a balance must be struck between the two, and it is the task of the manpower forecaster to foresee the implications now and later of different possible courses of action.

23. All this points to the fact that estimating future manpower requirements is not a theoretical exercise. Adequate consideration needs to be given to the existing supply situation and to the financial and other restraints that prevent its being r fied rapidly. In other words, there is a close interdependence between estimating future manpower requirements and planning to meet these requirements.

24. Similarly, planning to meet manpower requirements is closely interrelated with economic planning.[2/] The manpower implications of an economic development plan may be such that they cannot be met, because the resources available for education and training under the plan are insufficient. In that case, the production targets of the plan may have to be adjusted or the resources allocated to education and training to be increased, or both.

2/ The Interdependence of High-Level Manpower Planning and Economic Planning, by the International Labour Office (E/CONF.39/B/17, 9 October 1962). United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas.

IT. APPROACHES AND METHODS

25. Estimating the future requirements of technical personnel of the higher and intermediate levels would be a relatively easy task if it were possible to consider these independently of variations in other factors. For example, one could envisage extrapolating past trends of employment of the above-mentioned categories, the ratio of such personnel to total employment and their corresponding growth rates. Data on these aspects are, of course, an important ingredient in the forecasting process. However, it is generally admitted that simple extrapolations from these data, taking no account of new or changed circumstances that may modify existing trends in the future, do not provide a reliable picture of future requirements of technical personnel, especially in the developing countries. One reason is that a major objective in these countries is to step up development, and this involves breaking away with past trends; moreover, data about the past from which underlying trends could be derived are frequently unavailable.

26. An alternative "simple" approach could consist of assuming that a given rate of increase of the stock of technical personnel with a view, e.g., to doubling its size over a certain period would be consistent with broad social objectives. This method has the advantage of not depending on the availability of information about past trends, but the decisions made may very well be arbitrary. It takes no account of the factors known to influence the demand for technical personnel and, consequently, the assumed targets may be too low - in which case economic development could be slowed down; or they may be too high. In the latter alternative, there is little doubt that the additional trained personnel could be absorbed in the economy, having regard to the elasticity of demand under different conditions of supply.[3/] However, the effort involved in training the higher number of technical personnel which would have to be supported from available resources, might well conflict with other demands and with the need for optimizing the use of resources.

3/ While a saturation point could conceivably be reached, it seems very unlikely that in the developing countries, which suffer from a severe shortage of technical personnel, this could happen within the 15-20 year period which would normally be taken into account for educational planning. Any surpluses would be more likely to result from the inadequacies of market mechanisms, including the wage structure.

27. Consequently, close attention has been given in recent years to defining the relationships connecting the demand for technical personnel with economic growth and, more particularly, with industrial development. Various approaches have been explored to this end. In this connexion, an attempt has been made to determine the factors which influence the demand for technical personnel and to measure their impact. Special attention has not only been paid to changes in the volume of industrial employment, in its distribution by sectors, and in productivity, but also to the development of a forecasting methodology based on the use of this information. Theoretically, the analytical or disaggregated approach, the practical application of which is considered in section (a) below, can be carried into considerable detail, especially as regards the extent to which industrial employment is broken down into sectors and sub-sectors. In practice, however, it meets with two main difficulties: the unavailability or inadequacy, particularly in developing countries, of data on which the estimates would need to be based; and the fact that in the present state of knowledge, the impact of the factors analysed can in any event not be measured with precision, resulting in the higher degree of variation in the observations.

28. The use of more aggregative techniques has therefore been considered with a view to avoiding some of these difficulties. Broadly, two main approaches can be mentioned. The "manpower" approach relates changes in the demand for technical personnel to changes in employment and productivity. The "indicators" approach utilizes a number of indicators of educational and training development (including the density of technical personnel) in comparison with indicators of economic growth. These approaches are described in section (b) below.

29. The approaches discussed in sections (a) and (b) are of assistance in defining the underlying trends in the development of the demand for technical personnel and are therefore particularly suitable for the preparation of long-term forecasts. Various factors, however, may cause fluctuations around the basic trends (e.g., business cycle). Moreover, more detailed information is required on short-term than on long-term needs. Section (c) examines certain methods for obtaining this detailed information and for measuring the impact of certain factors which may operate in the short run.

(a) Disaggregated Manpower Requirements Approach

30. It is generally recognized that a chain of relationships connects production with educational and training requirements. More specifically, the industrial composition of output or output mix influences the industrial structure of employment, which in turn, affects the occupational composition of employment (since different industries have different occupational patterns). Finally, there is a relationship between occupations and the qualifications (in particular education and training) of workers in them. It should be noted that since output in turn depends on the availability of workers with the required educational and training qualifications, the chain of relationships is circular and all variables are interdependent.

31. The disaggregated manpower requirements approach, as the name implies, takes into account sectoral variations in the proportions of technical personnel employed. This method can only be applied, if information is available on the sectoral distribution of output (or employment) and on the ratios of technical personnel to employment in each sector.

32. If the relationships between output mix, employment, occupations and educational and training requirements were clear and well-defined, it would be possible to relate output directly to occupations or to educational and training qualifications. On this basis, an input-output table could be built, cross-classifying occupations by industry, and the matrix of input coefficients would show inputs of labour of different categories per unit of production. Basically, such a table would consist of the usual table of inter-industrial relations, but the row showing labour inputs would be split up on the basis of the occupational or educational characteristics of those inputs. Such an approach has all the weakness of a usual input-output model: it assumes constant input-output relations and does not allow for choice between alternative skill mixes in individual lines of production. Although these weaknesses can be remedied to some extent,[4/] it remains that the approach, although interesting

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4/ The input-output model can be expanded to a linear programming model and its extension pursued in two ways. First, different skill mixes for similar production activities can be introduced as possible alternatives, allowing for choice on the basis of optimality of skill composition (having regard to the current skill structure of the labour force). Secondly, skill-producing activities can be introduced in the model on the same basis as the activities concerned with physical production. This introduced the possibility of choice between skill-producing and goods-producing activities and forms a typical example of an approach that tries to integrate the problem of physical and

in theory, can hardly be applied today. The inadequacy of available data is a basic obstacle especially in the developing countries. But the main difficulty stems from the loose nature of the relationships between output mix and employment, between employment and occupations, and between occupations and education and training characteristics. These relationships vary both from country to country and over time. This makes it necessary to look at each link in the chain of relationships in the light of the best available knowledge in each country concerned and of international comparisons to supplement national data.

33. The first link is the forecasting of the industrial distribution of employment. This has sometimes been estimated directly, without reference to production, on the basis of an extrapolation of past trends.5/ Another method starts from the supply side, i.e. population forecasts. These can be used as a basis for deriving successively the labour force, the civilian labour force and the civilian employment (some assumption being made about the future volume of unemployment, both open and disguised). Civilian employment can be further broken down on the basis of past trends in the distribution of employment.6/ Both these methods, because of their reliance on data about the past, may be difficult to apply in the developing countries. Moreover, in the case of the latter method some doubts may be raised as to the logical sequence of a procedure which derives sectoral demand from aggregative manpower supply data through assuming an unemployment rate. Although measuring the manpower supply forms an essential part of any manpower forecast, it seems more appropriate to calculate demand and supply separately and to check supply against demand at the end of the forecasting process. Therefore, whenever possible, it would seem best to derive manpower demand directly from production.

34. This has in fact been done in most recent manpower forecasting studies, which have based their estimates of future employment by sectors directly on production

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5/ S. Doös, "Long-Term Employment Forecasting. Some Problems with Special Reference to Current Organization and Methods in Sweden", Employment Forecasting, OECD, 1963.

6/ See U. S. Department of State, Agency for International Development, The Forecasting of Manpower Requirements, Washington, 1963 (chapter III); UNESCO, Regional Advisory Team for Educational Planning in Asia, Long-Term Projections for Education in India, New Delhi, 1963 (ron.), pp. 25 and ff.; and IBRD, The Economic Development of Venezuela, John Hopkins Press, 1961.

targets. Basically, three kinds of data are required: planned output by sectors, the present relationship between production and employment in the various sectors, and the prospects in each sector for raising productivity through investment in new plant or equipment or by other methods.7/

35. In studying the relationship between production and employment in each branch of activity, an important distinction should be made between the traditional and the modern sectors, since patterns of manpower utilization in the two sectors are often quite different. (Incidentally, this affects not only the numbers employed per unit of production, but the occupational distribution of employment and educational and training requirements.)

36. A convenient method for drawing the line between the "traditional" and the "modern" sectors in industry is to include in the latter only plants employing more than a certain number of workers (say twenty or fifty) or using more than a certain amount of horsepower, with the "traditional" sector comprising all smaller undertakings as well as self-employed persons engaged in various handicrafts.

37. At this point, there is sometimes a tendency to leave aside the traditional sector and to concentrate attention solely on the manpower requirements of the modern sector. Often, however, there is scope for increasing production and productivity in small-scale industries (which under the above definition are included in the traditional sector), inter alia, through better training of the management, technical personnel and workers in those industries. This points to the need for including attention to small-scale industry when estimating future manpower demand.

38. Once the industrial structure of employment has been determined, the next step consists of deriving estimates of requirements for technical personnel. Here again, various approaches have been used. The simplest is to take the current ratio of technical personnel to employment in individual sectors, to assume that it

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7/ See studies initiated by the OECD in the Mediterranean countries of Europe. As an example of recent manpower forecasting studies undertaken by a developing country, reference is made to a research project of the Institute of National Planning in the United Arab Republic on manpower forecasting and educational planning. Under this programme, a number of surveys were undertaken and final results have been presented in Manpower Requirements for the United Arab Republic for the period 1960-1985, memorandum No. 431 (26 May 1964), edited by Dr. Mostafa Hamdy.

will remain constant, and to derive future requirements by applying this ratio to future sectoral employment. However, the assumption that the ratio will remain constant is open to doubt. Another method is based on the analysis of the occupational structure of employment in a sample of leading firms, and on the assumption that the structure for each sector as a whole will tend to approximate in future that found today in these representative firms. This approach appears rather promising. However, it relies on assumptions being made about the probable speed of change and adaptation of existing firms. Moreover, particularly in the developing countries where the promotion of small-scale industries is emphasized, a distinction should be made on the basis of scale of enterprises, since the structure of employment in large-scale and small-scale firms often differs substantially.

39. Changes in the ratio of technical personnel (or of one category, e.g. engineers) to sectoral employment can also be forecast by relating the ratio to certain variables, e.g. productivity, scale of enterprises, etc. One of the difficulties about using such ratios and making assumptions about the changes that may take place in them over time is the inadequacy of data. There is uncertainty regarding the extent to which the ratios are to be raised during the period considered. Consequently attention has been given recently to the possibility of using ratios from other countries (or the growth rates of such ratios) as a point of comparison in setting growth targets for national ratios. This should, however, be done with caution. Although available data show some striking correlations in the ranking of the ratios according to sectors in industrialized and developing countries, they also reveal important variations in the size of the ratios for given industrial sectors in different countries.8/ These divergencies are due to some extent to differences in the scale of enterprises, in technology and in the availability of personnel of the categories considered. But an equally important cause of variation appears to stem from differences in the industrial composition of the sectors considered and in the extent to which research and development activities are included. This points to two conclusions: in the first place, close attention should be paid to the activities actually covered by ratios relating to broad industrial sectors; secondly, however, the reliability of the

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8/ See annex A, table No. 1.A.2.

"ratio" approach appears to increase when the ratios are more closely related to well-defined types of production.[9] This seems to indicate that further research in this area, as well as analysis of the causes of variation between national ratios, could provide useful information with a view to helping the developing countries estimate their future technical personnel requirements.

40. Estimates of requirements for individual technical occupations still need to be translated into estimates of education and training requirements, expressed in terms of the duration and types of education and training required.[10] This task should, of course, be carried out in close consultation and co-operation with the educational and training authorities and with due regard to the structure of the educational and training system and to the types of facilities available in the country concerned.

41. Here, certain difficulties arise, because most occupations are not homogeneous as regards the educational and training qualifications of people in them. Some are significantly less homogeneous (e.g. management) than others (e.g. engineers or doctors). Differences in training background relate not only to the type of training but also to its level. The occupations of engineers and scientists usually include a proportion of people whose level of education and training is somewhat below the "norm" for the occupations concerned but whose experience or other qualifications are considered to make up for the difference.[11]

42. In translating occupational requirements into educational and training requirements, account should be taken of these "equivalents" and of their training backgrounds. Another aspect relates to their suitability and to the desirability or otherwise reducing their proportion.

43. Clearly, the greater the diversity of training backgrounds of people in a given occupation, the more difficult it is to draw from the existing patterns any

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9/ See annex D for an elaboration of this topic, with reference to the cement, fertilizer and iron and steel industries.

10/ An additional aspect relates to the methods of acquiring qualifications, e.g in institutions, organized apprenticeship, on-the-job training, etc. This, however, raises questions of policy which can best be dealt with by the educational and training authorities.

11/ See annex B to this chapter, part three.

firm conclusions regarding the specific training requirements for that occupation. The present composition of occupations according to the educational and training qualifications of persons in them is an illustration of the flexibility of manpower demand and is strongly influenced by the composition of the supply. In other words, it does not shed much light on what would be a desirable composition of future supply. Perhaps because of these difficulties, some studies have concentrated attention on the proportion in total employment of certain educational and training groups (especially high-level groups), without reference to the occupations in which the people concerned were employed. This approach is based on the assumption that the present level of employment of persons of different educational and training groups corresponds broadly to the absorption capacity of the economy, if not to the ideal requirements of specific occupations. Thus, the operations involved in analysing successively the occupational structure of employment and the educational and training backgrounds of people in different occupations, only to reaggregate these data as a basis for estimating future educational and training requirements, are considered largely superfluous.

44. While this is a plausible approach, it overlooks completely the problem of the relationship between education (and training) and occupations. It would, for example, be useful to know something about the range of occupations in which people with a specific educational or training background are engaged, and about the proportion of "equivalents" in specific occupations. Although such information can be obtained independently, there seems to be an advantage in seeking it within the framework of the forecasting exercise.

(b) Aggregative approaches

45. The main attraction of the disaggregated manpower requirements approach, described above, is that it attempts to measure variations in the demand for technical personnel that are due to changes in the industrial composition of output (and consequently, of employment). However, the longer the period, the broader and more aggregative must be the terms in which targets of economic and social development are expressed (for the very long term these perhaps can only be specified in terms of "production" or "consumption"). Use of a sectoral approach becomes impossible under these circumstances and the specification of

educational and training requirements will become broader and more aggregative. One may distinguish two main types of the aggregative approach, the "aggregative manpower requirements approach" and the "indicators approach".

(i) Aggregative manpower requirements approach

46. This is not basically different from the disaggregated manpower requirements approach, except that ratios of technical personnel are not computed for each industrial sector, but for industry or even for the economy as a whole. The omission of this "sectoral" step makes the calculations much simpler, because it greatly reduces the number of variables to be considered, but it also means that the effects on the ratios of possible future changes in the industrial structure of employment are not taken into account directly. This can however be remedied; for example, allowance can be made for a shift in the distribution of employment between less skill-intensive and more skill-intensive activities. Thus, according to a United States study, 40 per cent of the changes in the ratio of engineers and scientists to the industrial labour force in that country can be attributed to shifts in the employment structure.[12/] Changes in the ratios of technical personnel can also be related to expected changes in productivity. Thus, a Swedish study analysed the relationship between the ratio of engineers to employment and labour productivity, found this relationship to be close and used it to forecast the long-term demand for engineers.[13/]

47. If a forecasting model is used, the introduction of such additional explanatory variables does not raise special difficulties since the total number of variables is per se much smaller than in a disaggregated model and remains, therefore, very manageable. The limited number of variables allows for refinement in other respects, e.g. by introducing time lags and splitting up the forecast period in successive phases.

12/ National Bureau of Economic Research, The Demand and Supply of Scientific Personnel, by D.M. Blank and J.G. Stigler, New York, 1957.

13/ Universitet och Högskolor I. 1960 - Talets Samhälle, "Statens Offentliga Utredningar 1959:45", Stockholm, 1959, p. 50 and following.

(ii) "Indicators" approaches

48. These approaches differ from those previously described in that they omit the intermediate steps of forecasting employment and occupations, and attempt to derive educational and training targets directly from economic and social targets. They are highly aggregative and provide only a rough guide to the planning of education and training. Their advantage is that they are based on relationships derived from data that are usually available in developing countries.

49. One such approach is termed the education-output approach, because it relates broad educational categories to levels of national output.[14/] While it provides broad indications, more specific planning with this method would require research into methods of disaggregating and analysing educational and output data and into the underlying relationships between educational requirements and output targets.

50. It is also possible to use indicators of educational and training development in comparison with other indicators of economic growth, e.g. national income, its growth rate, income per capita or per unit of the labour force, public expenditure as a percentage of national income, the growth of investment (which has the advantage of taking into account the rate of both technical change and expansion of the sectors concerned). These and other indicators can be related to the stocks and outputs of educated personnel in broad categories. Again, such a method provides only a rough planning guide and research would be required to determine the extent to which disaggregation into requirements for individual industries would be possible, and into the underlying relationships between the indicators.

51. All the methods described above have advantages and drawbacks. Whenever possible the results obtained by these methods should be cross-checked against each other, to provide guidelines within which close estimates may be sought.

(c) Estimates of Current and Short-Term Requirements

52. The methods and approaches discussed above are most suitable for determining long-term trends in the manpower demand for technical personnel. In addition,

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14/ See "Quantitative Adaptation of Education to Accelerated Growth", by J. Tinbergen, Planning Education for Economic and Social Development, OECD, 1963.

special efforts should be made to assess current and short-term requirements. First, as already pointed out, such information needs to be more detailed than data on long-term demand. Second, current bottle-necks in supply, which need to be overcome rapidly, may imply different orders of priorities in training programmes for the short term and for the long term. Finally, factors such as fluctuations in the business cycle may cause variations in demand which, though they do not modify the long-term trend, should if possible be determined in advance.

53. Current shortages may be visible (e.g. unfilled vacancies registered at employment offices, or posts filled by expatriates because of the lack of nationals with suitable qualifications). These can be identified easily. Or they may be concealed, e.g. employers may be conscious of them, yet not take steps to advertise their needs since they feel this would not bring any results; or, even though the demand has adjusted to the supply apparently without causing friction, the level at which such balance is achieved may result in low productivity and poor quality of goods produced.

54. One way of ascertaining current shortages is to determine by means of establishment inquiries, the number of unfilled vacancies or inadequately filled jobs. An alternative method is to estimate concealed demand by applying staffing patterns prevailing in other countries or in representative firms within the same country.

55. These methods have their limitations for which allowance must be made, even though no substitute methods can be suggested. Employers, when interviewed, often tend to overstate the required standards of qualification for a given occupation, and do not always seem aware of the increased remuneration which should go with higher qualifications. The difficulties in the use of ratios from other countries have already been discussed. And staffing patterns from so-called representative firms do not (as a rule) closely reflect the current needs of the industry as a whole.

56. Short- and medium-run fluctuations of manpower demand around the long-term trend find their origin chiefly in general movements of employment and population. As far as employment is concerned, such fluctuations appear to be due mainly to cyclical or accidental causes. Cyclical fluctuations are largely absent on the

population side[15] (which influences not only the labour supply, but the total level of demand for goods and services and, consequently, the labour demand), but accidental events may be of great importance, a relevant example being the post-war baby boom in Europe.

57. How can the impact of such developments on the demand and supply of particular categories of manpower be measured so as to adjust the trend data? It seems that the influence of accidental events can only be dealt with separately, through ad hoc measurements. There is still little experience in accounting for cyclical movements in employment, but reference can be made to the Netherlands, where this is done by using appropriate mathematical models.[16] Alternatively, one may simply adjust the trend having regard to the expected movement of the business cycle during a period of one to three years ahead. This movement can be determined on the basis of business interviews and/or analysis of business cycle indicators.

III. FUTURE REQUIREMENTS OF SCIENTIFIC AND TECHNICAL PERSONNEL IN THE DEVELOPING COUNTRIES

58. For the purposes of the present report, an attempt will be made to assess the training requirements for technical and scientific personnel of the higher and intermediate levels for the period 1960-1975 in the developing countries of Africa, Asia and Latin America. The estimates are based on the aggregative manpower requirements approach. As indicated above, such a method can provide, at best, only a rough planning guide. Moreover, the estimates have been determined under certain broad and hypothetical assumptions which are subject to review. Thus, it should be noted that the estimates of requirements are provided for illustrative purposes only.

15/ Some cyclical fluctuations in labour supply, such as changes in female labour force participation rates, appear to be largely in response to changes in labour demand.

16/ "Employment Forecasting Techniques in the Netherlands", by P. de Wolff, Employment Forecasting, op. cit., pp. 90-91.

59. The following table gives an estimate, based on available data,[17] of industrial employment in 1960 in Africa,[18] Asia[19] and Latin America,[20] and of its share in total employment.

TABLE 1.1

Estimated Industrial Employment by Main Regions, 1960

Regions	Total Industrial Employment (millions)	Ratio of Industrial Employment to Labour Force (in %)
Africa	4.5	5.1
Asia	33	5.0
Latin America	10	14.7
Total:	47.5	

60. A number of developing countries have drawn up plans showing at what rates they expect employment in the industrial sector to expand during the plan period. These rates vary significantly for a number of reasons, of which an important one relates to the present size of the industrial sector in the economy. It is easier to double this size over a given period if the industrial sector is very small than if it employs already a significant proportion of the labour force. However, in looking at the targets set in development plans, and assuming that planned growth rates can be maintained until 1975, it seems possible to define, for each region, reasonable maximum and minimum cumulative rates of growth of industrial employment.

17/ The estimates in the present section are based on United Nations Statistical Yearbook, ILO Yearbook of Labour Statistics, as well as national census data and data or estimates found in the development plans of some countries. They include only salaried employees and wage earners and exclude employers, workers on own account and family workers, who usually include a large proportion employed in handicrafts rather than in modern industry.

18/ For the purposes of this section, Africa includes all African countries, except the Union of South Africa, where the structure of the labour force differs substantially from that of other African countries.

19/ Includes all Asian countries, including those of the Near and Middle East, but excludes the Asian Republics of the USSR, Israel and Japan, where the structure of the labour force differs from that of other Asian countries.

20/ Includes all independent countries of South and Central America and the Caribbean Islands.

61. Thus it seems likely that in Africa the rate would be neither higher than 3.9 per cent per annum[21] nor lower than 2.3 per cent.[22] In Asia it would range between a maximum of 6.8 per cent[23] and a minimum of 4.6 per cent[24] and in Latin America between 5.0 per cent[25] and 4.4 per cent.[26] For the purposes of the present paper average rates of 5.7 per cent for Asia, 3.1 per cent for Africa and 4.7 per cent for Latin America have been retained; and table 2 presents estimates of industrial employment by main regions for 1975, based on these average rates.

TABLE 1.2

Estimated Industrial Employment by Main Regions, 1975

Regions	Assumed growth rate	Total Industrial Employment (millions)	Ratio, Industrial Employment to Labour Force (in %)
Africa	3.1	7.1	6.3
Asia	5.7	75.8	8.5
Latin America	4.7	19.9	19.0
Total:		102.8	

21/ Weighted average of rates found in development plans of Morocco, Tunisia and the United Arab Republic (5.6 per cent) and assumed rate of growth of 3 per cent for the rest of Africa.

22/ Weighted average based on growth rate of 4.5 per cent for North Africa and the United Arab Republic (eliminating higher growth rates forecast in Morocco and Tunisia) and assumed growth rate of 1 per cent for the rest of Africa. The latter low average growth rate takes account of difficulties encountered recently by several African countries in maintaining past levels of industrial employment.

23/ Weighted average of programmed growth rates in ten Asian countries.

24/ Weighted average of planned growth rates in eight Asian countries (leaving aside some countries where targets appear to have been set very high).

25/ Weighted average of programmed growth rates in seven Latin American countries.

26/ Weighted average of programmed growth rates, leaving aside some countries where targets appear to have been set very high.

6.2. Indications regarding the present proportion of engineers and scientists[27] in the industrial labour force are available for a few countries at the most in each region.[28] This makes it difficult to determine what this proportion may be for each region as a whole. However, on the basis of available data it seems possible to present both a conservative and a more optimistic estimate of that proportion. Estimates range between 0.20 and 0.40 per cent in Africa, 0.18 and 0.30 per cent in Asia and 0.30 and 0.60 per cent in Latin America. For the purposes of this report ratios representing an average between the higher and the lower estimate for each region have been assumed. These are presented in table 5 which also gives the absolute number of engineers and scientists in each region as of 1960, as determined by applying these average ratios to the figures in table 1 concerning total industrial employment.

TABLE 1.5

Estimated Number and Proportion of Engineers and Scientists to Industrial Employment by Main Regions, 1960

Regions	Ratio, engineers and scientists to total industrial employment (in %)	Absolute numbers (thousands)
Africa	0.30	15
Asia	0.27	90
Latin America	0.45	45
	Total:	147

[27] Includes architects, engineers and surveyors (minor group 0-0 of International Standard Classification of Occupations; chemists, physicists, geologists and other physical scientists (minor group 0-1); biologists, veterinarians, agronomists and related scientists (minor group 0-2). In a few instances, available data refer only to engineers. There are, however, indications that in developing countries engineers represent the bulk of the engineers' and scientists' group. Variations that may result from different definitions should therefore remain well within the range of variations indicated in this paragraph.

[28] The countries for which data or indications are available include Congo (Leopoldville), the Federation of Rhodesia and Nyasaland, Tunisia, United Arab Republic, Uganda, China (Taiwan), India, North Korea, Argentina, Brazil, Chile, Venezuela.

63. New requirements for engineers and scientists over the period 1960 to 1975 may be expected to result from four main causes: (1) the expansion of industrial employment; (2) the need to raise the proportion of engineers and scientists in total industrial employment above its present levels; (3) in Africa in particular, the need to replace expatriates, who at present form a substantial proportion of the total number of engineers employed by Africans; (4) normal replacement needs. The expansion of industrial employment has already been discussed. Available data suggest that Africanization is likely to affect some 75 per cent of the engineers and scientists at present employed in Africa.[29] As regards the growth of the ratio of engineers and scientists to the industrial labour force, it appears that the most appropriate method would be to determine reasonable maximum and minimum growth rates. The ratio cannot be expected to grow at a higher rate than 5 per cent per annum. This is close to the highest growth rates observed in the United States and Sweden, in both cases over five-year periods.[30] Such a cumulative growth rate over a 15-year period would involve more than a doubling of the ratio of engineers and scientists to the industrial labour force which, coupled with an expected substantial increase in the industrial labour force (see table 1.2), would involve about a fourfold increase of the existing stock of engineers and scientists. On the other hand, some increase in the ratio of engineers and scientists to industrial employment is probably to be expected, to take account of technological change in existing industries and of the growth of new industries employing a larger proportion of technical personnel than the existing ones. Thus, it has appeared reasonable to set the "low" growth rate, at 1 per cent per annum. In table 1.4 an average cumulative growth rate of 3 per cent has been assumed.

64. Normal replacement rates resulting from retirement, death, permanent illness or transfer to other occupations are difficult to estimate in the absence of

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29/ The proportion of African engineers and scientists out of the total number of engineers and scientists employed appears to be negligible in Africa south of the Sahara. For the countries of North Africa and the United Arab Republic the relationship of African to foreign personnel was determined for individual countries on the basis of available statistics; the number of African engineers and scientists in these countries represents 25 per cent of the total number of engineers and scientists in Africa.

30/ See annex B, table 1.B.3.

information on the present age structure of the engineers' and scientists' group or on the extent to which they remain employed as engineers or scientists throughout their working lives. There are reasons to believe that most of the existing stock of engineers and scientists are relatively young, so that replacement needs resulting from retirement, death or permanent illness could be expected to be very low, at least during the 1960-1975 period. The replacement rate has been set at 2 per cent of the existing stock per annum. This is assumed to make sufficient allowance also for the (presumably very low) replacement requirements affecting the future stock to be trained during the 1960-1975 period.[51/]

TABLE 1.4

Additional Number of Engineers and Scientists to be Trained by 1975 by Main Regions
(in thousands)

Regions	Ratio of engineers and scientists to industrial employment (in %)		Total engineers and scientists required by 1975	Net Increment	Attrition	Replacement of existing stock	Total engineers and scientists to be trained
	1960	Target 1975					
Africa	0.30	0.47	55	20	10	1	31
Asia	0.27	0.42	313	229		27	256
Latin America	0.45	0.70	150	94		13	107
Total:			400	343	10	41	394

51/ This replacement rate, which is applied also in the case of technicians in Table 1.5, corresponds to "normal" replacement needs, i.e. it does not take into account the problem, known to be acute in many developing countries, resulting from the fact that a substantial proportion of people who have completed technical studies do not go into, or stay in, the technical occupations for which they have been trained.

65. The number of technicians[32] required can be determined by applying a ratio representing the proportion of technicians to be employed for every engineer or scientist in industry. In industrialized countries there is considerable variation in this ratio, which at recent dates was, for example, 0.7 in Belgium and the United States, 2.5 in the USSR, 3.3 in the Federal Republic of Germany, 3.8 in the Netherlands and 4.3 in Sweden.[33] It would seem that a high ratio of technicians to engineers and scientists approximating that found in Sweden, would have much to commend itself in developing countries in view of the relatively lesser cost and shorter time required to train technicians than engineers or scientists and of the substitutability which is known to exist between technicians and engineers in particular.[34] However, current ratios of technicians to engineers and scientists are rather low at the present time in most developing countries and as a result the attainment of a ratio as high as that prevailing in Sweden may be an unrealistic training target to be achieved during what is, after all, a relatively short period. The determination of the most suitable ratio is certainly a matter that would require closer examination with a view to setting the scope of technician training programmes, but for the purpose of this paper it will be assumed that this ratio should be an average between the highest and the lowest of the above-mentioned ratios. On this basis, table 1.5 presents an estimate of total training requirements for technicians (excluding normal replacement needs).

TABLE 1.5

Additional Number of Technicians to be Trained by 1975 by Main Regions
(In thousands)

Regions	Estimated requirements 1975	Estimated technicians (excl. expatriates) 1960	Replacement of existing technicians	Total technicians to be trained by 1975
Africa	93	14	4	73
Asia	705	233	70	632
Latin America	347	86	26	287
Total:	1,325	333	100	992

32/ Includes draughtsmen and science and engineering technicians as defined in minor group 0-X of International Standard Classification of Occupations.

33/ The exact definitions of the groups covered in the ratios vary somewhat from country to country and will be found in annex B, table 1.B.4.

34/ See annex B, paras. 7-12.

66. The above calculations seem to indicate that total training requirements by 1975 may be in the order of 394,000 for engineers and scientists and 992,000 for technicians, in order to meet the needs created by industrialization (and Africanization in Africa). The limitations of these estimates must, however, be stressed. There is, of course, the fact that little is known of the future course of certain factors likely to influence future requirements for engineers and scientists and for technicians, e.g. the greater or lesser emphasis placed in future development plans on industries employing larger proportions of technical personnel than those suggested in the tables, the extent to which the proportion of engineers, and scientists to industrial employment, or of technicians to engineers, may be affected by technological change or by other causes, etc. But the main limitation of the estimates results from the inadequacy of the data on which they are based. Rough assumptions, based partly on the scant data available and partly on judgement, have been made regarding the range within which existing ratios or the growth rate of such ratios, were likely to be confined. For the lack of better information, a decision was made to select, for each calculation a ratio or growth rate - representing an average between the "higher" and "lower" hypotheses put forward. However, these average ratios and growth rates are necessarily rather arbitrary and this affects the value of the end results regarding total training requirements for engineers and scientists and for technicians. It could be argued that in view of all these uncertainties, it would have been better not to present estimates representing an average between various hypotheses, but to show the full range within which the estimates might vary, depending on whether "high" or "low" assumptions were retained. Thus, it appears that if the "high" assumptions had been used systematically in the successive calculations in tables 1.1 to 1.5,[35/] total training requirements would have been assessed at 843,000 for engineers and scientists and 4 million for technicians, i.e., respectively 2.1 and 4.0 times

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35/ The higher estimates are based throughout on the higher ratios and growth rates presented in the text. The lower estimates are based on the lower ratios and growth rates, except in the case of technicians; the ratio of 0.7 technician per engineer and scientist (as in Belgium and the United States) is lower than the average ratio currently prevailing in developing countries and its use would have yielded a figure representing a decrease in the stock of technicians in 1975 as compared with 1960. This was considered unrealistic and a ratio of 2.5 corresponding both to the average ratio used in the calculations and to the ratio found in the USSR was used.

higher than those presented in tables 1.4 and 1.5. On the other hand, the use of "low assumptions would have yielded 169,000 engineers and scientists and 309,000 technicians, i.e., respectively 2.3 and 3.2 times lower than those in the tables. In other words, depending on which of the admittedly rough - but reasonable - assumptions presented are used, estimates of the training requirements for engineers and scientists appear to vary by a factor of about 5 and those for technicians by a factor of approximately 13.

67. For the purposes of the present report it was thought preferable to present average estimates rather than the widely divergent estimates produced by the use of high and low ratios. It must be remembered, however, that in the present state of knowledge a plausible case could probably be made for any estimate within the wide range just indicated. This shows the difficulty of arriving at any realistic estimate of training requirements for industrialization in the developing countries, and the need for improving data on the current situation, future prospects and desirable targets to be attained both as regards the proportion of engineers and scientists in the industrial labour force and the technician/engineer-scientist ratio.

68. In spite of all these reservations, the figures presented here are significant in that they show the tremendous task involved in training the new engineers, scientists and technicians required. Clearly, this will require, in addition to the mobilization of all resources that can reasonably be made available in the developing countries for this purpose, a major effort on the part of the international community in order to help these countries in overcoming the technical and financial difficulties that such a large-scale training programme would raise.

IV. REQUIREMENTS AND RECOMMENDATIONS

(a) Information Requirements

69. Much progress has been made recently in defining various approaches to the determination of the requirements of technical personnel resulting from industrialization. However, much still remains to be done to improve the basic information that is needed in order to make these estimates, and to obtain a closer insight into the specific impact of various factors on technical personnel requirements and into the broad interrelations between educational and training development and economic and social development.

70. In the developing countries, the chief need is for more adequate data on the labour force, its distribution by branches of economic activity and specific industrial sectors, the proportions in key occupational categories (e.g. engineers, scientists, management, technicians, as well as other categories needed for the planning and implementation of industrialization programmes). Information on the age and sex distribution of the labour force, on its geographic distribution and on mobility trends is equally essential. The structure of wages and salaries and other incentives should be examined when considering the causes of current imbalances in the supply and demand of trained and educated personnel. Finally, data should be obtained on the educational and training characteristics of workers, particularly in key occupations, and the output of the educational and training system should be measured from the standpoint of its adequacy to meet the quantitative and qualitative needs of industrialization.

71. Censuses and labour force sample surveys provide much of the information required on the labour force. However, economic analyses will also need to be conducted industry by industry with a view to obtaining the detailed information required in order to relate requirements for technical personnel of the higher and intermediate levels to specific types of production, technologies used, scale of undertakings, etc. For this purpose, establishment inquiries are an indispensable tool. Their use is of a three-fold nature. In the first place, they are an indispensable complement of the census through providing information for the inter-census period on the structure of the labour force (its size and distribution

over the different activities, occupational and educational characteristics, etc.) and the changes thereof over time. Such information is essential to long-term forecasting, since it represents the basic data to be used as a starting point. Moreover, establishment inquiries are a convenient tool for gathering information because of the ease with which questions about particular problems can be incorporated in them, and because their limited scale means that their results can be processed rapidly. In addition, through such surveys information can be obtained about the views and expectations of management with regard to future manpower demand. Although such information is not usually reliable for the medium and long term, it can provide useful indications about short-term prospects.

(b) Recommendations for Developing Countries

72. Governments should set up systems for the periodic review, preferably annually, of the requirements of personnel for industrialization. The results of this review should be integrated into the over-all long-term planning for human resource development. In particular, since educational plans involve long periods of time for their execution a system of rolling adjustment should be envisaged in order that education and training plans are not over-rigid but adjusted to changing circumstances.

73. Within the limits of available resources countries should endeavour to train economists and statisticians with a good knowledge of manpower and educational questions, and set up their planning organization units specializing in the analysis and forecasting of the patterns of training and education required for the process of industrialization.

74. Steps should be taken to collect more adequate educational, occupational and industrial data and to conduct economic analyses industry by industry for the purpose of determining higher and intermediate-level personnel requirements and for improving the statistical basis for the formation of forecasts, projections and targets.

(c) Recommendations for International Organizations

75. The international agencies concerned should pursue:

(1) The study of methodologies appropriate to the forecasting of the requirements of personnel for industrialization in countries at different

levels of development. Inter-country comparisons of patterns of growth should be established, as far as possible based on past experience and what is known as regards future trends of the use of different types of skill and knowledge for industrial purposes.

(ii) The improvement, and development at the international level, of tools and techniques needed for work in this field, including research for the development of an international educational and training classification system; for the improvement of quantitative indicators of, and techniques of analysis for, human resource development; for the determination of relationships between educational and occupational categories and between occupational structure and employment in given industrial sectors; and for the identification, definition and standardization of data necessary to be collected from countries, and internationally, for this purpose.

(iii) Measures to aid countries by technical assistance and other means in the training of people to undertake the necessary national surveys, in the analysis of the results, and in the study of trends relating to the demand for higher and intermediate-level personnel and educational and training qualifications. Arrangements should be made for the international dissemination of the necessary knowledge and techniques through seminars and clearing arrangements for information and publications.

CHAPTER 2

AVAILABLE FACILITIES IN DEVELOPING COUNTRIES FOR THE EDUCATION AND TRAINING OF TECHNICAL PERSONNEL

I. INTRODUCTION

76. This chapter is concerned with existing facilities in developing countries for technical education and vocational training in the light of the requirements for technical personnel for industrial development. It must be emphasized, however, that considerable difficulty has been encountered in endeavouring to establish a comprehensive picture of existing training facilities even for a limited number of developing countries owing to a number of factors.[1/]

77. An over-all but unavoidably incomplete picture, as far as facilities within the educational system are concerned, is given in the various volumes of the UNESCO publication World Survey of Education.[2/] It is not possible, however, in such a publication to cover qualitative, as well as quantitative, aspects. It is also not possible, for reasons of space, to include all quantitative details - such as number of schools, their location, workshops and laboratory facilities, machines and other equipment. Global enrolment figures, even if available, do not permit an answer to the question of adequacy.

78. Moreover, the World Survey does not cover the training facilities which exist outside the educational system and sufficient information is not available on these facilities to complete the picture even on the quantitative side. One of the reasons for this lack of information on facilities for training outside the educational system is the fact that there is frequently no arrangement within the countries for collecting and analysing information from enterprises and other bodies which give or organize training outside the educational system. The task, in any case, is not an easy one since training in plants is very often organized on an ad hoc basis and is not always continuous.

1/ In preparing this chapter, consideration was given to obtaining information through the questionnaire to the Governments. Owing to lack of time, this method was not pursued. Moreover, the information could not have been obtained on training outside the established educational system.

2/ Published periodically by UNESCO.

79. An additional problem encountered is the fact that no internationally recognized classification of types of school and training institution exists which would have permitted the collation and comparison of information on an international basis. Some work has already been done towards the establishment of such a system, the classification being based on the length of the course offered by the school or training institution. Account is also taken of the length of prior education or training required. The work has not yet progressed far enough, however, to allow adequate international comparisons to be made, even if the necessary information were available.3/ Moreover, even when detailed quantitative data are available it is very difficult to evaluate the quantity of the education and training provided and yet this is the core of the problem.

80. Although information is available as far as technical education and vocational training are concerned on the number of hours of instruction and length of courses, this information alone does not give an account of the benefit derived from instruction. The number of hours alone is no creterion of either the quality of quality of the work done in the course, but it can be taken as an indication of the time that the student is in contact with his teacher, and as such can possibly be regarded as a measure of the facilities available for dissemination and absorbing of knowledge by direct contact. It is quite clear that in those countries where early specialization takes place, the number of hours devoted to formal teaching are generally much greater than in some other countries where there is less specialization. Also it is evident from the details of the various curricula supplied that the proportion of the total time devoted to laboratory and/or drawing-office work varies considerably between the countries, and in some cases between the different branches of engineering.

81. On paper at least some countries would seem to possess adequate facilities to meet the requirements of their expanding industries, but these very countries make great efforts to improve the quality of technical education and vocational training.

3/ The UNESCO recommendation concerning technical and vocational education refers to the desirability of promoting the systematic application of international norms relating to one or other field of technical education, such as systems of units and scientific symbols.

In other countries enormous efforts have been made during the past years to increase the number of technical schools but without a concomitant effort to maintain or improve the quality of education they provide. Other countries have established or developed facilities for training in enterprises, in an effort to provide the trained manpower they require, but the necessary close co-ordination with existing facilities has not always been arranged.

82. In addition, the data available on the various categories and levels of skills required are often not sufficiently comprehensive. Over-all estimates need to be given by branch of industry, geographical location and, if possible, by occupation if plans for the creation of schools and training facilities are to be realistic. As the case study on the forest industry in Chile (Annex A to this Chapter, Part three) shows, it is necessary to make a more detailed investigation to reach a reliable estimate.[4/]

83. In spite of the fact that it has proved to be impracticable within the limits of this study, to present a comprehensive picture of the adequacy of existing facilities as a whole, the survey of available data has confirmed that, in many developing countries the existing facilities are patently insufficient to meet the needs of large-scale industrial development. While the situation is better in some countries, it is not yet satisfactory and much remains to be done in order to assist the process of industrialization. In the following paragraphs, an attempt has been made to identify certain patterns and to arrive at conclusions applicable to developing countries in general

II. INFORMATION ON EXISTING FACILITIES

84. The developing countries have in recent years made enormous efforts to establish, reorganize or expand their systems of technical education and vocational training. Some of them have already made fairly exhaustive reviews of these systems and others are well on the way to implementing the action which the reviews have shown to be necessary. Frequently this work has been carried out with the aid of international agencies or of other countries.

4/ See also Annex D to Chapter 1 in Part Three of this report.

85. The criteria by which systems of technical education and vocational training should be assessed are set out in two international instruments adopted in 1962 by UNESCO and ILO. These instruments are the recommendation concerning technical and vocational education and the recommendation concerning vocational training which were adopted respectively by the General Conference of UNESCO at its twelfth session and the General Conference of the International Labour Organisation at its forty-sixth session.5/

86. Attention has been drawn in earlier paragraphs to the inadequacy of quantitative information on existing technical education and vocational training facilities. If developing countries are to have a comprehensive picture of the existing facilities of all kinds and plan for future development of these facilities, they need some means of collecting and analysing the appropriate information on training, wherever given. In addition, as a by-product of such collection of data and provided a recognized classification of facilities is followed, it will also be possible to make international comparisons which will help countries to evaluate their efforts by reference to general practice.

87. The available information includes data relating to several developing countries on: the number of vocational training institutions by type - second level - (Table 2.B.1); enrolment in vocational secondary education and ratios to total secondary enrolment (Table 2.B.2); similar ratios as above by students' age groups (Table 2.B.3); secondary vocational enrolment per/1,000 total population (Table 2.B.4); students/teachers ratios at the vocational second level (Table 2.B.5); facilities for skilled workers, mainly outside the educational system/(Table 2.B.6); enrolment in third level education and ratios to the country total population (Table 2.B.7); number of engineering degrees or diplomas granted in universities or technological institutes (Table 2.B.8).6/ As mentioned before, these are not sufficient for an answer to the question of adequacy. Moreover, the survey showed that data concerning size of school buildings, workshop and laboratory space are not in general available.

5/ ILO, resolution concerning Vocational Training and Technical Education, Official Bulletin, volume XLV, No. 3, July 1962, and UNESCO International Recommendation on Technical Education, UNESCO/ED/183, Paris, 31 October 1961, and UNESCO/ED/183/Add.1, 1962.

6/ See Annex B to this Chapter contained in Part three.

88. Data contained in the tables mentioned above are not intended to convey norms. They show that in most of the developing countries secondary technical education has been in the past and still is in many cases insignificant by comparison with general secondary education. In countries where the increase of vocational education is substantial this is largely due to an extensive development of commercial education with which this report is not concerned.

89. A study of the rate of increase of technical secondary schools by comparison with that of the general secondary schools showed that no general trend was discernible. In some countries technical and vocational education in full-time schools has grown much faster than general secondary education, in others the reverse trend could be observed. In the Philippines for example, the increase in enrolment in technical schools for the period 1957-1960 was 79.5 per cent, whereas enrolment in general secondary education increased by only 6.1 per cent. In Pakistan the increase in both branches of education was approximately 12 per cent for the same period, and in Brazil the situation is characterized by the following table.

Table 2.1

Brazil: Full-time secondary

Year	General Secondary		Technical	
	No. of Schools	Enrolment	No. of Schools	Enrolment
1949	1,766	360,271	...	15,086
1951	2,190	405,049	421	17,013
1956	2,746	619,019	402	17,504
1958	3,308	761,740	426	19,835
1961	4,015	960,489	419	30,759

Source: UNESCO World Survey, Vol. IV and UNESCO Statistical Yearbook, 1963.

90. Thus the total number of technical schools has not grown since 1949 and the ratio of students in technical schools to those in general secondary schools has decreased from approximately 1 : 24 to 1 : 31. But these figures do not take into

account the significant development of SENAI which consists of a mixed system of training at schools and at enterprises under the sponsorship of education and national federations of industry.7/

III. ORGANIZATION AND ADMINISTRATION

91. It is appropriate that responsibility for technical education and training is vested in different ministries, where each is responsible for training in clearly defined major sectors of the economy. It is necessary that their areas of technical competence and responsibility be clearly defined, whether they be separate ministries, departments within a ministry, or provincial authorities, to avoid duplication of effort and waste of scant resources.

92. In-service training often takes place without proper control of standards and performance; individual responsible ministries should take steps to rectify this. Other forms of training are carried on by a variety of authorities without co-ordination of action as a whole. Nor is there always the necessary close link between the authorities responsible for technical education and vocational training and those responsible for, among other things, economic planning, manpower policy and the employment situation. In addition, there is frequently no provision for the necessary collaboration with and by industry itself. Internal administration is often rendered cumbersome by complex procedures. Where simple rules of administration and in particular sufficient delegation of responsibilities are observed there are few problems.

93. In some case, school budgets are not fixed before the financial year begins, so that for the first few months no expenditure is possible. Although this former case may be rare, it does frequently happen that even when budgets are fixed and approved, the director or administrator of the school cannot incur expenditures for individual items without reference to other authorities. Schools, therefore, often resort to production work to make a little extra money for their budgets. Though the practical experience gained by the pupils may be useful - if the work done is of a level of complexity appropriate to the stage of their progress - the

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7/ See Annex B to Chapter 3 contained in Part three this report.

amount of time that must be spent for such productive work to be financially rewarding is out of proportion to the pedagogical benefits obtained by such methods.

94. In addition the cumbersome nature of financial administration often leads to undesirable delays in paying teachers' salaries. The consequence is that teachers will try to find other jobs alongside their teaching - a very familiar phenomenon in many of the developing countries. While there can be no objection in principle to part-time teaching, it must not be on a scale that is detrimental to effective instruction and education.

95. In many cases, the authorities responsible for technical education and vocational training do not yet have the means to set standards of performance and achievement and to control their application. As far as the schools are concerned, this problem may be partially solved by the establishment or approval at a national level of curricula, and in some cases even of syllabi, when national examinations are set. But this is not always done and for vocational training outside school the problem of setting appropriate standards and controlling adherence to them is, in many countries, acute. Systems of inspection both for the schools and all the various forms of vocational training are frequently inadequate or, in the case of training outside the educational system, may not exist. Where inspection services do function their activities frequently do not include the complementary and very important function of providing the necessary guidance and advice to those organizing or giving training. Even if the function is envisaged the necessary trained staff, reference material and documentation are not always available.

IV. TEACHERS AND INSTRUCTORS

96. There is an acute shortage of well-trained , competent teachers and this shortage is probably the greatest obstacle the developing countries have to overcome. Their number needs to be increased substantially. There is, in many countries, too much part-time teaching in schools and training institutions and many teachers and instructors are not sufficiently well-qualified for their work.

97. Not all countries provide training for teaching staff and the courses which do exist for them are not always fully comprehensive.[8/] Sometimes, for instance, they cover only teaching techniques, sufficient account not being taken of the almost certain need for further theoretical and technical training. Frequently persons who give training in enterprises are not given any training for this special kind of work. These are examples of common shortcomings observed with regard to teaching staff of all kinds.

98. A number of developing countries in recent years have, however, established special training establishments for teaching staff, frequently with the assistance of the United Nations Special Fund. EPTA projects have also been devoted to the training of instructors in particular in the agricultural industries. In these countries, the situation has improved considerably as a result, but is not yet fully satisfactory. There remain, even in these countries, let alone the others, large numbers of inadequately trained teaching personnel. The problem is evidently more serious still in countries without such facilities at their disposal, either locally or abroad.

99. There is, in addition, clear evidence that some of the resources now being used for training technical teachers and instructors for schools and training institutions are not being used to the best effect. In many cases the best elements are not attracted and candidates without the desirable entrance qualifications often have to be accepted for training. In addition, there is considerable drop-out during the courses given for teaching staff and many of the persons who do complete their courses do not continue as teachers for any period of time. This situation is largely due to the inadequacy of the salaries and conditions of service offered to teaching staff in training institutions, by comparison with those which persons with equivalent qualifications are able to obtain in industry.

8/ Some indications regarding available facilities for instructor training mainly outside the educational system can be found in Annex B, Table 2.B.6, Part three of the report.

V. SYSTEMATIC TRAINING BY ENTERPRISES

100. A number of developing countries have, in recent years, established schemes for systematic training by enterprises and the quality of the active labour force has thereby been improved. In addition, such schemes have enabled young persons who could not afford to stay on at school or attend a training institution full-time to gain technical qualifications, for instance, through systematic apprenticeship. This training is mainly for workers but has also been used for training technicians in certain fields; as a general rule the in-plant training is supplemented by theoretical instruction given in a technical school.

101. The pattern of systematic training by enterprises is far from general, however, and it is obvious that insufficient use is being made of the potential reserve of technical manpower represented by those already in employment. Where the training does exist, moreover, it has very often not yet reached the desired standard. The new vocational training services established in recent years, particularly in Latin America, have however made a very considerable contribution to this end. This has been due largely to the setting and application of standards of training under their auspices, and to the organization of facilities for training teaching staff both for training institutions and for the enterprises.

VI. PRIMARY EDUCATION

102. The level of general education required before technical education can be effective is rising steadily. The study has shown that, in a large number of developing countries, it has not yet been possible to provide all the population with the general education they require as a basis for technical education and vocational training. Whereas in the industrialized countries general education is compulsory until the age of 14-16, that is for a period of eight to ten years if not more, most of the developing countries as yet are able to afford only six years. Moreover, the losses in primary schools are enormous and, in some countries, quite large numbers of children still do not go to school at all.

103. By comparison with the industrialized countries, pupils in similar educational institutes of the developing countries tend to begin pure vocational training, or specialization for particular skills, at a much earlier age. The results are

unsatisfactory, partly because the technical and vocational schools often have to make good the deficiencies of primary school instruction and partly because the pupils are not old or mature enough.

104. In addition, in spite of the strenuous and determined literacy campaigns organized in developing countries, quite considerable numbers of adult workers are semi- or completely illiterate. They require at least the elements of literacy, however, if they are to be enabled to learn a technical occupation and make better use of their inherent ability. An indication of the magnitude of the problem involved is given in the table which follows and which shows the percentage of illiterate adults in a number of developing countries at the dates indicated.[9/]

Table 7.2

Percentage of Illiterate Adults in Selected Countries

Country		Percentage
Bolivia	(1960)	60
Malaya	(1957)	49
India	(1961)	73.3
Iran	(1961)	80
Pakistan	(1961)	84.7
Philippines	(1957)	38
Sudan	(1960)	90

Source: UNESCO World Survey, Vol IV and UNESCO Statistical Yearbook, 1963.

VII. GUIDANCE

105. In many of the developing countries there is a decided tendency of students to seek employment in administrative or clerical work, although they may have been trained in a technical field. As a result the technical education and vocational training they have received are not used to the best advantage. Moreover, the

9/ UNESCO, World Campaign for Universal Literacy; document submitted to the Economic and Social Council, E/3771.

prestige attached to the traditional liberal studies such as law, literature and philosophy makes it very difficult for technical studies to attract the more gifted students. Ignorance of the possibilities and satisfaction to be derived from skill and competence as a craftsman or technician often prevents youths from engaging in a technical course. Moreover, their whole background is often alien to the attitudes valued in a technological society. Children in industrialized countries nowadays grow up with a considerable background of technical information; in the developing countries lack of such a background presents a serious handicap if children are to be interested in a technical career for which they may be well suited. The survey has shown that there is a serious lack, in many developing countries, of the necessary facilities for giving young persons information about the types of career which may be open to them and for providing them with the vocational guidance they should have before commencing training for their future occupation.

VIII. RECOMMENDATIONS

106. The following recommendations are suggested for future action in the light of the results of the study:

A. to Governments of Developing Countries

(a) to establish some means of collecting and analysing comprehensive information about existing technical education and vocational training facilities, as a basis for determining what further action may be necessary to develop these facilities in the light of manpower requirements;

(b) to arrange for the data available on the various categories of skills required for the purposes of accelerated industrialization to be broken down into the necessary detail, in particular by branch of industry, geographic location and occupation;

(c) to assess at regular intervals the adequacy of their existing facilities for technical education and vocational training in the light of the criteria set out in Chapter 3, with particular regard to the common shortcomings to which attention has been drawn in Chapter 2.

B. to the International Organizations

(a) to assist, as required, in the implementation of the above recommendations and particularly to aid Governments in assessing the adequacy of their technical education and vocational training systems;

(b) to collect, analyse and communicate to countries, information on the general and technical organization of technical education and vocational training, in both developing and already industrialized countries;

(c) to promote the exchange of information on technical education and vocational training as well as the comparative study of such information and, for this purpose, to pursue their efforts towards the establishment of a recognized classification of types of school and training institution.

CHAPTER 3

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

107. This Chapter is primarily concerned with training[1/] for industry, both large- and small-scale. Since training for small-scale industry has certain characteristics, further discussion of that subject is included in Annex A to this Chapter. The special aspects of training in management functions for higher administrative and managerial personnel are discussed in Section E of the Chapter. The preceding sections cover training for this category of personnel only in so far as training in technical, as distinct from functional, qualifications is concerned. The remarks on methods and systems contained in this Chapter refer to training for commerce and service industries which contribute to the growth of industry. The discussion on training for one sector, however, needs to be considered in the over-all context requirements of the economy and the training network of the country as a whole.

I. OBJECTIVES OF TRAINING

108. One important consideration with regard to technical education and vocational training is the need to maintain a balance of conflicting factors, such as vocational specialization on the one hand and the cultivation of broader interests on the other. The latter will be taken into account in considering the more specifically vocational aspects with which this Chapter is concerned.

109. Educators and economists need to have a clear grasp of the objectives of training, particularly in regard to vocational training, if the necessary arrangements are to be made for efficient and properly co-ordinated action concerning systems and methods of technical education and vocational training. These objectives of training emerge from the analysis of needs for trained manpower, as indicated in Chapter 1. For the purpose of determining the objectives

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1/ In this Chapter, "training" covers all forms of preparation for employment within the framework of industrialization and includes, among other things, technical education, vocational training and management training.

of training, however, it is necessary to break down the data on manpower needs still further to ascertain the exact levels of qualification and the content at which training should aim for these levels.

110. As regards the levels of qualification, the distinction is usually made between three main categories of technical personnel: skilled workers, technicians 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:

(i) semi-skilled workers, whose short-term training involves the acquisition of specialized manual skills and limited background knowledge;

(ii) skilled workers, who receive a broader range of practical training and the scientific and technological knowledge required for the occupations involved;

(iii) foremen and supervisors, who have been trained and employed as skilled workers, who require further training of a functional nature covering such aspects as organization of work and human relations and who may also require further technical training and/or general education;

(iv) assistant technicians who, after being trained as skilled workers or the equivalent, have received additional technical training lasting two or three years; such training covers mathematics, scientific and technological knowledge, experience in research and technical operations and in the preparation and supervision of work and production, including the use of appropriate apparatus and instruments;

(v) technicians, who have received full secondary education and specialized technical education lasting one to two years and emphasizing construction and drawing skills;

(vi) engineers, who have received full secondary education emphasizing mathematics and the sciences and who have received three to six years of higher technical education in a technical institute or at the university level.

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

(i) 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 machines and instruments;

(ii) the acquisition and development of manipulative and practical skills appropriate to the level of training required;

(iii) the adaptation of trainees to the conditions of work in enterprises;

(iv) 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 practised.

112. The training objectives naturally need to be considered within the framework of the basic over-all objectives of a national training policy. Such a policy must provide for young persons, and adults who so desire, to have the means of acquiring the knowledge and skills which are indispensable for practising an occupation. This means that it is essential to establish diversified training facilities which, in addition to providing training of the content and for the levels required in employment, will be accessible and available to all throughout working life. It is usually necessary, therefore, for these facilities to cover the initial training of young persons; the training of unskilled adults to qualify them for employment; the further training of persons already in employment, either to improve their qualifications for the work on which they are engaged or with a view to promotion; and the retraining or conversion training of adult workers for a new occupation, when the change is necessary or desirable for economic, technical or personal reasons.

113. It is clear that the general objectives of training mentioned above have not been achieved in many developing countries. It is also not possible to achieve all the objectives since they represent the ultimate goal of a training policy and can only be realized progressively. It is equally evident that progress in realizing these objectives is dependent on factors such as development of educational sectors (other than technical education) the present structure of industry, the rate of growth of the economy and industrialization and the evolution of production techniques. Thus, it is necessary to take into account not only the needs but also the position in the other economic and educational sectors concerned in establishing priorities for achieving these objectives.

114. 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 to the evolving needs both of the economy and of the labour force.

115. In connexion with training for small-scale industry, it will for instance be necessary to take account of the need for this training to be linked with an over-all programme for the development of the small-scale industry sector. Small firms are in particular need of regular guidance and counselling in the technological, economic and social spheres. The training schemes should therefore be supported by a scheme of industrial extension service adapted to the needs of the industry concerned, with a view to ensuring, among other things, an appropriate place for small-scale industries alongside medium- and large-scale enterprises.

II. TRAINING SYSTEMS

116. The considerable diversity of training systems is due to the large number of factors which influence them. It is possible, however, to distinguish three main types of training systems for the purpose of analysing the characteristics of such systems and their effectiveness for a programme of industrialization:

(i) Systems of an institutional character, i.e. when training is given in institutions organized for the purpose. These institutions may exist both within the framework of the general system of education, in which case they give technical and vocational education which usually comes under Ministries of Education. The institutions may also exist outside this framework, in which case they are centres for basic or further training which may be established by the State, by employers' or workers' groups, or by other organizations;

(ii) Systems of in-plant training, in which training is given mainly in enterprises, possibly in premises apart from and including the shop floor; it includes apprenticeship and the further training of workers and cadres;

(iii) Combined Systems which combine training in an institution and training in an enterprise, and which take various forms.

(a) Institutional Systems

117. In most of the developing countries, schools for technical education and vocational training are an integral part of the general system of education and these are invariably patterned on the experience of the industrialized countries.

118. The variety of different schools is commensurate with that of the systems of education and it would seem that no amount of systematic presentation or the use of classification symbols at their present stage of development can sort the vast complexity of 200 school systems into neat comparable groups. Detailed discussion of existing types and comparisons is not possible at this stage. It is possible to refer to this in a general way only and the conclusions arrived at should be interpreted with caution.

119. The titles used for the schools are varied and often cover different things in different countries. The term, "Technical School" in some countries, for instance, embraces establishments providing commercial education, whilst in others it refers only to schools in which the mechanical and industrial arts or applied sciences are taught. However, in spite of this variety of names and the differences in length of courses, some basic pattern of school training can be discerned in most of the countries. First, these schools require the completion of primary education for entry - some even require an examination, but in general, selection does not seem to be rigid. Since the duration of primary education ranges from four years to eight years according to the country, the requirement that primary education be completed does not provide much information on the level of knowledge and skill attained. While the curricula of primary schools often do not contain vocational subjects, some primary schools whose curricula extend over a period of eight years do include handicrafts among the subjects taught in the last years. Sometimes the general education given in the primary schools is inadequate and has to be supplemented by the vocational and technical schools.

120. Most developing countries have vocational or trade schools which aim at training craftsmen and skilled workers. They may be called arts and crafts schools, artisan schools or vocational training centres. They are, in general, meant to give a terminal education and, when primary education is of limited duration, the vocational schools also provide a good measure of general education.

In Iran, for example, all pupils in the recently established Amouzeshgah schools which are meant to train skilled tradesmen, starting with boys who have completed six years of primary school, devote considerable time to general education. The completion certificate of the schools does not entitle the holder to continue his studies at a secondary school or a vocational secondary school. Since the course is normally three years' duration, boys complete their training in the school at about sixteen years of age, on the average.[2/]

121. Technical secondary schools constitute another general category. They 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.

122. 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. The first cycle may also be taken at a general secondary school - sometimes called a preparatory or middle school. In countries in which technical education is patterned on the North American system the first cycle would roughly correspond to junior high school and the second cycle to senior high school. In Mexico, for example, the second cycle is often given at a university.

123. In countries which have adopted the French system of technical education, one finds the lycée or collège technique, both of them leading to the baccalauréat technique. This type of course provides, in addition to practical work, a technical education which calls for higher intellectual ability and prepares for employment as a technician.

2/ Children enter primary school between 6 1/2 and 7 1/2 and in the early stages of the Amouzeshgah scheme have not necessarily entered an Amouzeshgah direct from primary school. The possibility of organizing the final stage of the course in an enterprise is under consideration.

124. The education provided in what may be broadly called the category of technical secondary schools has a strong component of general education, since it is meant to produce technicians, foremen and supervisors. On the other hand, there is a trend towards including technical and vocational subjects in the general secondary stream. This trend towards a broadening of the curriculum in both the technical and the general secondary schools is encouraged by the educators, though it may not be in keeping with the more narrowly vocational objectives based on purely economic grounds. It constitutes one of the main issues which should be taken into account in determining the educational and training policy to be followed.

125. Full-time technical and vocational schools exist in most of the developing countries and, in some cases, may even be the only training system in existence. While the schools described 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. This type of long-term education and training 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.

126. Technical and vocational education in developing countries frequently suffers, however, from a number of shortcomings. The main ones are:

(i) 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;

(ii) the considerable wastage during training, which considerably increases the cost per pupil trained;

(iii) the insufficient adaptation of the training to conditions of work in enterprises, as well as to the speed and quality required on the job;

(iv) the shortage of personnel and incompleteness of equipment, since the funds available are not always adequate for the needs of technical institutions; and

(v) the inadequate qualifications of teaching staff, particularly workshop instructors.

127. The system of technical and vocational education is essential in the framework of the general system of education. There is clear evidence, however, that in many developing countries it 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.

(b) Higher Technical Education

128. In higher technical education there is also a great variety of institutions with the result that it is difficult to compare the actual levels of the graduates without more extensive reference to the entrance requirements, to curricula and examination or graduation standards. Even then the similarities often exist only on paper, because of differences in methods of teaching and in laboratory and workshop equipment.

129. It is important to note, however, that in matters of internal administration, the universities and colleges are usually autonomous and this autonomy often also covers all educational aspects, such as programmes of study, selection of subject matter, teaching methods and organization of classes and laboratory work. The autonomous universities also have the right to confer degrees, though often when these degrees are recognized by law, the relevant government authority has some influence on the course of study - if only by having to approve the curricula.

130. As a result governmental action to develop or improve the system of higher technical education is less direct than in the case of schools at secondary level. Governments can and do, of course, create their own technological research institutes but the facilities for the training of engineers in such institutes are usually limited to a few cases of post-graduate study and research.

131. Governmental action to develop the system of higher technical education thus usually takes the form of creating and endowing new facilities. International assistance through the despatch of teachers and instructors, by the provision of equipment and the allocation of fellowships is most important in this field.

132. As is the case for the technical secondary schools there is strong criticism of the products of present higher technical education in many of the developing countries. It is that the young engineers have too much theoretical knowledge and too little practical experience for them to be able to apply this knowledge in industrial enterprises. Proposals have therefore been made in Annex D to this chapter to organize in-plant training courses for young engineers or engineering students. These courses would be different from the pericds of

practical work in industry that form a manual prerequisite for most of the engineering degrees offered at technical universities or graduate schools. The courses are discussed briefly later in this chapter.

133. It is not yet possible to evaluate the effect of such programmes but it seems that an attempt should in any case be made to cure a recognized defect where it arises, i.e. in the institutions of higher technical education themselves.

134. Another form of institutional training is accelerated training in centres for adults. This system 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.

135. The system has been mainly used hitherto for training skilled workers[3/] 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.

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

(i) 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

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3/ The term "skilled worker" should be understood to mean that the persons trained in these centres are qualified to perform one job at the skilled level whereas persons who have received long-term training, for instance by apprenticeship or in a vocational school, have a broader range of skills and knowledge and may be considered qualified to perform several jobs at the skilled level. (Based on terminology used in Accelerated Vocational Training for Unskilled and Semi-Skilled Manpower, European Productivity Agency, Organisation for European Economic Co-operation, Paris 1960).

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;

(ii) 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;

(iii) 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 problem of unemployment.

137. 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. In principle, however, it does not seem reasonable to make the national budget finance programmes at this level of training, in view of their relative benefit to the employers concerned. It is possible, however, for accelerated training at semi-skilled level to represent a stage towards the training of skilled workers and to form part of the system of training for that purpose. In such a case the observation just made would not apply.

138. It would seem of particular interest, for developing countries, to mention the organization of accelerated training centres[4/] for technician training. This

4/ The courses often provide for the training in the centres to be supplemented by a period of in-plant training and experience.

is a relatively new development which has occurred mainly in France and Italy. Centres of this kind make it possible to secure for key posts in industry young people from general secondary education who cannot find employment unless they have some technical qualifications and who would otherwise not be able to secure the necessary training. The centres also make it possible to apply at this level of qualification the accelerated training methods which have proved their value in the training of skilled workers. By this means industry can be provided more rapidly with the intermediate level cadres of which it is in such need.

139. Centres for basic and further training organized by groups of employers or workers are very varied in type and meet particular needs. The most interesting initiatives, as far as industrializing countries are concerned, appear to be those which have been taken either by industrial sectors or by groups of enterprises in order to supplement the state's general training effort, with a view to reducing the bottlenecks due to shortages of trained manpower.

140. 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 or 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.

141. The Italian Institute for Industrial Reconstruction (IRI) which operates a large number of enterprises and has established its own system for training senior technicians, has recently taken an interesting initiative with a view to overcoming shortages. Realizing that it would require 1,200 engineers for the period 1964-1967 and that the national system of technical education would only be able to provide 400 to 500 of these engineers, IRI decided to give young technicians who had just gained their diplomas further technical training and to change the internal structure of its labour force in such a way that these new entrants would make up for the shortage of engineers.

142. Similar problems exist in other countries and, in France, the Inter-Enterprise Centre in Paris gives further training to technicians from more than 100 enterprises in the region. Initiatives of this kind 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.

In-plant Training[5/]

143. The oldest and most classical system of in-plant training is apprenticeship; that is systematic long-term training for a recognized occupation taking place substantially within an enterprise. This system has the advantage of increasing rapidly the possibilities for training, particularly of skilled workers, without requiring large-scale expenditure on premises or material or the recruitment and training of teachers. Because of this some industrializing countries are tempted to establish apprenticeship legislation which obliges enterprises to train a fixed minimum number of apprentices. Experience has, however, shown that, if apprenticeship legislation does not contain very specific safeguards and if conditions are not favourable for this form of training, the legislation is likely to lead directly to the exploitation of young people who are virtually obliged to become apprentices without having the assurance that they will receive the requisite training in acceptable conditions; the exploitation in such cases varies in gravity according to the country's degree of economic and administrative development.

144. A number of requirements need to be met if conditions within enterprises are to be favourable for the development of efficient apprenticeship. The first requirement is for the general working and safety conditions to be satisfactory. Secondly, enterprises must be so organized that it is possible to teach there the basic elements of the occupation. Finally, the supervisors or skilled workers responsible for training apprentices require to have the necessary technical and pedagogical competence. In developing countries enterprises in the traditional industries often do not provide the necessary favourable conditions for apprenticeship in accordance with these criteria and it would seem desirable for apprenticeship legislation to provide for the necessary safeguards on this point.

145. Other safeguard provisions in apprenticeship legislation should cover such aspects as:

(i) the determination of apprenticeable occupations and the duration of apprenticeship for them. These occupations need to be recognized occupations, not just parts of occupations, and of a level corresponding to that of skilled worker or, if appropriate, of a higher level (for instance in the training of technicians by apprenticeship).

In the United States of America only occupations which involve at least 4,000 hours (2 years) of practical work as well as theoretical instruction are considered apprenticeable:

(ii) the obligation to provide related theoretical instruction, without which there is no real training. This obligation naturally involves the existence or establishment of appropriate facilities for theoretical instruction, either in the enterprise or in an establishment for vocational or technical education. Where the apprentice attends such theoretical courses outside his enterprise the legislation should provide for him to do so during working hours without loss of pay;

(iii) adequate safeguards for apprentices both from the technical and social points of view. These safeguards should include, for instance, the existence of a central apprenticeship service to be responsible, among other things, for acting as apprentices' public guardian. In this capacity it would give support to apprentices' parents and, if necessary, take over full responsibility for apprentices from parents who were not looking after them satisfactorily. The service should also be responsible for receiving, listing and keeping apprenticeship contracts up-to-date and for settling any conflicts between the parties to apprenticeship. Other safeguards should include participation in apprenticeship by bodies representative of the various occupations. This participation might be arranged through tripartite committees set up for each sector and consisting of representatives of government, employers and workers. The safeguards should also include adequate provision for vocational training technicians to

supervise technically the preparation and implementation of apprenticeship programmes, and the organization of annual or half-yearly examinations covering both the practical and the theoretical training.

146. The best method of organizing apprenticeship in developing countries is certainly to arrange for legislation to be sufficiently flexible for it to be applied progressively as industry develops and the technical and social conditions indicated above are improved. If this is not done, abrupt and generalized application of apprenticeship legislation is likely to lead to a situation in which it is impossible for the facts to conform with the law.

147. In-Plant training for skilled workers including apprenticeship 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 chamical 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.

148. As is the case with apprenticeship, 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.

149. In-plant training programmes are being rapidly developed at the present time in highly industrialized countries. A recent report by the OECD on techniques of evaluating the training of cadres[6/] drew attention to:

(i) the considerable increase in numbers trained;

(ii) the integration of training services in the enterprise, which means that training is considered as a permanent and generalized function of the enterprise;

(iii) the very definite increase in the funds expended on training by enterprises; and

(iv) the large number of private training bodies which offer their services to enterprises.

150. 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 Trukey.

Combined Systems of Training

151. 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.

6/ Evaluation of supervisory and management training methods, Organisation for Economic Co-operation and Development, OECD Publicaticns, Paris 1963.

152. Various ways of combining the two systems have been developed over many years. The UNESCO Recommendation concerning Technical and Vocational Education suggests that, when establishing institutions for such education, the competent authorities should consider the following main systems:

(i) full-time technical and vocational education, including practical training, provided in the school itself;

(ii) theoretical education provided by the school while part of the practical training is obtained by periods of work in the chosen occupation;

(iii) the day-release system providing for workers to attend school for one day a week;

(iv) the "sandwich" or "co-operative" system under which periods of school alternate with periods in a factory, farm or other undertaking;

(v) the block release system whereby employees are released by their employer to attend technical and vocational education courses for one or two short periods a year;

(vi) evening courses for persons in full-time employment;

(vii) correspondence courses;

(viii) refresher courses for persons who have already received vocational and technical education, or for those having practical experience in the occupation.7/

153. The ILO Vocational Training Recommendation, 1962, recommends that enterprises not in a position to furnish their trainees with all the theoretical and practical knowledge required for a particular occupation should as necessary:

(i) arrange for the deficiency to be made up in training institutions on the basis of one or more of the following: day release, release for periods of several weeks at a time every year, alternating substantial periods of training within the undertaking with substantial periods of study in the training institution, and other suitable training arrangements in accordance with national regulations;

7/ See para. 129 above.

(ii) establish and operate joint training schemes involving the use of their several facilities or the establishment of a common training centre.[8/]

154. 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.

155. 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 been able, for instance, to organize 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.

156. 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. The Act on strengthening the links between school and life to provide for further development of the system of national education was adopted by the Supreme Soviet in December 1958.

157. 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:

(i) organizing training facilities for young persons who could not attend vocational schools and who were to start or had already started work;

8/ See para. 119 above.

(ii) introducing programmes of combined training involving successive periods of training in a school and in an enterprise;

(iii) obliging employers to accept the pupils as apprentices throughout their training and to pay them as such during this period;

(iv) 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.

158. 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).[9] The apprenticeship service in Argentina,[10] 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).

159. These bodies have been mainly concerned hitherto with the initial training of skilled workers. Several of them, however, particularly SENAI in Brazil and SENA 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 desirable to consider in greater detail the principles governing these new training services, the way in which

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9/ There is also a National Commercial Apprenticeship Service (SENAC).

10/ This service has since been incorporated in the National Committee for Technical Education (CONET).

they operate and the results obtained by the combined forms of training which they have organized.[11/]

III. TRAINING STANDARDS AND METHODS

160. The training standards and methods are reviewed in this section within the framework, among other things, of the three over-all categories of technical personnel. Occupational safety and health are of importance for all categories of personnel. Neglect of these will have serious repercussions on personnel and also, in the long run, on the industry itself.

(a) Occupational Safety and Health

161. It is evident that personnel at all levels need to be aware of the hazards which may exist in connexion with their work and to be familiar with the necessary safety and health precautions. In consequence training in occupational health and safety needs to be included in all technical education and vocational training programmes for both initial and further training. In order for this instruction to be effective it should be linked with both theory and practical work. It is particularly important that the instruction should be given to management and supervisors and in general to all those who assume responsibility for other people in industry. These responsible cadres and other personnel should subsequently be enabled to arrange, within the enterprises, for the necessary training and information to be given to the workers themselves on a continuing basis and to ensure that the safety and health standards laid down are observed.

162. This direct training of industrial personnel in safety and health should be supplemented by the special training of doctors and allied personnel in this field and the establishment wherever possible of occupational health services. By this means an important contribution can be made towards adapting the work and the conditions in which it is carried out to local manpower in the light of their physiological and psychological needs.

163. A further contribution can be made by government officials and particularly by members of the labour inspectorate. In addition to their work of checking

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11/ A more detailed description of the systems introduced in Latin America is given in Annex B to this Chapter, entitled, "A new system of apprenticeship in Latin America."

whether regulations are observed, labour inspectors have an important advisory role in the field of occupational safety and health. It is therefore important that they should be well informed and competent in this field and receive the necessary training for this purpose. Some countries, however, have difficulty in recruiting technical cadres rapidly for labour inspection. In such cases a doctor qualified in industrial health and occupational medicine is often in a position to act as expert, technician and adviser to the inspectorate or within its framework. This will help to ensure that human problems are not misunderstood or neglected during training for industrialization when the tendency may be to concentrate on problems of short-term productivity.

(b) Training of Workers

164. 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.

165. It would be therefore desirable for the competent authorities in collaboration with all other interested bodies, to take a number of steps in order to get over this difficulty. These steps include:

(i) determining the occupations for which national standards of qualification are considered necessary or desirable;

(ii) analysing these occupations with a view to the preparation of training programmes;

(iii) establishing such standards and programmes, on the basis of these analyses.

166. In developing 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 practised in the country in which the standards and programmes will be used. The importance of this question

is being increasingly recognized in developing countries, and action is being taken by some of them to establish standards and programmes consistent with their own circumstances and requirements.

167. A second major problem to be solved relates to the access of candidates to training and to their vocational guidance or selection. These questions are inter-related and are of particular importance in countries where training facilities and funds are limited.

168. The problem is then to obtain the maximum return from the existing training facilities' needs. This would mean:

(i) limiting access to the number for whom these facilities can provide adequate training, i.e. to the number for whom sufficient premises, equipment and teaching personnel are available;

(ii) within the limits of acceptable numbers, eliminating candidates who do not possess adequate ability and qualifications for the training concerned;

(iii) eliminating, during the course, the trainees who are clearly not capable of continuing the training to the end.

169. This is, of course, an exclusively economic and technical view of training. It cannot always be reconciled, at least on a short-term basis, with the principle that each member of the community should be entitled to vocational training in order that he may fulfil his full role in society; it will be for the countries themselves to decide on the action to be taken when the two aspects cannot be reconciled and a choice is necessary.

170. The situation is also complicated by the fact that, in many developing countries, very few complete the full course in comparison with the numbers at the beginning of training. This means that there is an excess, which is sometimes very considerable, at the stage of "access to training facilities" and a shortage during the final stages of training. In consequence the problem does not consist only of making a choice between free access to training or systematic limitation of the number of candidates but also of ensuring a reasonable balance between the numbers required by industry, the number of pupils and the number for whom adequate training facilities are available.

171. It is clear that a number of pupils in excess of the available facilities should not be admitted and that the essence of the choice is to decide between giving adequate training to an appropriate number of trainees and inadequate training for a greater number. While it is possible to accept temporarily slightly too many candidates than existing facilities warrant this should be done only in special circumstances since otherwise the risk will be too great that all the pupils, not only those additional to the normal complement, will be inadequately trained. If the number of suitable candidates desiring training, coupled with the employment which will be available, exceeds existing training places, then the only solution would appear to be to extend the training system accordingly.

172. Training for occupations which do not offer much prospect of employment in the near future should also be discouraged, as it will inevitably lead to considerable difficulties. Some countries consider training as a means of reducing the number of unemployed when there is general and under-employment and, from the social point of view, training can be very useful in such cases. The effort may however be largely wasted if an energetic employment policy is not introduced at the same time.12/

173. The problem is more complex as regards free access to training on the basis of candidates' suitability. In some forms of training, for instance accelerated training for adults, there can be no question of admitting unsuitable candidates and strict selection is therefore essential. If it is not practised the training will not be successful.

174. The position is however less rigid with regard to the long-term training of younger people. In developing countries there is often very considerable diversity of general education and basic knowledge among candidates for such training. While it is certainly reasonable to reject those who are not physically or intellectually suitable for the training programmes envisaged, it is less certain that those whose only shortcoming is inadequate general education should be rejected. In such cases it would seem desirable either to make special arrangements within the framework of technical and vocational education for the deficiency to be made up - for instance by means of special courses - or,

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12/ See paragraph 136 in this connexion.

alternatively, to make more general arrangements to prevent such deficiencies arising, for instance by establishing better co-ordination between general and technical education.

175. Consideration should be given only as a last resort to the radical elimination during a training course of pupils who are not up to standard and then only after everything possible has been done to obviate the necessity for such a step which, in itself, is an admission that the training facility in question is not being used to the best advantage. Action for this purpose would include adequate vocational guidance and selection before training commences with a view to ensuring that those admitted have the necessary ability and thus reducing wastage, on technical grounds, to the greatest extent possible.

176. Certain trainees may be obliged to drop out for financial reasons or family troubles, unless provision is made for financial or other help to be available in case of need. Even so there are likely to be pupils who cannot continue in a school or training centre. If steps can be taken to provide better links between the various training systems so that such pupils are enabled to continue their training while earning, then their participation in the course will not have been a waste, either for themselves or as regards the benefit which the community should receive from the training facility constituted by the course. Similarly, if there is close liaison between school and industry pupils obliged to leave school should be able to find employment without difficulty. In such situations the training will not have been a waste.

177. Another question which should be covered by standards is the duration of training, a question which might usefully be studied by countries in the process of industrialization. In doing so, they may wish to bear a number of points in mind. To begin with, institutional systems of training have been in existence for a long time and have frequently been little if at all changed during that period. It is quite possible that the various durations observed for different courses within these systems date back many years and are no longer valid today, in view of the changes which may have occurred in the content of the occupation and the improved pedagogical techniques and facilities which can be used. In the second place the duration, set in terms of the training programme involved, will naturally vary according to trainees' level of general education, the type

of training involved and the pedagogical facilities available - such as appropriate teaching staff, equipment and premises. Thirdly, it is sometimes the practice in countries at all stages of industrialization to maintain durations which are unnecessarily long. This occurs both in apprenticeship and in institutional training.

178. Standards need to be established to evaluate training and to organize examinations. It is generally agreed that examinations are an excellent means of checking training, whether given in a school or in an enterprise. The examinations need, however, to be based on nationally set training standards covering both the theory and the practical work of the occupations involved, if they are to serve their purpose of checking that training is satisfactory in terms of the objectives laid down. It may also be desirable to supplement traditional examinations with other evaluation methods such as school marks, tests, observations and questionnaires so as to obtain comprehensive results. If adequate means of evaluating training are not used, it is extremely difficult to ensure that training is adapted to the requirements of employment and to prevent young people who are being trained in enterprises from being exploited.

(c) Teaching Programmes and Methods

179. 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. International assistance has been given in this field to achieve progressively higher quality training.

180. 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 programmed instruction which makes use of appropriate machines.

181. 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 qualification 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.

182. 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 such as relevant renewal of equipment to meet current training needs, the training of teachers, and the acquisition of audio-visual material. This is evidence once again of the interdependence of the various elements of training systems. Language problems also have to be faced, since access to documentation is frequently made difficult by lack of knowledge of the languages used.

183. Expert assistance has been extensively utilized in dealing with problems, and in particular in improving training methods and programmes of education and training. This assistance, however, involves a risk. It tends to lead to the introduction of programmes which are employed in developed countries but which are not suitable to the needs of industrializing countries. For this reason, it is essential for teams of international experts to include specialists in methodology who are capable of making the necessary adaptations of programmes to local requirements, in addition to specialists in the techniques of particular occupations.

(d) Recruitment and Training of Teaching Staff[13/]

184. The seriousness of the problems with which developing countries are faced in connexion with the recruitment and training of teaching staff is generally recognized. These problems are particularly acute for workshop instructors and are due to the conditions of employment especially the salaries paid, which make it difficult to recruit personnel of the required quality. It is clear that these problems will become even more serious as industrialization develops more rapidly as the best instructors are likely to be attracted by the greatly increased opportunities in industrial employment. Problems also arise in regard

13/ The term is used here to cover both those who give training in training institutions and those who give it elsewhere, for instance, in the course of work.

to technical and pedagogical training for instructors and are due, in many countries, to the low level of general education, technical knowledge and industrial experience of candidates for posts as instructors. They are also due to the shortage of the necessary training facilities for them.

185. The qualifications required of teaching staff vary according to the level and type of training they are required to give. Teaching staff fall broadly into the following categories:

- teachers of practical work
- teachers of theoretical technical courses
- teachers of general subjects.

Teachers of general subjects should be trained at the normal pedagogical institutes or teacher training colleges.[14]

186. For teachers of theoretical technical subjects only a few specialized institutes exist. It is essential that in any programme of developing schools for technical education, in particular at the secondary level, provision will have to be made for specialized institutes. Entry requirements would correspond to the completion of secondary education, preferably in a technical school, but access from general secondary education should also be allowed. In that case additional periods of practical technical instruction would be necessary to bring the candidates up to the level of technical knowledge required. The practice of appointing as teachers of theoretical technical subjects students who have just completed their own courses in technical education, while understandable on the grounds of extreme scarcity of teachers, should not be allowed to continue. Such future teachers should, at the very least, be given a period of special instruction in pedagogical methods, the use of teaching aids, etc., at a specialized training institute for technical teachers.

187. Teachers of practical work are essentially workshop instructors. They carry out their duties both in training institutions and in enterprises. In addition to an adequate level of education and training for the occupation they teach they should have some years of practical experience in it so as to be familiar with the conditions in which it is practised in industry.

14/ See Chapter 3, para. 97.

188. At the present time, however, trainee workshop instructors in developing countries do not always have the requisite mastery of their occupation or practical experience in it and it is necessary to provide further technical training for them. It is probable that they will also need further general and technical education to ensure that their educational and technical background is adequate in the light of the level of training they will be required to give. Before commencing their instructional work they will need instruction in pedagogical techniques, a necessity which is frequently overlooked, particularly when the training is given within the enterprise.

189. A constant effort is, however, being made to organize a network of technical teacher and instructor training institutes in developing countries. In Asia, for instance, India is in the process of establishing with the help of the United Nations Special Fund six instructor training institutes. Pakistan is setting up two institutes and Cambodia one. Burma, Indonesia and Iran also have institutes of this type. In Latin America, and again with the help of the United Nations Special Fund, institutes or systems of instructor-training are being established in Chile, Colombia, Mexico, Peru, Uruguay and Venezuela. In Africa similar projects are foreseen or are in operation in such countries as Algeria, Congo (Leopoldville), United Arab Republic, Libya, Morocco, Nigeria, Senegal and Tunisia. Similar projects are also in progress in Europe and the Middle East.[15/]

190. The International Centre for Advanced Technical and Vocational Training which is being established at Turin by the ILO will be able to make a substantial contribution to the training of teaching staff. This Centre will commence operation in 1965 and it will be possible to organize on a large scale programmes of further training for instructors which will involve both pedagogical training and periods of practical application in industry, or in European training bodies. It will thus supplement the possibilities for further training for teaching personnel which are available on a regional or international basis with international or bilateral assistance.[16/]

15/ Brief descriptions of several schemes are given in Annex C "Examples of National Training Schemes for Instructors".

16/ See section VI below.

(e) Education and Training of Supervisors and Technicians

191. Most of what has been said in the previous section concerning access to facilities for technical education and vocational training applies also to personnel in the categories of supervisor and technician. However, at this level it is more difficult to define or delimit occupations as precisely as can be done in the case of skilled workers. Nor is it in many cases possible to lay down national norms and standards for technicians' occupations because the rapid development of technology brings with it considerable changes in functions and duties. It is therefore necessary to look a little more closely at the actual content of the courses.

192. In addition to the category of foremen and supervisors, two groups of technicians were referred to earlier, namely assistant technicians and technicians. The functions of the assistant technician frequently overlap with those of foremen and supervisors and will therefore not be separately discussed here. The combined group of foremen and supervisors/assistant technicians is, broadly speaking, constituted by those who, after completing a full training as a skilled worker and acquiring considerable practical experience in their craft, have followed a full or part-time course of supplementary education providing them with the necessary background of underlying theory and principles, as well as instruction in related subjects. Their duties usually involve supervising the work of skilled craftsmen. Amongst other functions, this comprises the planning, control and inspection of production in a given workshop or unit, working out the details of a task in the light of well-established practice, distributing work and personnel, ensuring the application of safety and labour legislation and dealing with personnel problems. Such duties require considerable experience and knowledge of skills, operations, administrative practice and human relations. In practice, this ideal will often not be immediately attainable in the developing countries; many will accede to such positions without having undergone formal supplementary courses. It would be advisable for this group 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. Adequate opportunity should be provided to skilled workers having the necessary initiative to make use of such

supplementary part-time courses. The immense desire to learn and to advance often found among young workers should be exploited by encouraging private study.

193. 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. In practice, the effectiveness of such supervision is often hampered by lack of personal authority. Such lack of authority is, however, not only due to insufficient knowledge. It can also be due to the fact that, in certain countries, the industrial supervisor who does not belong to a family which traditionally holds responsibility and authority in the social hierarchy may not be recognized by the workers under him as having the right to exercise authority in the industry hierarchy. In these and other countries, however, superior education and training are being increasingly recognized in their claim for leadership.

194. The group of technicians consists of persons who, having completed the first cycle of secondary education, and sometimes both, continue their studies at a full-time technical institute for training in techniques requiring more theoretical knowledge and understanding of scientific principles. They may also, after their secondary education, engage themselves as engineering apprentices or the equivalent in other branches and attain the same level by alternating periods of practical work and attendance at the technical institute or college. The duties of such technicians in the engineering field include the following: working on design and development of engineering plans and structures; erecting and commissioning of engineering equipment and structures; engineering drawing and detail constructions; estimating, inspecting and testing engineering construction equipment; use of surveying instruments; operating, maintaining and repairing engineering machinery, plant and engineering services and locating defects therein; laboratory work, testing of materials and components, sales engineering and advising customers.

195. The study course for this group would, in general, have to 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 speciality. The course also includes 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.[17] The entry requirements for such a course, of two or three years' duration, need to be quite rigorous.

196. Many of the industries in developing countries process agricultural products. The operation of such processing plants requires special skills. The duties of a milk plant operator or foreman, for example, include the following: operation of reception and processing equipment; maintenance of equipment in good working condition and supervision of its cleaning after the daily run; in regard to the raw material - in this case milk-supervision of the quality of incoming milk to be processed, and the milk or milk products to be distributed, through routine laboratory examinations; heat treatment of liquid milk to be packaged in bottles or cartons; manufacture of butter, various kinds of cheese, fermented milk products, etc.

197. The course of study for such a group of technicians would need to include biological and bacteriological subjects and an understanding of marketing principles, as well as many of the subjects outlined in paragraph 195.

(f) The Education and Training of Engineers

198. The training for the engineering technician mentioned above will apply in many respects, at least when curricula are compared, to the training actually provided - with the aim of producing graduate engineers - in many existing post secondary technical institutes in the developing countries. It must be emphasized however that, in general, the education and training of graduate engineers in the highly industrialized countries require a much longer and more exacting period of study, namely four to six years.

17/ The question of practical work in enterprises for student engineering technicians is discussed below, in para. 202.

199. Entry to such a course normally requires a level corresponding to a full secondary education with a predominance of mathematics and natural sciences. The ratio of theoretical to practical instruction will be much higher than for the engineering technicians. Moreover, although in the beginning of the course the subjects are similar to those of the engineering technicians' course mentioned in the preceding paragraphs, their treatment needs to be much more thorough with an emphasis on general principles and application of these principles to the most varied problems.

200. Furthermore, it is necessary for the curriculum of the graduate engineer to contain a great deal of individual and independent construction (engineering drawing) and research work. He is expected to be competent by virtue of his fundamental education and training to apply the scientific method and outlook to the analysis and solution of engineering problems and to be capable of closely following progress in his branch of engineering science by consulting newly published work, assimilating such information and applying it independently. This knowledge and competence can only be acquired by individual and direct experience. This means that the future graduate engineer must, as part of his education, have conceived, planned and drafted some piece of machinery or structure having predetermined characteristics. Alternatively, he must have investigated some engineering process in detail and suggested improvements in machinery or operation, as a part of the independent diploma or thesis work required at the end of a graduate engineering course.

201. Advanced technological research very often is not possible to undertake within the present financial or human resources of universities and technological institutes in the developing countries, particularly in subjects such as semiconductors, atomic reactors or electronics. This is also true in the case of fundamental research concerned with "unnatural" states of distance, speed, size, time, temperature and pressure, because it involves heavy expenditure on equipment and increasingly refined techniques are required to measure them. On the other hand, there are many subjects or problems which can only be investigated locally, in a given geographical region, where applied research and engineering science contribute to development. Surveys of natural resources, extraction, processing and utilization of local materials, exploitation of unconventional

energy sources, irrigation and hydraulics are obvious examples. Research, or at least an individual creative effort in engineering science, should therefore be an essential part of the training of top-level engineers in the developing countries.

(g) Practical work

202. Practical work, either before the study course or between terms or for one or two full terms during the course, is an essential complement of any graduate engineer's or engineering technician's education. There are several ways of arranging practical work periods. It will not be difficult to make them compulsory for both categories of students, because it should be easy to enlist the support of industry. The purpose of such practical work periods is not to supplement the instruction given at the university or technological institute, but to acquaint the future engineer or technician with practical work conditions and requirements. He evidently cannot be expected to rival an experienced worker in his particular skill but he should have first-hand acquaintance of manipulating tools and machinery and should have spent some time in the maintenance workshops and production sections of a factory.

IV. IN-PLANT TRAINING OF GRADUATE ENGINEERS IN THE DEVELOPING COUNTRIES

203. The above-mentioned considerations refer to training of engineers in the established educational system of the developing countries. While such efforts will assist in improving the quality of education, 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.

204. 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. As a contract, in-plant training programmes emphasize the development of abilities, that is the acquisition of skills and the exercise of judgement in concrete cases rather than the addition to technical knowledge. Another purpose is to make apparent the suitability of graduate engineers for particular occupations.[18/]

205. Since the in-plant training programme is designed to fill a gap in the first instance, each programme of training will have to be tailor-made for the

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18/ "The American industrial attitude regarding the education of engineers is very widely that of expecting the under-graduate engineering curriculum to provide a good basic scientific and technical foundation upon which the industry can provide the necessary development and understanding of problems peculiar to it after the student has entered the company employ. The expectation that an engineering graduate will be immediately productive is less prevalent today than it was two decades ago; in fact, it has largely disappeared." A Report on the Education and Training of Professional Engineers in the United States (Conference of Engineering Societies of Western Europe and the United States), Engineers' Council for Professional Development 1962, p.80. Also, see Yap Kie Han, "In-plant Training of Graduate Engineers". Industrialization and Productivity Bulletin No. 4, United Nations, New York, pp. 50-57.

situation. Whether it should form a permanent feature of the country's network is a question that needs to be explored further. This is a much more complex problem, in view of the fact that it involves basic policy questions on national education.19/

19/ For details of the in-plant training programme for engineers, see Annex D to this Chapter.

V. EDUCATION AND TRAINING OF HIGHER ADMINISTRATIVE AND MANAGERIAL PERSONNEL FOR PUBLIC AND PRIVATE INDUSTRY

A. TRAINING OF HIGHER ADMINISTRATIVE PERSONNEL IN THE GOVERNMENT ORGANIZATIONS

206. 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. As the discussion of the subject will indicate later, the subject of management of industrial enterprises was originated in the United States of America and later followed extensively in the West European countries. The subject in those countries has been approached primarily at the plant level. 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, 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 controlling the pace of development through systems of allocation of foreign exchange, raw materials, licencing, etc. The economic functions of the administrators in the governments have been increasing and any improvement in the services they provide to aid the industrialization process would be considerably desirable.

207. 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 the 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. In a recent survey carried out by the United Nations, certain gaps in training provided by the economic development institutes were ascertained. The consensus of opinion of those involved in the training of economic administrators was that courses in formulation, evaluation and implementation of industrial development projects should be provided in the existing economic development training institutions sponsored by the governments and the international organizations. This should be followed by evolving training programmes in industrial development for the economic administrators. Such training programmes could be introduced in the Planning and Development Institutes sponsored by the regional economic commissions of the United Nations and assisted by the Special Fund. The experience gained there could be further made available for use in similar training programmes.

208. 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.[20/]

B. EDUCATION AND TRAINING OF HIGHER ADMINISTRATIVE AND MANAGERIAL PERSONNEL FOR PUBLIC AND PRIVATE INDUSTRY

1. INTRODUCTION

209. The term, "higher administrative and managerial personnel for industry" here refers to the members of an enterprise who have responsibility for policy-making, planning, organizing, and directing important affairs of the enterprise. For

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20/ See Preparation of Teaching Materials in Economic and Industrial Development (E/C.5/54); document submitted to the Fourth Session of the Committee for Industrial Development of the Economic and Social Council.

example, in organizations employing a staff of several hundred, in which work is commonly performed by personnel at four levels, namely, workers, foremen or supervisors, department managers and senior or top management, the term includes primarily the last two levels. The term, "department manager" here includes managers whose administrative responsibilities consist of matters concerned with production, accounting, finance, marketing or personnel management. In small enterprises, particularly those which employ less than forty people, only the top managers would be likely to have the kind of responsibilities mentioned here.

(a) The Need for Management

210. The arbitrary definition of management is not intended to portray a systematic managerial structure. Its object is merely to identify the positions which carry a high degree of administrative responsibility, because the proper staffing of these positions is most important to the successful operation of an enterprise. Indeed their staffing, together with an understanding of the managerial functions which they involve, is now regarded as being of vital importance to the industrial development of any country. This fact has been recognized by industrially developed countries, mainly within the past two decades. It now emerges clearly in developing countries, especially with the growth of larger scale industry and expatriation of some managers. Nevertheless, the functions of management and the training of managers are themselves subjects which are not yet sufficiently developed throughout the world. However, the progress recently made in this field by many industrialized countries has major significance for industrial development anywhere. It is for this reason that a broad description of management training and development in industrialized countries is provided here. While the developing countries have to adapt facilities to their needs, experience shows that the basic process described may be considered as being generally applicable.

211. While the importance of general education and training is usually recognized, analysis of the need for particular types of education and training has often omitted important sectors. Even when shortages of trained manpower have been found to exist at all levels in developing countries, shortages of engineers and technicians have until recently received most attention, while shortages of management personnel seem to have received the least. But it is management

personnel, i.e. those responsible for planning, innovating, organizing, co-ordinating and directing who make resources such as skilled labour, technology and capital productive. This has been adequately expressed as follows:

> "Effective management can often make a weak project prosper, but the strongest project has little chance if it does not have adequate management. This is true in the most industrialized countries; it is equally true in the under-developed nations, where impediments to industrialization can be surmounted only by superior management. Yet, due to the very nature of the non-industrialized countries, the thing they lack even more than capital is experienced management." 21/

212. Failure to recognize the importance of management in developing countries can perhaps be attributed to past experience in industrialized countries where developments were more gradual and the supply of managerial talent tended to follow economic growth more naturally. However, even these countries, as this report will show, have recently had to make strenuous efforts to acquire the management personnel essential for extensive and complex economic growth.

(b) The Professional Manager

213. The need for management depends a great deal on the rate and scope of enterprise development for which it is required. The small family-owned firm, which may make only one product over a long period of time for a limited and known market, needs less highly trained management. In past years even industrialized countries could afford to let young men grow with an enterprise and slowly take places in managerial ranks. However, when the rate of industrial growth increases or when there is scope for increasing it, as in the developing countries, the rate of training must be accelerated. Larger enterprises, together with new and continual technological developments, require a higher level of qualifications in management.

214. Although small-scale family-owned and operated firms are still predominant in many developing countries, they do not usually meet the whole range of industrial needs. When a family firm grows to meet new circumstances, it cannot usually

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21/ Murray Bryce: Industrial Development, a Guide for Accelerated Economic Growth (McGraw-Hill, New York, 1960), p. 158.

provide enough family staff to keep pace with this growth. This difficulty, as well as the emergence of large public enterprises - increasingly common in developing countries - and larger multiple-owned private corporations, has brought into being the professional manager. This new type of manager, who is the administrative mainstay of public and private enterprise in industrialized countries, is himself an employee. He is professional in the sense that he has intellectual qualities and fairly universal skills which he uses to serve the enterprise - public or private. In countries with large sectors of public enterprise, the top managers are senior civil servants. The manager of an enterprise in a developing country generally has a more difficult task than his counterpart in a developed country. As a rule, the operation of industry in the more advanced countries takes for granted the existence of the so-called external economies, that is, of a complex of economic overhead, including transportation, power and water supply, repair facilities and availability of spare parts, and of a variety of skills ranging from highly complex managerial skills to a labour force brought up in an industrial tradition and possessing at least a minimum of general and professional education. The entire institutional framework, which has gradually evolved throughout the course of economic development, provides a favourable climate for the operation and growth of the industrial sector, or at least does not interfere with this. In the developing countries, economic and social changes brought about by industrialization are relatively recent phenomena and are accompanied by a number of frictions and maladjustments; many and varied obstacles have still to be overcome.[22/] The manager cannot always recruit workers with the necessary understanding of the functions of the enterprise and of such matters as administrative discipline. Moreover, there is no large body of managerial colleagues who can help him solve his problems and correct his mistakes when necessary. He has to be highly self-reliant and must constantly help other members of the staff to do their work properly.

22/ United Nations Management of Industrial Enterprises in Under-Developed Countries (E/3143) Sales No.: 58.II.B.5, p. 2.

(c) Qualifications for Management

215. While the abilities of managers in contemporary industrial society must be of a high order, it should not be assumed that managers must have special biological or mental characteristics. Occasionally, one finds cults of leadership and personality in management, but none of these have withstood the test of scientific inquiry. Research on the qualifications needed for success as managers shows primarily that most persons of sound mind and body who have more than average intelligence, the courage to make decisions, a strong sense of responsibility, and the necessary interest and motivation, can become good managers - if they have the opportunity to learn. The occupation of manager is of a general character and there is need for innate qualities. Nevertheless, in particular circumstances a manager may be required to possess a particular combination of skills, since managerial qualifications, (e.g. technical knowledge, innovation, energy, tact) vary according to the particular needs of the position.

2. EDUCATION AND TRAINING OF MANAGEMENT IN INDUSTRIALIZED COUNTRIES

216. The systems and methods of education and training of managerial personnel for public and private enterprises in industrialized countries are outlined below. Education and training is interpreted here as the more or less formal and systematic teaching of management in universities, schools, institutes and special training centres and under programmes sponsored by particular enterprises.

217. In the earlier stages of industrialization, where there were more family-owned and managed firms, the families concerned generally provided their own managerial personnel. However, managers were also recruited from the ranks of craftsmen, tradesmen or clerical personnel, some of whom slowly rose to senior positions.[23/] Later, professionally trained engineers and accountants became available for management positions. In public enterprise, lawyers and persons of university education were appointed. There were no management training programmes either inside or outside enterprises. However, there was more time for individuals to learn through actual experience of managerial functions.

23/ Learning a trade or craft by apprenticeship is still common in some Western European countries, even for sons of industrialists who are destined to become managers.

(a) Development of Management Education in Universities and Colleges

218. In the early part of the twentieth century, universities and colleges in many countries introduced commercial courses, usually as adjuncts to economics courses. Commerce courses provided some training in accounting, finance and economics of trade. These courses have continued until the present day. They were not intended to provide, and do not provide, management training, although graduates from the courses seem to have made the transition to management occupations more easily than persons with no economic or commercial training. However, these graduates usually remain in professional work of a technical character, such as accounting and finance, and do not take up senior management posts. Formal management and business education was pioneered some time about 1910 in the United States of America. The new concept was that management is a process of planning, organizing, directing, etc. of appropriate functions which commonly include production, accounting, finance, marketing and personnel management in the industrial enterprise. University and college programmes, both graduate and undergraduate, based on this general concept became widely established in that country during the next fifty years.

(b) Management Education in Europe - Special Institutions

219. During the past fifteen years many industrialized countries in Europe have made considerable efforts to develop management education facilities. With few exceptions, they have encountered resistance, or at least lack of interest, on the part of the universities. Consequently, they have had to develop facilities outside the university framework, in the form of special institutes or schools sponsored and operated by industrial firms, chambers of commerce consulting firms and professional associations. France, the Federal Republic of Germany, Italy, the Netherlands, Sweden and the United Kingdom each have a number of such training institutes, which have the advantages of autonomy and of adaptability to meet rapidly changing needs. However, universities are needed for research and for long-range development of scientific knowledge in this field. Several countries have been able to stimulate interest on the part of their universities. In France, management departments (Instituts de Préparation à l'Administration des Entreprises)

been established in all universities during the past six years. In the United Kingdom more than 300 technical and commercial colleges are now offering some courses in management at the under-graduate level as part of their regular curricula. Many of these colleges offer a wide range of special short courses for managers, as well as courses for a nationally recognized management diploma.

(c) Management Training within the Enterprise

220. A further significant development in almost all industrialized countries during the past ten years is that most large enterprises, both public and private, have also established their own programmes for training managers. These programmes vary widely, ranging from full-time courses of several weeks' duration to part-time lecture courses, seminars and conferences. The instructors are senior managers, full-time professional teachers and guest lecturers from consulting firms and universities. They generally teach the whole range of management subjects, with emphasis on the particular needs of the enterprise concerned.

(d) General Trend of Management Education and Training in Industrialized Countries

221. The general trend of management education and training for larger enterprises in industrialized countries is approximately as follows:

- a strong system of primary and secondary education of about twelve years' duration;
- four years of university or college studies, which include one or more of the following: physical sciences, social sciences, humanities, engineering, commerce and management;
- one or two years of professional management education at the post-graduate level;
- some years of part-time employer-sponsored management training after several years' employment as a specialist (e.g. an engineer or accountant);
- occasional specialist courses or seminars in various aspects of management, provided by universities and management institutes.

5. EDUCATION AND TRAINING OF MANAGEMENT IN DEVELOPING COUNTRIES

222. 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.

(a) College Education - The Commerce Courses

223. Some of the colleges in the developing countries provide courses in commercial subjects such as accounting, finance and economics, in addition to the general curriculum of subjects such as languages, history and philosophy. They are patterned on the commerce course of some industrialized countries. These courses provide general college education and limited preparation for accounting and financial occupations. There are indications that some of these colleges have modified their commerce courses to include management training (e.g. training in marketing, work study, personnel administration, labour relations and administrative theory and practice) patterned on the business administration courses of the United States.

(b) Universities and Special Institutions

224. During the past ten years some of the developing countries have acquired new educational institutions designed specifically to provide management training. The University of the Philippines now has a post-graduate course in business administration which was developed with assistance from the United States. The Philippines Industrial Development Centre also offers management training. The Ford Foundation has assisted the United Arab Republic to establish a Higher Institute for Management. Pakistan now has an Institute for Public and Business Administration at the University of Karachi. Brazil, Colombia, Ghana, Iraq and Uruguay each have at least one management department in a university. Mexico has at least four such departments. Nigeria has established in 1946 an Institute of Administration for the training of public servants. Management institutes for the training of graduates have recently been established in Ahmedabad and Calcutta,

India, with the aid of the Ford Foundation. India also has an Administrative Staff College, established in 1957, and the Indian Institute of Science has a Department of Management.

225. The foregoing account, although incomplete, gives an indication of how management education has been initiated in some of the developing countries. Most of the facilities mentioned have only recently been established, and it will be some time before their graduates make an impact on the economy of their respective countries. These university, college and institute programmes will, in due course, assume particular importance in countries now receiving outside technical assistance in the field of management education. When this assistance ends, the universities, colleges and institutes concerned must be ready to take over responsibility for management education and research.

(c) Need for Undergraduate Programmes

226. Since these countries need to train managers as quickly as possible they will have to emphasize the undergraduate level of university education for some time. This does not imply that they should not at the same time initiate graduate training programmes, particularly programmes for training management teachers. However, emphasis on undergraduate programmes with properly balanced curricula can produce potential managers and management specialists more quickly. 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 "specialities" of management, namely, economics of the firm, finance and management accounting; work study or industrial engineering; marketing; personnel management.

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

(d) Need for Management Teachers

227. The chief difficulty encountered when initiating university and other management training programmes is the shortage of management teachers at all levels. Teachers for management development centres (described in the following section) are trained in these centres and under various current fellowship programmes. However, university and college management teachers require intensive post-graduate education for which most developing countries have very limited facilities. For some time to come, their best means of obtaining higher-level management teachers will be to send selected nationals to industrialized countries for graduate studies.

(e) Management Development and Productivity Centres

228. Many of the developing countries, recognizing that they need facilities which produce more immediate effects, have established a variety of training institutions designed to provide such facilities. Many of the institutions recently established are called Management Development and Productivity Centres. These centres are established under the auspices of the governments of the countries concerned and are usually attached to a government department or ministry. They have an advisory council including representatives of other interested ministries, universities, employers' and workers' organizations. The function of the centres is to stimulate the interest of the whole community of enterprise - public and private, management and labour - in productivity. Their activities usually include:

- publicity and promotional activities in favour of productivity improvement;
- programmes of education and development for top and middle management, productivity technicians, supervisors and workers' representatives;
- technical information and inquiry services and a reference or lending library;
- the preparation (including translation and adaptation) of textbooks, training manuals, films, film strips, etc.;
- advisory and consultant services and research into problems of raising productivity.

Their concept is similar to that of the productivity agencies organized by many European countries during the past ten years.

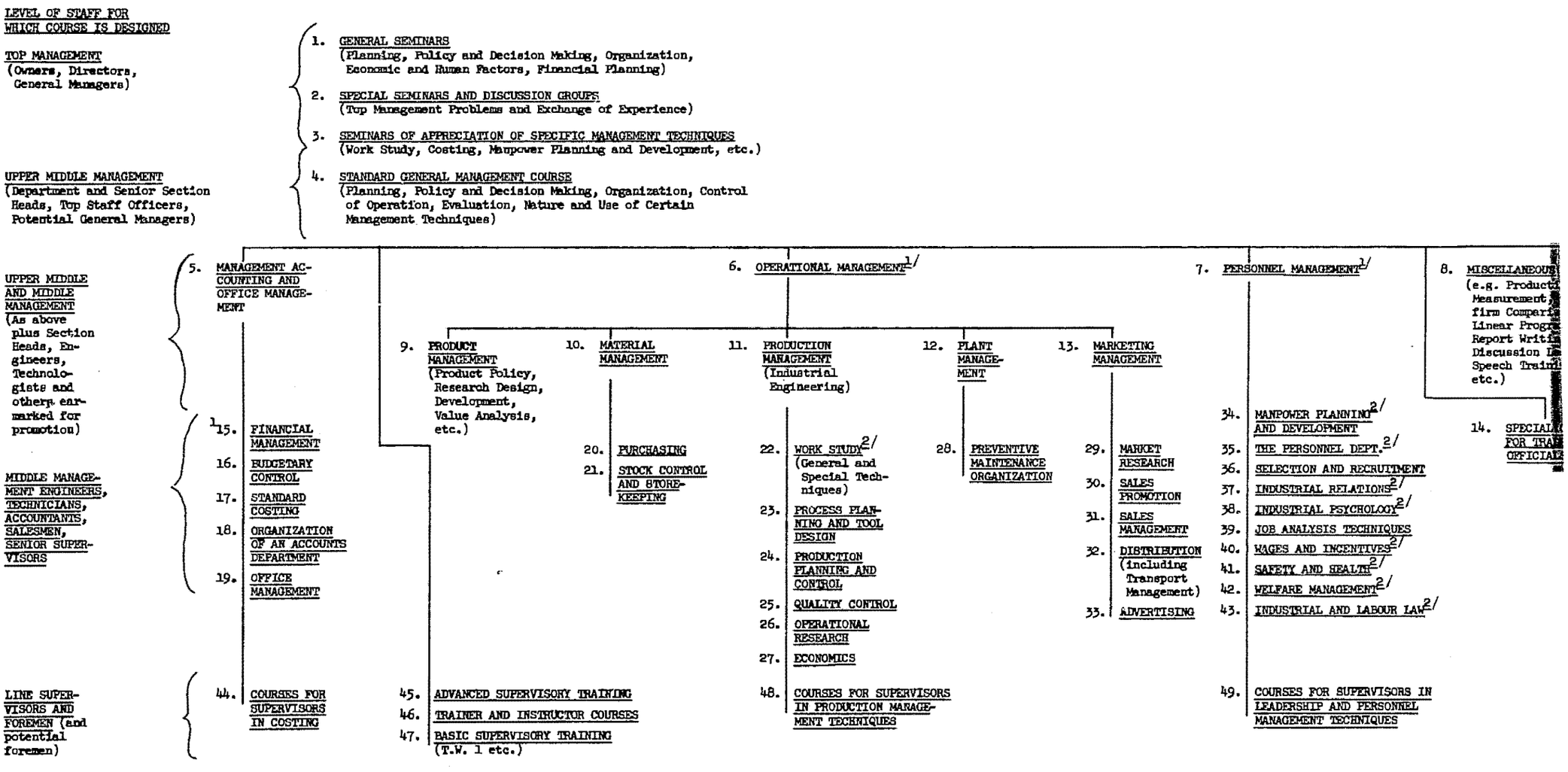
229. The work of these centres commenced with providing practical demonstrations of work study at the factory level. As it usually became obvious that improvements in productivity were also heavily influenced by middle and senior management decisions, the programmes in these centres have been extended to include senior management training. They are now planned to cover the whole field of management. It has become increasingly recognized that restricting training to specialists and to some levels, particularly the lower levels, does not improve productivity very much and that comprehensive and systematic programmes are required.[24/]

230. A scheme for a fully integrated management development and supervisory training programme is presented in Chart I. This does not imply that there should be only one programme or that one centre should necessarily supply the whole range of training. The purpose of data in Chart I is to identify all sectors of the industrial enterprise for which training facilities are normally required. This is necessary in order to avoid the above-mentioned lack of balance and loss of effectiveness which occur when training is given only at certain levels and in certain specialities. It is also necessary because junior members of the industrial community require training facilities which will enable them to work their way up to senior positions. For example, a young man working in the production field will need courses in such subjects as production planning and work study, to enable him to become a specialist before becoming a manager. If he is competent and can receive administrative training and experience, he will be able to assume managerial responsibilities sooner, perhaps first in production management and later in general management. Industrial personnel in a developing country require facilities for rapid mobility and progress which training can help to provide. The kinds of training proposed in the scheme do not exclude the possibility of further technical training and/or education if this should be necessary, particularly in the case of line supervisors and foremen. (44-46 of Chart I.)

24/ See Richard S. Roberts, Jr., Economic Development, Human Skills and Technical Assistance, A Study of ILO Technical Assistance in the Field of Productivity and Management Development, published in 1962 by Librairie E. Droz, Geneva, and Librairie Minard, Paris. This publication provides a description of ILO assistance in this work, including a case study, entitled, "ILO Productivity Work in India".

CHART I

SCHEME FOR A FULLY INTEGRATED MANAGEMENT DEVELOPMENT, PRODUCTIVITY AND SUPERVISORY TRAINING PROGRAMME



1/ Any of the courses in these groups can, of course, be taken separately or in various combinations and at different times.

2/ Courses suited for participation by workers' representatives and trade union officials.

(f) Long-Term Need for Management Development and Productivity Centres

231. The smaller developing country generally has a greater need for a centre with a wide range of training facilities. However, other training resources whenever possible should be developed and used as quickly as possible. Technical colleges and vocational schools can provide full and part-time training for managers, management specialists, foremen, supervisors or workers' representatives. Professional bodies representing fields such as accountancy, personnel management, work study, general management and trade unionism, can also play their part in training. However, in most cases, the centres will for many years have to meet the continuing and changing training and productivity needs of their countries, either with or without outside technical assistance. The need for them will diminish as long-term or permanent facilities become available in universities, colleges and technical and vocational schools. However, the flexible services of the centres will still be needed to fill many gaps. This conclusion has been reached by many industrially advanced countries with regard to their own needs, in the light of their experience during the past ten years.

(g) The Fellowship Programme

232. The fellowship programme connected with the Management Development and Productivity Centres is a further means of management training. Fellowships give staff members of the centres an opportunity for appropriate studies in industrialized countries. These studies, which may last from several months to one year, usually include a combination of specialized courses and attachment to selected industrial enterprises where the Fellows can become acquainted with advanced methods. Fellowships enable individuals to obtain first-hand acquaintance with the personnel, theories, practices and system of industrialization in other countries. They establish sources of future contact and information and provide much encouragement. The number of fellowships was very limited when the major source of technical assistance funds was the Expanded Programme of Technical Assistance. However, the Special Fund has made it possible to grant many more fellowships.[25/] Governments and enterprises in many countries have generally received a growing number of fellows and have played an important part in their training.

25/ See Chapter V, para. 324.

(h) The Turin Centre and Management Training

233. If the necessary funds become available, the Turin Centre for Advanced Technical and Vocational Training will provide managerial training for 400 persons from developing countries each year. The participants will be carefully selected on the basis of their education, experience and general suitability for training for senior management posts. In the early stages, however, emphasis will probably be placed on the training of management teachers. Candidates for such training would be members of the staffs of productivity centres and management development institutions and senior managers from the more important enterprises who may participate in the activities of these institutions as part-time instructors.26/

(i) Management Development for Public and Private Enterprises

234. The preceding section dealt with the more or less formal functions of management training. The present section is concerned with the more informal process of managerial growth termed "development". This process, although more informal, is nevertheless planned and directed by organizational means as well as by individuals themselves. This is not to deny the importance of cultural influence, i.e. the influence of life-long exposure to the values, customs and disciplines of a particular industrial society, on the development of the manager. Indeed, it is now commonly recognized that one of the major obstacles to industrialization in developing countries is that people are generally unacquainted with the pattern of industrial living and working conditions. Transition from rural conditions and from more individualistic or small group traditional occupations (such as farming and home crafts) to urban life and to more formally organized work in a modern enterprise is a difficult process mainly because there are no established patterns to follow. This difficulty pertains to the whole range of industrial personnel including potential managers who must be recruited among individuals without industrial experience. However, one of the important requirements of a modern industry at any stage of its development is that all its personnel, managers and workers alike, must continue to learn throughout their whole working life, because knowledge and skill become quickly obsolete. Training

26/ See Chapter 5, para. 336.

and development processes have acquired greater importance because there is now less time for people to learn their occupation and because the requirements of that occupation are continually changing. The manager in particular needs development throughout his career. Development is here understood to mean the process whereby an individual learns through inner and outer direction, on-the-job experience and guidance from others.

(a) Management Development in Industrialized Countries

350. A discernible process of management development has emerged in many of the industrialized countries during the past twenty-five years or more, in medium and large-scale enterprises.[1/] It applies to public as well as private enterprises, although the latter have often led the way, presumably because they have had to be more adaptable. The process is described here because it has been found to have considerable relevance to developing countries, particularly as they acquire larger public and private organizations. Considerable effort is devoted to the selection of managers. Employers make some attempt to identify potential managers when they engage individuals who have just left school. However, the main work of identification takes place later, when the qualities of the person have been demonstrated in employment, even if only at worker level. Selection is, of course, a recurring process because after appointment as a manager, a person frequently moves to a position at a higher level and takes on other functions, and reappraisal of his qualifications is therefore necessary. The following is a common pattern of progress for an individual who becomes a manager. He begins his industrial career, after a university education, as a specialist (e.g. in engineering, accounting, personnel or marketing). After four or five years, he becomes a supervisor in his specialized field and after a further five to ten years, he becomes manager of his department. If he is destined for promotion to higher levels he must then broaden his experience and knowledge so that his

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1/ A report of management development activities in eight countries exemplifying degrees of industrialization (Chile, France, the Federal Republic of Germany, Great Britain, India, Italy, Japan and the United States) entitled Developing Better Managers was compiled and published by the National Industrial Conference Board, 460 Park Avenue, New York City, in 1961.

qualifications become general, rather than specialized. The identification of the training and development needs of each individual is related to the selection of management personnel. At best, this is a co-operative venture on the part of the individual and his organization. It involves deciding on realistic development objectives and the means of achieving them. It requires analysis of present and future needs for managerial personnel within the enterprise.

(k) Management Development In Developing Countries

256. In developing countries, the manager is faced with an uphill struggle for development. There is a lack of experienced senior managers to guide him, he has fewer professional colleagues, he has little published material and he has fewer norms or examples as a reference. At the same time, his status and authority are very high, and his enterprise, including his subordinates, fully expect him to manage competently. He is so preoccupied with managing others, developing policies and methods and basic organizations, that his own development is neglected. These circumstances naturally condition him but often in the wrong direction, making him cynical. One additional problem is that managers in developing countries are less inclined to be selected objectively. Patronage of one kind or another often plays too great a part in their appointment. A related problem is the myth that managers do not really need any particular competence, but only authority and power. While technical functions, like those of an engineer are considered difficult, managing is thought to be a simple task.

257. Fortunately, there are usually potentially competent managers available. They are owners of small, medium and large enterprises or members of owners' families; they are, to an increasing extent, young men with general education and technical training in technology, accounting, etc., who become available for managerial positions in the same way as in the industrialized countries. The question which arises is how to assist them to become trained. The Management Development and Productivity Centres are, at least in principle, the best source of assistance. These centres can also influence the development of professional management associations. Some developing countries already have specialized societies such as Personnel Associations. However, they also need management institutions such as a "Society for Advancement of Management" with chapters in various sectors which provide "do it yourself" opportunities toward

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establishing management as a competent profession. The centres can provide published material and information on other sources of knowledge. They can also provide consulting services to enterprises and help them set up their own management selection, training and development programmes. Most of the centres are new and require much development themselves. They need additional backing from governments. They also generally need much more outside technical assistance of the type which many of them are now receiving.

(1) Concluding observations on the training of managers in public and private industrial establishments

238. 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.

239. 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, particularly those which have only recently begun to establish their own public and private enterprises, have a dearth of management training facilities.

240. Most of the developing countries have begun to acquire management training facilities of the following types: higher general education, commerce and management training at university and college levels, management development and productivity centres. These facilities are generally new and need to be considerably developed. The main problem is lack of teachers. University programmes of training and research are essential for the long-term supply of management knowledge and personnel. Formal educational institutions (e.g. universities, colleges and vocational schools) are also needed to provide ancillary services, in the form of adult education programmes for industrial personnel.

241. In the meantime, many developing countries have demonstrated that management development and productivity centres, with technical assistance from outside, can accelerate the development of managerial personnel. There is evidence that this leads to an improvement in productivity. The current formula for technical assistance of this nature, namely, expert assistance in development centres, together with a fellowship programme, appears to be appropriate. The centres need to improve the quality and geographical range of their work. Many of them require much more outside assistance. Finally, it should be emphasized that for at least the next ten years developing countries will need the help of internationally assisted Management Development Centres which can provide practical training for persons already employed as managers and for new managers. At the end of this period, more formal educational and training facilities, such as those which now exist in many Western countries, may also be able to assist in providing sufficient qualified managers to accelerate economic progress in the developing countries.

VI. INTRA-REGIONAL AND REGIONAL ARRANGEMENTS FOR EDUCATION AND TRAINING OF NATIONAL TECHNICAL PERSONNEL

242. It has been generally agreed that training should be provided in the trainees' home country as far as possible. Almost all international organizations working in this field have recommended the establishment and expansion of local facilities for education and training.[28/] However, only a few countries can claim to have an adequate network of educational and training institutions capable of meeting the needs of the country at all levels.[29/] Therefore, the developing countries will have to take advantage of facilities available elsewhere both in the region and in the industrially advanced countries.[30/]

28/ I.L.O., First African Regional Conference, Lagos, 1960, Par. 11, U.N. Report of First and Second sessions of the Committee for Industrial Development, New York. Colombo Plan Bureau: Report on Training Facilities at the Technician Level in South and Southeast Asia, Colombo 1961, page 108.

29/ See Chapter 2 of this report.

30/ Training abroad has been dealt with in detail in Chapter 5.

243. The choice concerning training within the region and training abroad will be influenced primarily by the facilities available in the region itself and the degree of specialization required for the trainee. In general, the available experience indicates that trainees sent abroad are generally a higher level personnel seeking either specialization in particular fields or comparative experience in various institutions dealing with certain basic problems.[31/] Trainees haye been sent to the developed countries generally when there is no alternative, namely, training in the country itself or in the region. The report on the Development Decade, pointed out that "individual fellowships abrcad should be limited to high level specialists or to students who will acquire new technical knowledge in fields where training in the developing countries would be difficult or uneconomic".[32/]

244. The case for training in the countries themselves or in the region is based on low cost of training. In particular, it is based on the desirability of providing training in an environment similar to that prevailing in the trainee's country. These considerations are satisfied in the case of training in another country of the same region, and hence the importance attached to intra-regional arrangements for training.

245. The levels of industrial development differ in the countries of the same region and the degree of facilities for training vary accordingly. There is thus considerable scope for co-operation and help. Sometimes, the capacity of the institutions is not utilized to the fullest extent and this should facilitate acceptance of trainees from other countries in the region.[33/] This situation often exists in the case of institutions which have been newly established.

31/ United Nations Report of the Study Groups of Mining Engineers and Geologists ST/TAO/SER.C/27, para. 4 and also ST/TAO/SER.D/59, para. 60.

32/ United Nations, The United Nations Development Decade - Proposals for Action, (Sales No.: 62.II.B.2), para. 36.

33/ Colombo Plan Bureau: op. cit., p. 241, and United Nations Economic Commission for Africa, Report of the Standing Committee on Industry and Natural Resources, E/CN.14/192, Mimeographed, para. 30.

246. Apart from placement of trainees in other countries of the region which have adequate facilities for training, serious consideration has been recently given to establishing institutions to serve groups of countries in the region or all countries in the region. Such institutions very often cater to the needs in specialized training. The training offered is generally of a high level, if not superior as compared to that in the developed countries. The main feature of training in regional institutions is the adaptation of a training programme to suit local needs, a feature which is too expensive and difficult to obtain in the case of individual training in the industrially advanced countries. As pointed out earlier, training programmes to be effective, need to be adapted to suit the needs of the trainees in the developing countries. While this can be achieved in the case of regional training institutes, they can also prepare training programmes to deal with peculiarly local problems of development. This has been particularly evident in the case of training of government officials in planning techniques in economic and industrial development.

A. INTRA-REGIONAL CO-OPERATION IN TRAINING

247. Various bilateral and multilateral programmes of technical assistance have encouraged placement of trainees in the countries of the regions. Similarly in countries in Latin America and in the Middle East, there is a continuous flow of students and trainees within the region.[34/] Some of it is planned under the regional plans of co-operation and some is spontaneous and privately financed. The programmes of technical co-operation of the United Nations assist such countries in this field by both financing selected trainees and assisting the countries in establishing the training institution itself.[35/] In the Latin American region, the co-operation by organizations in Colombia (SENA), Brazil (SENAI), Peru (SENATI) is instructive. The ILO has played a significant role in assisting the activities in those countries. The Marine Diesel Training Centre in Rangoon originally established at the request of the Government of Burma trained students from other parts of the region.

34/ The main factor facilitating intra-regional co-operation is the existence of a common language. See Annual Report of the Technical Assistance Board for 1960, E/3471, page 89.

35/ See Chapter 5.

248. The regional economic commissions of the United Nations are actively engaged in sponsoring regional co-operation on all matters of economic and social development. In the field of training for industrialization, they have been instrumental in setting up Institutes for Economic Development and Planning with the assistance from the Special Fund. The objective of these institutes (one each in the ECAFE and ECLA region and two in the African region) is to raise the technical level of government officials and specialists both through an expanded training programme and by in-service training. They also assist the Governments in establishing the institutional and technical organizations to evolve policies and formulate development programmes. The United Nations has also been active in establishing, with the assistance of the Special Fund Technological Research Institute in Latin America (ICAITI). It is concerned, among other things, with collaborating with Central American Governments and other organizations in the region in promoting scientific and industrial research including training researchers, technicians, etc. Technological research institutes are being established in a number of countries mainly to serve the needs of individual countries. In the African region, plans are being made to establish industrial research and development institutions on a sub-regional basis.

249. The Asian Productivity Organisation, established in May 1961, has developed other forms of intra-regional co-operation with a view to up-grading management and technical skills in its member countries, such as study missions and training courses for which developing countries of the Asian region have sometimes acted as hosts.[36/] India, Pakistan and the Philippines were some of the host countries for a study mission carried out in August and September 1962 which enabled participants from national productivity centres in Asian Productivity Organisation member countries to study the work of similar centres in other member countries and thus improve their own efficiency in the field of programme planning. Thailand

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36/ The following countries are members of the Asian Productivity Organisation: Republic of China, India, Japan, Republic of Korea, Nepal, Pakistan, Philippines, Thailand. Other Asian countries are also eligible for membership.

was one of the host countries for a training course held in October and November 1962 to enable participants from Asian Productivity Organisation member countries to improve their knowledge of marketing and distribution techniques.

250. The Inter-American Vocational Training, Research and Documentation Centre (CINTERFOR) now being established in Montevideo by the ILO, in co-operation with the countries of the American continent, represents an attempt to extend intra-regional co-operation into fields other than the actual provision of training.37/ The Centre is being set up in response to a resolution adopted by the Seventh Conference of American States Members of the ILO. The main functions of the Centre will be to carry out research and organize seminars on all practical and technical questions related to the development of human resources, to establish a documentation service for these purposes and to provide assistance to interested bodies in respect of all problems connected with the general and technical organization of vocational training programmes. The Centre is financed by the ILO and the countries of the American Continent and part of its programme will be supported by international technical assistance funds.

251. A regional centre for French-speaking African countries is being sponsored by ILO for training in labour administration. It is envisaged that in the earlier stages of operation (beginning late in 1966) it will concentrate on the training of middle and lower grade personnel of the Departments of Labour in the region.

37/ An International Vocational Training Information and Research Centre (CIRF) has already been established jointly by the ILO and the Council of Europe in Geneva, Switzerland, to serve the countries of the European region. The Organisation for Economic Co-operation and Development, the European Economic Community and the European Coal and Steel Community are also participating in the work of CIRF. There will be practical co-operation between CIRF and CINTERFOR.

B. REGIONAL SEMINARS

[illegible]. Another significant method of intra-regional co-operation is the convening of seminars and workshops in which representatives of government, industry and other organizations participate. The regional economic commissions, in the case of United Nations, sponsor seminars and meetings on subjects of interest to governments in the region. The specialized agencies, in response to suggestions made in the general conference of the organizations, appointed special committees to deal with questions in the region and to sponsor and organize meetings on technical subjects. The training element involved in such meetings is of a special character. It consists, primarily, of exchanging views and national experiences on specific problems of industrial development. It results in arousing the interests of senior technical persons attending such meetings to pursue further study of a particular subject. It also results more often in implementing in the respective countries the decisions reached at the meetings. Such regional meetings have immediate operational character of significant interest. The following table provides a sample of such meetings held during 1961, 1965 and 1965.

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TABLE 3.1

Inter-regional projects under the United Nations Technical Co-operation Programmes (1961-1963)

Name of Project	Location	No. of countries participating	No. of personnel participating
Seminar on organization and operation of industrial estates	Madras, (India)	22	22
Working party on chemical industries	Bangkok, (Thailand)	14	14
Handicrafts (CINEFAL)	Patzcuaro, (Mexico)	5	NA
Training course on forging techniques	Rangoon, (Burma)	6	NA
Productivity Seminar	Tokyo, (Japan)	13	25
Rural development and handicrafts	Tokyo, (ILO)	NA	NA
Apprenticeship Seminar	Cairo, (UAR)	9	14
Fisheries processing and technology training centre	Iloilo City, (Phillip)	10	24
Fisheries training centre (South Pacific Commission)	Tulagi, (Solomon Islands)	4	25
Training courses in laboratory techniques	Baikerim, (Jordan)	11	NA
South Pacific regional training in boat building	Auki, (British Solomon Islands) and Nouville, (New Caledonia)	NA	31
Development prospects of basic chemical and allied industries in Asia and the Far East	Tehran, (Iran)	-	-
Inter-regional seminar on modern methods of iron and steel making	Prague and Geneva	50	126
Seminar on training supervisors held by ILO	Singapore	13	-
Seminars on accelerated training and apprenticeship programmes for directors and administrators held by ILO	Karadj, (Iran)	8	-
Regional seminar for high-level labour administrators, held with assistance of ILO	Brazzaville, (Congo)	-	-

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TABLE 3.1 (cont'd)

Name of project	Location	No. of Countries participating	No. of Personnel participating
Regional seminar for high-level labour administrators, held with assistance of ILO	Freetown, (Sierra Leone)	-	-
Travelling seminar for senior management from private undertakings, held by ILO in co-operation with ECLA	Central America	6	-
Technical meetings on productivity and public works held under auspices of ILO	Lagos, (Nigeria)	22	-

253. The urgent need for qualified technical personnel in the developing regions, the growing awareness of the scope for greater intra-regional co-operation and the rapid evolution of training methods and techniques and of the actual content of training programmes to keep pace with technological progress are all factors which will certainly lead to the development of new forms of co-operation in the future. It is therefore not without interest at this time to draw the attention of the governments to the following points. These emerge from the experience acquired thus far and are relevant in undertaking intra-regional co-operation.

(i) Training outside the home country is not normally envisaged as a means of providing basic skills but rather for raising the level of qualifications with a view to highly specialized work, for the training of instructors and, in some cases, for giving training or further training to high level personnel.

(ii) The establishment of regional training centres for which the technical, administrative and financial responsibility must be shared by several governments is a costly undertaking. Financial assurance over a period of years is necessary and should not be affected by the fact that budgets are voted annually.

(iii) All countries of the region need to be fully informed of the national training facilities available for regional use and of the procedures to be followed in order to enable their nations to take advantage of them.

/...

(iv) The trainees from various countries participating in a course should have similar basic qualifications and similar practical experience.

(v) Since trainees attending courses at the regional institutes will normally be persons occupying positions of responsibility which preclude long absence from their home countries, training courses in the institutes should not be unduly long. They should be designed to provide appropriate advanced technical training.

(vi) Training should be consistent with the need of the country and capable of immediate application in the trainees' home country on completion of the training course: (e.g., instructors should be trained abroad only if the facilities for giving instruction already exist - or are being simultaneously established - in their home country).

VII. WORK OF THE UNITED NATIONS FAMILY

254. The present section is concerned with the current and planned activities of the United Nations family in regard to the development of systems and methods of education and training. The international action in this context is to a large extent determined by the requests addressed by Governments to the United Nations or to the appropriate international organizations. The work of the United Nations and the specialized agencies in the field consists of studies and research, establishment of standards and models, and operations. It should be borne in mind, however, that all these are interdependent, both at the planning stage and when the programme is being implemented.

255. Details regarding research projects undertaken by the United Nations family are given in Annex E to this Chapter. As regards standards, the international organizations have prepared a number of them relating to the organization of vocational and technical education and vocational training. These standards are general, regional, or by sector. The most important of them are contained in the UNESCO Recommendation concerning Technical and Vocational Education (Paris, 1962) and the ILO Recommendation concerning Vocational Training (Geneva, 1962). The two organizations have reproduced these recommendations in a joint publication which is being sent to the Governments of their member states.

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256. Plans are under way to prepare technical standards in the form of guides or manuals. These documents will take account of the results of technological research and experience gained in operational activities and will facilitate the execution of both national training programmes and international technical assistance projects. It is envisaged that these new standards will cover, among other things:

(i) Employment objectives and manpower organization
(ii) The establishment of vocational guidance tests in a number of developing countries
(iii) The preparation and use of audio-visual aids
(iv) The construction and fitting out of premises
(v) Equipment for training workshops
(vi) Codes of practice for various industrial sectors - building, electrical, mechanical and chemical industries
(vii) Basic equipment lists for teaching and practice laboratories
(viii) Guide to management education at various levels

257. A substantial programme is foreseen for the preparation of standards applicable to training in given industrial sectors. It is intended that these standards should be based on:

(i) the identification and selection of functions and key occupations in the industry concerned
(ii) the determination of the qualifications they require
(iii) the determination of the content, duration and conditions of training for these functions and occupations
(iv) a study of the organization of training in the industry
(v) a study of participation by employers' and workers' organizations in the preparation and implementation of training programmes.

It is envisaged that during the next five years, this programme will cover the chemical, textile and metal working industries, printing, transport, mining and petroleum. In the field of technological research, it is more difficult to establish standards but it will be possible to elaborate recommendations on particular problems such as:

(i) the planning and design of prototype testing and research centres, and
(ii) the typology of research laboratories and institutions.

258. A substantial portion of the operational programmes undertaken by the United Nations system, is devoted to the training of technical personnel for industrialization.[38/] This programme, which goes back many years, has grown rapidly as a result of the increasing demand from the industrializing countries and the development of the various aid programmes. The volume of the action involved is illustrated by the fact that, as of 31 October 1963, sixty-six projects approved by the Special Fund since its establishment were in the specific fields of technical education and training and management development for industry.[39/] The Special Fund allocations for these projects exceeded $60 million.[40/]

259. The projects supported by the Special Fund involve work in the following areas:

(i) The analysis of manpower problems and the preparation of training schemes

(ii) Educational planning

(iii) The establishment or development of national training systems

(iv) The improvement of standards and methods

(v) The training of teaching staff

(vi) The establishment of engineering schools and specialized technological departments in universities

(vii) The establishment of management education and training facilities

(viii) The establishment of institutes of metrology and standards, mechanical engineering, and other research institutes

(ix) Establishment of extension and training services in agricultural and small-scale industries; and

(x) The development of post-graduate training for scientists' and engineers' highly specialized fields.

38/ See Chapter 4, paragraph 300.

39/ Excluding, for instance, technological research institutes, agricultural or public administration training institutes, small industry service institutes, telecommunications and civil aviation training establishments, general education, manpower planning, etc.

40/ Special Fund, The Implementation of the Programmes Approved by the Governing Council at its Second Through Tenth Sessions, (SF/L.92), 3 December 1963.

These missions and projects are usually national in character. They may, however, be confined to a specific area in a country or involve a number of countries in one region or continent which are faced with the same problem.

260. Technical co-operation within the international programme for the developing countries takes different forms but generally combines the services of international specialists, the award of fellowships to national specialists, and the provision of equipment for demonstration purposes.[41/] A particularly important contribution to programmes for training national officials and for the further training of technical personnel will become possible in the next few years following the establishment of such bodies as the regional economic planning institutes, the UNESCO Institute for Educational Planning in Paris and the ILO Centre for Advanced Technical and Vocational Training in Turin.

261. The conference and other meetings organized by the international organizations help to develop Governments' desire for technical co-operation. They make it possible, in connexion with a particular problem to bring out the various factors and to determine the means of achieving the objectives through international co-operation. The various publications of the international organizations, including those prepared for such meetings, constitute an important source of information for the organizations themselves and the technical assistance experts.

262. The increase in operational activities financed by the Special Fund has given rise to a considerable increase in work of the organizations dealing with studies, analyses and normative activities. Such work covers various problems of industrialization which can be tackled within the limits of presently available resources. In order to avoid duplication of substantive effort and to promote co-ordinated action, appropriate inter-secretariat machinery has been established in fields such as manpower assessment and educational planning, technical education and vocational training, and agricultural education.

41/ For details see Reports of the Technical Assistance Board to the Technical Assistance Committee for the years 1960, 1961, 1962 and Chapter 5 of this report.

VIII. TRAINING POLICY AND INDUSTRIALIZATION

263. Training policy can no longer be isolated from the other elements of national policy, particularly when this policy is conceived and operated within a framework of economic planning. The policy itself will be influenced by the rate of growth, the proportion of investment devoted to industrial development and the prevailing position of the educational system.

264. The situation in developing countries is characterized by low levels of skills, inadequacy of the funds for education, and training. The situation, however, varies widely: in countries with primitive economies to those in which industry has developed substantially. Between these two positions, there are numerous countries in which a backward sector exists alongside an extremely modern sector.

265. The policy to be followed in regard to training is thus, therefore, dependent on a large number of factors. These, in turn, depend on the conditions of the country concerned, the degree and dynamism of its economic and social development, its administrative structure and on the over-all objectives of its national policy. In addition, the problem of determining the appropriate training policy is made complex by the inadequacy of data which are necessary if a national training policy is to be satisfactorily planned at the national level. It is, nevertheless, possible to suggest for industrializing countries, a general strategy for training systems and methods.

266. It is possible, in the first instance, to undertake analyses for determining a short-and long-term training policy. Such analyses include estimating needs for technical personnel and a review of training facilities. The latter includes a review of the structure and organization of existing training facilities for the three main levels of qualification, the use made of and the pedagogical and economic return from these facilities, the extent to which methods and programmes were adapted to the training objectives and the respective costs of the training systems. Once the results of such analyses are available it is possible to determine what immediate steps should be taken in the light of the programme of industrialization and the resources available.

267. A first category of such measures might aim at using facilities outside the national training systems (such as immigration, training abroad, training by foreign companies, international or bilateral technical assistance). Other measures will

include those such as systematic organization of work, raising productivity, redistributing functions, increasing working hours temporarily, etc. These measures constitute a basis for effective action for overcoming the shortage of technical manpower and particularly for meeting short-term needs.

268. A second category of short-term measures would be designed to improve the effectiveness of existing training systems. Some of these measures would be concerned with administrative organization and co-ordination at the national, regional and local levels, particularly as regards the links, between the different training systems, the authorities responsible for training and those responsible for education and the economy. Such action is suggested because, even in countries where training systems are not as yet developed, these systems often come under the administrative jurisdiction of different authorities and require co-ordination. Lack of proper co-ordination will, however, inevitably lead to inefficient use of national training facilities as a whole. The lack of co-ordination may be due to the inadequate Government administrative machinery. In such cases, a general effort in improving public administration would be desirable.

269. Other measures in this second category would be aimed at making improvements in the training systems and methods used. Consideration would be given in this connexion to such aspects as:

(i) The structure of the training systems, their geographical distribution in the country and their capacity in relation to short- and long-term needs

(ii) The volume and distribution of training expenses particularly in institutional systems of training

(iii) Wastage and drop-out during training

(iv) The standards and methods used; and

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

270. A third category of possible immediate measures seems particularly appropriate for countries which are in the earlier stages of industrialization. It is possible that the competent authorities in such countries will have to choose, within the framework of industrialization schemes and the limits of available resources, between training for the various levels of qualification (skilled workers, technicians, engineers) and between institutional and in-plant training. It may be

desirable for these countries to devote particular attention to determining the priority to training programmes with a multiple effect, namely:

(i) To the training of trainers of teaching personnel in institutional training systems, and supervisors and foremen in industry;

(ii) To the training of persons in key functions such as management, personnel maintenance and repair services of lower and intermediate level supervisors, etc.

(iii) To the development of systems of training young persons and adults who are already in employment.[42/]

(iv) To the establishment and development of programmes of further training (technical and pedagogical training and general education) since such programmes are usually of considerable importance as a means of improving the qualifications of the labour force as a whole.

271. For countries with a network of educational infrastructure and of some industrial development, consideration may be given to the following main measures:

(i) The extension of training facilities to the population as a whole, both for the initial training of young persons and adults at all levels and for the adaptation, specialization, retraining and further training which become necessary as a result of the economic and technical progress. These facilities should be sufficiently flexible and varied to meet all the requirements of the persons concerned and to provide for training to continue as necessary throughout working life

(ii) The improvement of the links between schools and industry, since at this stage of industrialization the general and scientific culture of technical personnel is increasingly important as a basis for training and technical specialization

(iii) 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.

42/ "The quickest way to increase productivity in the less developed countries is to train the adults who are already on the job. Education for children is fine, but its potential contribution to output over ten years is small compared with the potential contribution of efforts devoted to improving adult skills. This field is almost wholly neglected ... Yet there is ample testimony to what adult education can achieve, whether in the form of training-within-industry, evening classes, or sandwich courses in urban centres, ..." Lewis, A.W. "Education and Social Development" UNESCO International Social Science Journal, Vol. XIV, No. 4, 1962.

IX. RECOMMENDATIONS

A. FOR DEVELOPING COUNTRIES

272. In the light of experience in recent years, the following measures are suggested to train the required technical personnel within the framework of programmes for accelerated industrialization:

1. Evaluating existing training facilities in the light of current and estimated requirements for technical personnel at all levels, from workers to engineers and management;

2. Review of 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;

3. 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:

   (a) the improvement of existing training systems

   (b) the use of facilities outside the national training system such as immigration, training abroad, training by foreign companies, international or bilateral technical assistance and the more systematic organization of work and enterprises

4. The improvement of existing training systems with regard to:

   (a) 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

   (b) 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

   (c) the volume and distribution of training costs

   (d) wastage and drop-out during training

   (e) the standards and methods used

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

5. For countries in the early stages of industrialization, paying particular attention to determining the priority to be given:

(a) to 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

(b) to the 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

(c) to the development of systems of training young persons and adults who are already in employment, for instance by organizing systems of in-plant training

(d) to establish and develop programmes of further training as a means of improving the qualifications of the labour force as a whole.

6. 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:

(a) 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

(b) the establishment and development of high level training for new techniques, both for research and production

(c) 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

(d) 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.

7. Following measures are suggested in connexion with the training of management personnel:

(a) the development of university and college management education, both post-graduate and undergraduate, including management courses in technological education, for the longer-range supply of managerial practitioners and teachers;

(b) the establishment of further development of management training facilities, such as management development centres, for the more immediate supply of managerial practitioners and teachers: such centres to offer comprehensive management training for all levels of management and to cover a wide range of industries, including small-scale enterprises and co-operatives.

B. FOR INTERNATIONAL ORGANIZATIONS

273. It is evident that the existing programme of the United Nations and the specialized agencies in the field of Industrial Development, particularly in regard to technical education and vocational training, will need to be intensified and increased. The following items already in progress or planned and mentioned in paragraphs 259 to 260 would seem to be of particular importance within such an intensified and increased programme:

1. Studies and research on:

(a) employment objectives in economic development and employment policy, and particularly:

(i) employment creation in relation with industrial development

(ii) factors to be considered in determining what choice might be necessary between employment growth, changes in the conditions of employment, and patterns and rates of economic growth; and

(iii) formulation and implementation of policies for increasing employment

(b) problems of development of small-scale and handicraft industries

(c) methods of forecasting requirements for technical personnel for economic and particularly industrial development

(d) changes in the occupational structure of the labour force and the composition of occupations

(e) the economic problems of technical education and vocational training in developing countries with a view to establishing a basis for long-term planning and with particular respect to such aspects as:

(i) the determination of priorities in technical education and vocational training

(ii) the determination of the costs of the various systems of technical education and vocational training

(iii) the extent to which the various systems of technical education and vocational training are used and the return they give

(iv) methods for organizing and planning education and training in relation to general development policy

(f) the national planning of technical education and vocational training, including their organization and structure

(g) education and training methods and programmes and problems of status and training for teaching staff

(h) specific problems of training higher technical education and management development

(i) the establishment of inventories of training institutions in selected fields of industrial development

(j) the assessment of needs for technical education and vocational training in selected industries

(k) problems connected with the development of local resources and local engineering planning

(l) occupational health and measures for providing effective assistance in medical education and training to meet priority needs of developing countries

(m) specific problems concerning the social and economic conditions of engineers and higher technicians

(n) the professional training of highly specialized personnel of all grades in the developing countries in such branches as meteorology, telecommunications and civil aviation

2. The establishment of standards and models, with a view to facilitating the the implementation both of national training schemes and of international technical assistance projects, on such subjects as:

(a) employment objectives and manpower organization

(b) the establishment of vocational guidance tests in a number of developing countries

(c) the preparation and use of audio-visual aids

(d) the construction and fitting out of training premises

(e) equipment for training workshops

(f) basic equipment lists for teaching and practice laboratories

(g) codes of practice for various industrial sectors

(h) training in given industrial sectors; and

(i) guide to management education at various levels.

3. The establishment of recommendations covering such problems as the planning and design of prototype testing and research centres and the typology of research laboratories and institutions.

4. Operational activities, in accordance with requests from Governments, and consisting of:

(a) Survey missions involving studies on economic, technological, manpower and educational problems in relation with the creation or development of industries, either as a whole or in a specific sector and studies on the structure and organization of technical education, vocational training and management development and programmes for all or specific levels of qualification, occupational specialization or functions

(b) Operational projects involving advice and/or co-operation in the planning, establishment or development of systems, programmes and facilities for technical education, vocational training and management development for industry and the provision of experts, fellowships and equipment as necessary.

CHAPTER 4

THE FINANCIAL IMPLICATIONS OF TECHNICAL EDUCATION AND VOCATIONAL TRAINING

I. COST ESTIMATES OF EDUCATION AND TRAINING

274. The estimation of the financial aspects of the education and training programmes in the developing countries in connexion with industrialization involves a number of difficulties:

(a) The over-all cost of such programmes depends on preparing fairly accurate estimates of the numbers of technical personnel. Difficulties involved in this task are discussed in chapter 1.

(b) Cost estimates per pupil are not readily available and the existing data need to be up-dated. This is particularly true for training programmes undertaken in addition to those undertaken by the technical schools, institutions and universities.

(c) The available estimates of education and training vary considerably from region to region and from country to country. Therefore, estimates should be considered as illustrative only, and subject to revision.

(d) There is lack of data on "drop-out" rates at various levels, the present flows of students into various types of employment, and the appropriate lags in the expansion of these flows (5, 10, 15 or even 20 years, as the case may be). Data on such aspects are particularly necessary in the costing of the capital requirements of education and training programmes.

275. An attempt will be made in this chapter to assemble available data and to estimate costs involved in undertaking training programmes for intermediate and higher level technical personnel concerned with industrial development. These estimates are subject to the difficulties and qualifications mentioned in the preceding paragraph. It must be emphasized here that estimates are presented for illustrative purposes only. They are basically rough orders of magnitude and it is hoped that, as more data become available, firm estimates may be prepared.

276. Some estimates of recurring costs and of capital costs per pupil/place are presented in table 4.1 for various levels of education. Some are actual costs, while other refer to planned future costs.

TABLE 4.1

Costs Estimates of Education and Training in Selected Countries and Regions
(in $US)

Country or region	Recurring Costs Per Pupil (p.a.)						Capital Costs Per Pupil-Place					
	Primary	Secondary			Higher		Primary	Secondary			Higher	
	Primary	General	Voc. Tech.	Teacher	Sci. Tech.	Other		General	Voc. Tech.	Teacher	Sci. Tech.	Other
ECA Region (Addis Abeba Plan for Middle Africa)	20	40-150	40-200	400-600	1,600-600[2]	800	37.5	460-920	500-1,000	1,000	10,000	5,000
Middle Africa[1]					1,200						8,500	4,600 6,000
North Africa (Tananarive Plan)					1,000						10,000	4,000 6,000
Sierra Leone (Ten-Year Plan)							47	294[3]	-	2,800	-	-
Nigeria (IBRD Report)	11-20	-	-	-	-	-	14-34	250-350[3]	1,512[4]	-	-	-
ECAFE Region[5] (Tokyo Conference on Karachi Plan)	20[6]	100		150	300							
Pakistan (Second Five-Year Plan)	15	50	-	-	-	-	13	90	-	-	-	-
India (Third Five-Year Plan)	(include capital expenditure) 23	111			430							
India[6] Country regions	4-6											
Cities	16											
Ceylon[6]	21											
Thailand (Thai-USOM Report)	(include capital expenditure 1962) 11[7]	66	96-166[8]	134[9]	734							
ECLA Region (Santiago Conference)	35	144	285	184	600		65	232	405	236	1,200	
Venezuela (Four-Year Plan)	135[10] 56[11]						277[12]	476[13]				
Colombia (Economic and Social Plan)	15[6]						55					
Mexico (Development Programme)	44[14]						30					
Barbados (Development Programme)							180 (new) 135 (extension)	400-500 (new) 150 (extension)				

(Notes on following page)

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Notes to Table 4.1

1. This cost estimate is for 1970. By 1980 the cost would be 1,000 under the Tananarive Plan.
2. The lower estimate refers to higher training in non-university institutions.
3. Includes the cost of boarding facilities (for 1/3 of pupils in Sierra Leone).
4. Cost at one centre which was considered far too high.
5. The Tokyo Conference on the Karachi Plan envisages the following cost ratios for recurring costs per pupil and capital costs per pupil-place in primary, secondary and higher education respectively: 1 (primary): 5 (secondary): 15 (higher).
6. UNESCO, Needs of Asia in Primary Education, Educational Studies and Documents, No. 41, 1961. Target for 1980.
7. Includes adult education.
8. Operating costs only. The low estimate is for industrial training - the high for agricultural.
9. Includes secondary teachers' training.
10. Estimates from data in La Educacion, Union Panamericana, 21-22, Enero-Junio 1961.
11. UNESCO estimate - UNESCO/ED/CEDES/18.
12. Construction only.
13. Middle schools - includes equipment.
14. This refers to the average annual cost per pupil who completed a six-year primary course. La Educacion, Union Panamericana, 21-22, Enero-Junio 1961.

277. The relatively higher proportion of per pupil costs at the higher educated level, compared with the primary level in Africa, are due to the need for greater reliance on expatriate teaching personnel, for providing residential facilities for the students and teachers (also at secondary levels) and to the low pupil/teacher ratios in many African higher educational institutions. Plans to raise the proportion of indigenous teaching personnel, and the ratios of pupils to teachers, will reduce these costs in the future, as the development of the lower levels of the educational system enables more young people to take advantage of a university education and to become teachers themselves.

278. On the basis of the regional cost estimates of table 4.1, and on the basis of the numbers of scientists, engineers and technicians for industry estimated for illustrative purposes in chapter 1, an estimate of the higher-level educational cost has been made for each of the regions. It must be emphasized that this estimate:

(a) takes no account of the education of higher and intermediate-level manpower required for fields other than industrialization or any other educational needs;

(b) takes no account of the present or past output of higher-level technical personnel. (See paras. 279 (d) and 281 below.)

279. The educational assumptions on which this estimate is drawn up are the following:

(a) the duration of higher education is five years for engineers and scientists, and three years for technicians;

(b) the capital costs for Asia are 20.7 per cent of the total recurring costs.[1/] All other recurring and capital costs for the three regions are taken from the regional per-pupil estimates of table 4.1;

(c) the time-table over which graduates will be forthcoming to meet the fifteen-year needs indicated in chapter 1 is also fifteen years. In so far as countries between 1960 and 1965 have not produced a

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1/ Report of Meeting of Ministers of Education of Asian Member States Participating in the Karachi Plan, Tokyo, 1962, p. 68.

pro-rata share of the output required up to 1975, the annual requirements and annual recurring costs would have to be substantially increased for the period 1965-1975. In that countries were already producing in 1960 some proportion of the numbers required, the total capital expenditure necessary over the period is overstated, however;

(d) in so far as countries have not succeeded in achieving (between 1960 and 1965) a pro-rata share of the industrial output and employment targets, on which the fifteen-year educational requirements are based, the industrial output and employment targets for the remaining ten-year period might have to be scaled down, and the requirements of higher-level technical personnel for industry reduced in consequence. This would, of course, reduce the total educational costs to be incurred;

(e) the flow of graduates is evenly distributed over the fifteen-year period. This assumption is introduced for simplicity. It implies that the necessary number of pupil places are constructed just as the period begins and are fully occupied throughout the period. In reality, the flow of graduates is certain to be less in the initial years, and more in the later years. The total capital cost over the fifteen-year period would be greater than has been estimated, therefore, as the larger flow of the later years requires a larger number of places to be constructed and equipped. The capital costs in the initial years, however, would be smaller than the fifteen-year capital cost indicated in table 4.2;

(f) it is assumed that pupils drop out at the higher-level, and they do not repeat any year. This assumption is necessary in the absence of data on the average number of years it takes a pupil in the three regions to complete science, engineering and technical courses. Both the fifteen-year recurring costs and the fifteen-year capital costs will be too low because of this assumption;

(g) it is also assumed, for the purposes of the estimate, that the total number of technical personnel will complete their training in the new institutes established at the beginning of the plan period.

280. The rough cost estimate based on these assumptions is presented in table 4.2.

TABLE 4.2

Cost of Higher-Level Education for Scientists and Engineers

I. Number of Scientists, Engineers and Technicians Assumed to be Required[2/]

	Asia	Latin America	Africa	Total
Scientists and Engineers	260,000	110,000	30,000	400,000
Technicians	630,000	290,000	70,000	990,000

II. Cost of Higher-Level Education for Scientists, Engineers and Technicians for Industry ($ million)

	Asia	Latin America	Africa	Total
15-year recurring cost:	957	852	366	2,175
15-year capital cost:	198	114	170	482
15-year total cost:	1,155	966	536	2,657

281. The estimated cost of $US2.6 billion for the fifteen-year period appears to be considerable. However, this would amount to an annual expenditure of approximately $US177 million for all the developing countries which, in itself, may not be substantial. In any case, this figure is meant for illustrative purposes only and any attempt to translate it at this stage into operational matters would be truly misleading.

II. THE COST ANALYSIS OF TRAINING

282. There are two basic factors which influence the cost of training, namely, training systems and methods and thoroughness in training.

A. TRAINING SYSTEMS AND METHODS

283. It is possible to ascertain a training "terminal" point. It is assumed that, at this point, the successful trainee possesses such skills which equip him to

2/ Data given in chapter 1 rounded to the nearest 10,000.

undertake specified jobs at a given level of efficiency whatever the training "route" by which he reached the terminal. In practice, the quality of training given under alternative training routes to the same "terminal" point may differ widely. If the higher quality training costs more, then consideration will have to be given as to whether the extra quality is worth the extra cost. It is assumed in the chapter that all training courses can be adjusted to the quality required. In other words, jobs can be analysed and broken down into component skill elements necessary for the job and that training courses can be designed to inculcate this precise set of skill elements. In this regard, the Turkish Five-Year Development Plan states:

> "... the functions of skilled workers, foremen and technicians should be defined precisely, and appropriate training methods should be worked out. Co-ordination between the Ministries of Industry and Labour and the trade unions should be established in this respect ..." 3/

The skill elements required will depend on the productivity and technology which are required in the job. Thus, a tool-maker using "old-fashioned" techniques will require "up-dating" or retraining if he is to continue as a tool-maker as technology advances and the skill elements required of a tool-maker change.

284. Given these assumptions, it is clear that systems of training should use those methods which minimize their costs and that those systems which cost less should be gradually expanded and those systems which cost more should be gradually contracted so as to minimize the cost of training per successful trainee for the numbers it is planned to graduate from each training "terminal".

285. This problem is relatively simple analytically, although there may be some procedural complications in identifying the various cost elements. Each training system should be costed and compared on the basis of the cost per successful trainee. These systems should be compared, not only with other systems where these provide alternative routes to the same training "terminal", but also with the same system in other countries and in different establishments in the same country. Costs may be affected by such factors as trainee/instructor ratios, size of

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3/ Turkish Republic, Prime Ministry State Planning Organization, First Five-Year Development Plan, 1963, 1967, Ankara, 1963-1967, Ankara, 1963.

training establishments, pedagogic techniques, length of training period, where training is given (in a centre or in an enterprise, for example), whether training is part-time or full-time and how such training is distributed over each day, week and year, and the selection procedures and past experience and qualifications of trainees.

286. Such comparative analysis should seek to establish, for example, whether an apprenticeship system with fifteen apprentices to each instructor, using programmed learning techniques over a period of two years, would not result in lower costs per successful trainee than other apprentice systems leading to a given training "terminal". It should seek to establish whether the scale of training would not have to be larger than a given size for most economical results, thus leading to the recommendation that smaller firms should co-operate in training or that special centres should be set up which are large enough to provide training on such a scale.

287. The costs can be traced by cost accounting methods to the various elements in each training system which contribute to the costs per successful trainee, for example instructors' wages or salaries, other variable and fixed costs, the success rate of trainees, the length of training and so on. A standard method for costing the training of apprentices was recently developed by the Personnel Management Advisory Service of the British Ministry of Labour, in co-operation with the British Association for Commercial and Industrial Education (table 4.3).[4/]

288. This costing formula effectively encompasses all the cost elements from the point of view of an individual enterprise. For the purpose of planning training, however, some adjustments are required. First, to allow for wastage, the unit costs should be multiplied by the numbers in training in each "year" of each course. These aggregate "yearly" costs should be added and the total divided by the number graduating from the course concerned.[5/]

289. Second, when determining the cost of training for the economy as a whole, item 1 (a) in table 4.3 should be calculated as the wages which the trainees would have earned had they been working instead of learning. This is the "real cost" of

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4/ BACIE Journal, London, Vol. 17, No. 3, September 1963, pages 102-104.

5/ A slightly more elaborate method will have to be used if the apprentice intake is rapidly growing.

TABLE 4.3

Standard Method for Costing the Training of Apprentices

Description	Expenditure per Grade of Apprentice					Total Expenditure
	£ Craft	£ Technician	£ Technologist	£ Graduate	£ Commercial	£
I. Wages and Salaries (taxable)						
(a) Apprentices - for time spent in works and offices and at college or courses						
(b) Instructors* - full-time or part-time (foreman or craftsman undertaking other duties)						
(c) Clerical and administrative - to include allocation of training and/or personnel department effort						
(d) Statutory and social - payment for statutory and annual holidays, national insurance, and company contribution to pension scheme						
Total Cost for Wages and Salaries						
II. Maintenance of Training Centre or Defined Training Area						
(a) Rents.						
(b) Rates and taxes						
(c) Depreciation of fixed assets (plant, buildings, etc.)						
(d) Light, fuel and power						
(e) Indirect labour costs (e.g. shop labourer)						
(f) Maintenance of machine tools						
(g) Maintenance of other equipment of a capital nature						
(Shop tools, fixtures, furniture, equipment, and materials, etc.)						

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TABLE 4.7 (continued)

Description	Expenditure per Grade of Apprentice					Total Expenditure
	£ Craft	£ Technician	£ Technolgist	£ Graduate	£ Commercial	£
(h) Consumable equipment						
(Training material, stationery, etc.)						
Total Cost of Training Centre or Area						
III. Recruitment and Selection						
Advertising of vacancies, apprenticeship brochure, school visits, selection processes (including cost of interviewing, testing, entertainment, etc.), travelling expenses (of candidates and staff)						
IV. Fees						
(a) Fees paid to technical colleges, etc.						
(b) Cost of external courses and educational visits .						
Total cost of fees						
V. Awards						
Books, tools or prizes, cost of prize-giving ceremony - parents' day, etc.						
VI. Fringe Benefits						
Cheap canteen meals, subsidized travel, apprentice association, sports and recreational activities, etc. .						
VII. Accommodation						
Cost of lodging allowances, provision of hostels, etc.						
VIII. Donations and subscriptions to external bodies for training purposes						
IX. Any other items please detail						

TABLE 4.3 (continued)

Description	Expenditure per Grade of Apprentice					Total Expenditure
	£ Craft	£ Technician	£ Technologist	£ Graduate	£ Commercial	£ Total Expenditure
GROSS COSTS						
CREDIT ITEMS						
(i.e. value of apprentices production if done by skilled men)						
NET COSTS						
(i.e. gross costs less credit items)						
UNIT COSTS						
(i.e. $\frac{\text{net costs}}{\text{No. of apprentices}}$)						

* This should include any relevant payments for overtime or bonus.

engaging in training and is relevant for planning of national training systems. In the developing countries, where youth unemployment is very high, this "real cost" may be very low. Reference may also be made here to the cost formulae for education contained in the Addis Ababa and Tananarive Plans and to the work of the OECD on this problem.6/

290. In order to improve the efficiency of the training systems, it is considered important that the developing countries undertake to collect cost data relating to training. In the absence of data, it will be difficult to ascertain whether the resources devoted to training are being used in the most effective ways. For example, methods of accelerated training may, in given circumstances, be quite the cheapest and most effective means of training over a wide range of occupations. Programmed learning methods, which may allow more rapid and more effective training, while economizing on the need for instructors, may prove a most effective technique in developing countries. Again, a system of "shifts" of trainees and instructors in the same buildings and using the same equipment might yield a considerable saving in overhead costs, and in particular in library costs and trainees' facilities. But until the relative costs are known, these methods will scarcely be tried as an alternative to established methods.

291. The question of cost plays an important role in the decision of the industrial enterprises in adopting a given type of training programme. The capital which enterprises invest in training necessarily become embodied in employees who are usually free to move where their skills can earn the greatest rewards. One consequence of this is that the prospect of losing workers and the capital invested in their skills impels enterprises towards providing training programmes which bring a rapid return, that is, which are specifically applicable and necessary to the functions of the employees concerned. Another consequence is that certain types of longer-range training which might be more economically and efficiently provided on an in-plant than on an institutional basis may have to be provided in institutions or not at all, unless means can be found for reducing labour turnover or for providing training on a co-operative basis, and compensating enterprises for the loss of employees trained by them.

6/ I. Svennilson, Edding and Elvin: Targets for Education in Europe in 1970, Policy Conference on Economic Growth and Investment in Education, OECD, 1962.

292. Labour turnover to some extent can be reduced and secure a rapid return on training expenditure by the industrial enterprises. A commitment to work in a certain kind of job for a specified period, as is the practice of some Governments in dealing with trainees going abroad, is one way out of this situation. In Japan, large enterprises, in order to retain workers trained by them, use "the wage system, fringe benefits, such as retirement allowances, paid vacations, health insurance and recreational resorts, in such a way as to elicit a life-long commitment of employees to a particular enterprise".[7/] This system not only discourages labour mobility, but tends to place much more importance on younger workers as trainees.[8/]

293. Practices that severely discourage and penalize labour mobility have, however, some disadvantages, and Governments might wish to explore the possibilities and the difficulties of devoting public funds to the subsidizing of in-plant training in cases where this is considered a more economical system, from a national point of view, of achieving given results.[9/]

294. It is in the enterprises' own interests that training is carried out efficiently so as to yield the maximum returns. The widespread use of what has been termed "learning by absorption" on the job might seem to indicate that many employers have found this the most economic method of training, despite the apparent waste of output while the employee is "absorbing", by hit-or-miss methods on the job the specific skills required. These ad hoc methods may be attributable to scale factors, however, in the sense that small enterprises cannot afford at their scale of output to employ full or part-time training staff, and an employee trained less well by ad hoc means is a better economic proposition.

295. Large enterprises, on the other hand, which require large numbers of workers to be trained, may take advantage of techniques of training which are more efficient on a large scale than the "absorption" methods of small enterprises. These techniques, calling for specialized training staff and equipment, involve heavy fixed costs which can be spread over a sufficiently large number of trainees

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7/ Taishiro Shirai: The Impact of Rapid Economic Growth on Employment Structure in Japan, paper submitted at the Conference on Problems of Employment in Economic Development, Geneva, 12-18 December 1963 (mimeographed), p. 6.

8/ Taishiro Shirai, op. cit., p. 12.

9/ Ibid., p. 50.

to provide cheaper and more effective training than "absorption" training. The arguments levelled against the "inadequate" training carried out over a large part of industry are, therefore, arguments in favour of co-operation by small enterprises in carrying out their training activities together, and for public financial and organizational support of such joint training so that economical use can be made of better techniques of training. The possibility of such co-operation would depend on the spatial distribution of small enterprises in industrial branches, the degree of similarity of production techniques, and on guarantees against abuses to gain an economic advantage to any particular enterprise, for example, by non-payment of training dues. Government action to promote and protect such co-operation might be necessary and desirable in the interests of the industry as a whole.

B. HOW THOROUGHLY SHOULD PEOPLE BE TRAINED?

296. Training costs influence the degree of specialization in training and the distribution of training time over the working life of trainees. The problem in this case is to find appropriate "time pattern" and the degree of specialization of training which is most suitable to the peculiar conditions prevailing in each country. For example, over-training, while possibly advantageous for the individual, since it may allow a wider range of occupational choice, may not be directly useful for the country since there will be no immediate opportunity for full utilization of the skills acquired. Under-training, on the other hand, may be frustrating for the individual. It creates a rigidity in the skill structure of the working population and does not allow sufficient mobility to accommodate the rapid changes in the "product mix" required for industrialization. There is a problem, therefore, of balance between specificity and flexibility. Both over-training and under-training have undesirable aspects. The more skills acquired and the more generalized the training, the more flexible will each trained person be in the event of changes in the occupational structure of the work force. Conversely, the fewer skills acquired and the more specialized the training, the less flexible will each trained person be. In order to determine the appropriate method in training which will provide a worker with the necessary specialization within the "time pattern" no clear-cut solutions can be given. The initial training

can be devised in such a way as to equip the worker to work in the full range of occupations. Alternatively, the training may be phased: initial training of a limited type to be followed by further training. There are, however, certain factors which need to be considered. First, there is a risk for undertaking a full initial training, since the entire range of skills may not be required for some time. Secondly, a trainee might wish to seek employment as soon as he has a certain skill basis rather than wait until the entire training is finished. The social, as well as the personal, cost of waiting is particularly high in the developing countries, where living standards are so low. Training projects with low initial capital outlays and short waiting periods such as a training plus retaining system, appear to be suitable to the conditions in the developing countries. On the other hand, subsequent retraining may result in loss of income to the worker, at a time when he needs it most, in view of his dependants, etc. In such cases, subsidies are sometimes given. This experience is prevalent in some East European countries, France and Sweden. In Sweden, for instance, workers undergoing retraining for the adaptation of their skills to structural changes in production are paid transportation costs, housing expenses and an amount equal to the beginning wage of the occupation for which they are being trained.[10/]

297. In some developed countries, emphasis seems to have been on full initial training rather than on limited initial training plus further training. Their social framework is such that most people are unable to afford the loss of income attached to training in later years, and cannot obtain finance over the period to cover this loss of income.[11/] In Eastern European countries, however, more stress seems to have been laid on training plus further training systems. Special holidays with pay are granted for workers to attend advanced courses. Many workers attend general and technical education classes part time. In one factory at least in the

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10/ Statement by Bernard E. Teets, European Manpower Report to the Annual Meeting of the Interstate Conference of Employment Security Agencies, Omaha, USA, October 1963, page 8 (mimeographed).

11/ In France, Sweden and the Netherlands, however, considerable steps have been taken towards removing this burden from persons seeking retraining, through the provision of wages for trainees and housing and other benefits. Samuel C. Bernstein: European Manpower Report, pp. 1-5.

Ukraine SSR every second worker was receiving some kind of additional training.[12/] In the Byelorussian SSR, 10-15 per cent of all workers are retrained each year.[13/] In the USSR, in 1960, 6.8 million workers and employees, including 6.4 million wage workers, were enrolled in programmes of training for increasing skills within individual plants. About 40 per cent of trainees were in professional technical courses, about 14 per cent in work method courses designed to raise the level of productivity of low-output workers. There were about 14 per cent receiving training in a second field of work to increase their job mobility, and the remaining were retrained owing to changes in technology on product mix.[14/]

III. FINANCING OF EDUCATION AND TRAINING

A. EXTERNAL AID

298. The Addis Ababa Plan envisages that about 30 per cent of the cost of the programme for Africa would have to be financed externally. The aid implications for the other regional plans are not precisely set out, but they may be assumed to be less (say, 20 per cent), because of the special factors operating in Africa which make education more costly. The external finance needed for the higher-level education of the required technical manpower derived in chapter 1 might therefore amount to about $500 million over the fifteen years 1960-1975.[15/]

299. It is exceedingly difficult to estimate the present level of international aid for the development of technical education and training in the developing countries. However, the level of aid or technical assistance directly for this purpose administered by the United Nations[16/] organizations may have been roughly about $40 million in 1961.

12/ Statement by Eugene I. Efremenko (Workers' delegate, Ukrainian SSR) at the Preparatory Technical Conference on Employment, International Labour Organisation, Geneva, October 1963.

13/ Statement by Victor F. Pashentsev (Employers' delegate, Byelorussian SSR) at the Preparatory Technical Conference on Employment, Geneva, October 1963.

14/ Murray S. Weitsman, Murray Feshbach, Lydia Kulchycka, "Employment in the USSR", Dimensions of Soviet Economic Power, 1962, p. 637.

15/ See paragraphs 280-281 of this chapter.

16/ Latest data for which the breakdown of aid was available.

300. This amount was made up of the following:

TABLE 4.4

United Nations Assistance to Education and Training in the Developing Countries (in million dollars)

Source of Assistance			
Special Fund			
Higher and intermediate level technical education and training			18.8
EPTA			
Fellowships - country projects	4.1		
- regional projects[a]	1.1	5.2	
Technical education and training		0.4	
Vocational training		1.4	
Science teaching		0.1	
Assistance to advanced education		2.8	9.9
Regular Budgets			
Fellowships - all projects[a]		8.9	
Technical education and training, etc.[b]		2.6	11.5
			40.2

Notes: (a) Calculated on the basis of the average expenditure ($2,038 p.a.) per fellowship.

(b) Calculated on the basis of the same proportion of aid (15 per cent) being devoted to technical education and training, vocational training, science teaching and assistance to advanced education as in the EPTA programme.

Source: United Nations Annual Report of the Technical Assistance Board, 1961, E/3605/Rev.1; E/TAC/REP/213/Rev.1.

301. It should be noted that the expenditure on technical assistance projects in teacher training (approximately $US1 million) has been excluded. Data given in table 4.4 cover fields wider in scope than technical education and training proper. This factor is, to some extent, counter-balanced by the technical training directly

or indirectly entailed in the advisory services, and the training of local "counterparts", accompanying technical assistance projects outside the field of training proper. It was not possible to make an estimate for the bilateral aid and technical assistance in this field.

302. It should be noted here that expenditures financed under technical assistance programmes cannot be compared with the estimates of foreign assistance. The training programmes mentioned in paragraph 300 above contain salaries plus allowances and travel of expatriate staff, while the latter relate to needs in terms of local educational costs. Thus, the estimates of foreign contributions to training programmes need to be revised upwards to include costs of sending expatriates to the developing countries.

B. INTERNAL FINANCE

303. The internal finance required for the higher-level education and training was roughly estimated in the earlier paragraphs to be $US2,000 million over the period 1960-1975.

304. There are difficulties in identifying accurately each source in relation to the type of training. For example, Governments and enterprises very often subsidize private educational institutions. Government subsidies and tax concessions are given by the Governments to enterprises fulfilling certain training requirements. Sometimes apprentice taxes are levied to finance training centres. Some fragmentary evidence of a qualitative nature with regard to fees charged, and assistance from Government and industry is given in table 4.5. The table should be interpreted with due regard to the supplementary evidence appended as notes to the table.

305. The Governments of the developing countries have allocated great importance to the development of the educational system. There are three ways in which Governments finance programmes of technical education and vocational training: taxation, loans and by making use of personnel in other government activities without detracting too heavily from the performance of their primary functions.

306. All taxes for technical education and vocational training will be redistributive in the sense that those concerned directly in the process of technical education and vocational training (teachers and pupils, builders, printers and so on) will be better off, whilst those who pay taxes will be worse off. If sufficient resources

TABLE 4.5

Sources of Finance for General and Technical Education in Selected Countries

Country	Proportion of national educational expenditure spent on government and private schools (%)		Sources of Finance - General and Technical Education					
			Government Schools			Private Schools		
	Government	Private	Government %	Parents %	Enterprises and business operations of schools	Government %	Parents %	Enterprises and business operations of schools
GROUP I*								
Cameroon[1]	31	69	100					
Ghana[2]	95	5	100					
India	71	29	71	19	10			
Iraq	92	8	100					
Nigeria[3]	n.a.	n.a.	100					
Pakistan	81	19	80	12	8			
Peru[4]	89	11	n.a.					
Philippines	82	18	n.a.					
Senegal[5]	85	15	100					
Thailand[6]	88	12	100					
Tunisia	97	3	n.a.					
UAR	81	19	n.a.					
GROUP II*								
Brazil[7]	78	22	100					
Colombia[8]	80	20	100					
Ecuador	79	21	84	2	14			
Japan	87	13	32	3				
			62		3			
Mexico[9]	82	18	n.a.					
Poland[10]	100	0	100					
Uruguay[11]	86	14	100					
GROUP III*								
Belgium[12]	51	49	100					
Czechoslovakia	100	0	100					
France[13]	77	23	100					
Italy[14]	90	10	100					
Netherlands[15]	26	74	99		1			
Sweden[16]	98	2	100					
USSR	100	0	86	0	14			
UK	(86)	(14)	(73)	(12)	(15)			
England and Wales[17]	93	7	98	1	1			
USA	79	21	93	1	6	7	93	

* GROUP I : Per capita income less than $180 p.a.

* GROUP II : Per capita income greater than $180 but less than $500 p.a.

* GROUP III: Per capita income greater than $500 p.a.

Source: World Survey of Education, UNESCO, Paris, 1961.

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NOTES

1. Cameroon: The Government subsidizes private schools to some extent.
2. Ghana: Fees charged at government secondary schools.
3. Nigeria: Fees charged at government secondary schools.
4. Peru: Fees charged at government secondary schools.
5. Senegal: The Government subsidizes private schools to some extent.
6. Thailand: There are some student charges at secondary level.
7. Brazil: Some fees charged in post-primary schools. (Lower grade skilled workers trained in apprenticeship schools, and on the job, under the supervision of SENAI (National Service of Industrial Apprenticeship), which is financed by contributions from member firms.)
8. Colombia: Fees charged at government secondary schools. (Staff trained specially for business enterprises by SENA (National Service for Apprenticeship), which is financed by funds from such enterprises.)
9. Mexico: Fees and examination charges at government secondary schools.
10. Poland: Some services and funds voluntarily contributed by parents and industry.
11. Uruguay: No fees charged at government secondary schools.
12. Belgium: The Government extensively subsidizes private schools.
13. France: No fees charged at government secondary schools.
14. Italy: Fees charged at government secondary schools.
15. Netherlands: The Government subsidizes private schools on the same basis as the government schools.
16. Sweden: No fees charged at government secondary schools.
17. UK (England and Wales) The figures in brackets refer to financial sources at government universities.

are raised through taxation, it would mean a transfer of income from the traditional sector, which is very large in all developing countries, to the modern sector, which includes technical education and training activities. Such a transfer sometimes tends to create difficulties of a political nature.

307. Practices of levying tax on education and training matters vary in different countries. In Yugoslavia, enterprises which do not train apprentices pay a special tax corresponding to the costs which would have been incurred had they undertaken the training customarily required. These funds are used to finance special training centres. In the United Kingdom, steps are being taken to introduce a similar scheme, supplemented by subsidies to enterprises undertaking approved training. In Colombia and Brazil, the National Apprenticeship Services (SENA and SENAI respectively) are financed by an allocation from funds collected by means of a pay-roll tax under the family allowances scheme. In Colombia, 2 per cent of the pay-roll of enterprises employing more than ten persons is devoted to SENA for training purposes in special centres. While such a scheme is not specifically tied to an enterprise's performance in providing training, it has, on the other hand, advantages of simplicity. It facilitates distribution of financial responsibility for training in an equitable manner upon those who will benefit from it, ensuring that enterprises which do not provide training facilities themselves must still pay for the training of the skilled personnel which they obtain.

308. Loans are generally raised in financing expenditure on buildings and equipment for technical education and vocational training institutions. They may be used in lieu of taxes (and fees) to finance these expenditures. While they raise fewer political difficulties than taxes, there are usual economic difficulties in mobilizing the savings required. On the other hand, in view of the small sum, the effects on interest rates and the inflationary potential may not be of considerable significance.

309. In-plant training has certain merits. It ensures that the skills taught are those appropriate to existing, and not out-dated, technology, and is by definition responsive to changes in demand for various categories of skills. Moreover, such systems allow earning to accompany training. This system of training thus lends itself to serious considerations. The available experience shows that the results are very favourable. It presents, on the other hand, difficulties largely of

implementation. It is difficult to promote this kind of training on a purely voluntary basis since the returns may not fully accrue to the enterprise which has incurred the costs of training, as those who have been trained may go to other enterprises. Nowadays, it is generally the enterprises paying the highest wages or offering the best conditions which do most of the in-plant training and these, generally, tend to be the largest enterprises. Their turnover of trained personnel also tends to be low. In order to expand in-plant training, the enterprises generally should be encouraged to expand their training, and means must be found therefore to insure them against losses of investments made in training their personnel.

310. A limited form of a bond system might be applied on the basis of a bond commitment by trainees to an industry or group of firms which would collectively finance the training. This system would permit freedom of choice of occupation and place of work within the industry for the trainee and should also protect his right to work outside the industry in circumstances of individual need. On the other hand, subsidies might be given to enterprises which undertake training, such as is done in the Netherlands, Switzerland, Pakistan and Canada, for example. Finally, the system of apprenticeship taxes already mentioned provides an insurance against losses of investments made in training personnel, since all enterprises collectively finance the training required.

IV. FEES AND PART-TIME TRAINING

311. The central argument against financing education or training through fees is that it is inequitable as between pupils from poorer and richer families. However, it is a fact that in many instances, it is only the relatively well-to-do families which can afford the income loss involved in a full-time formal education for their children, once these come of earning age. This age occurs around the time when children usually start secondary-level training. Thus, to encourage poorer families to give their children full-time education, substantial scholarships and allowances would be necessary at a level commensurate with the earning capacity of these children in employment. It would not be sufficient merely to eliminate fees altogether, and the financial responsibility of the Government would have to be markedly increased if formal education at secondary and higher levels were to be truly on a basis of equal opportunity.

312. It is evident, therefore, that to expand training at the rate required for rapid industrial development implies that at secondary and higher levels of training adequate part-time systems of education must be set up to allow the abilities of the children of poorer families to be fully realized. Such part-time systems are not normally part of the formal school system, except at higher levels, in some fields, in which courses are so arranged as to enable students to complete their qualifications on a piece-meal basis. However, there exist numbers of private part-time and correspondence training institutions organized as profit-making concerns, which are not subsidized by the State and, thus, charge high fees, which are their sole source of revenue. Such concerns frequently offer the most economic training alternative to full-time education to children from poorer families despite the high level of fees, since they enable training to be combined with gainful employment. An expansion of similar State-organized institutions, which might charge fees at a level commensurate with, or even lower than, the level of fees in the formal school system, might well prove both more equitable and more effective than an expansion of full-time formal schooling financed largely by State funds.

313. In the USSR, for instance, great emphasis has been placed on developing part-time and vocational training as an alternative to full-time general and technical education. Two-thirds of those undertaking training in secondary technicums, for example, do so by part-time means.

V. CONCLUSIONS AND RECOMMENDATIONS

314. A. The developing countries should keep under review the financial implications of their programmes of technical education and vocational training. To this end, standard costing systems should be instituted for each educational and training programme, so that data may be collected, and analyses made of:

(a) the costs of systems of providing the higher and intermediate technical personnel required for industrialization, and,

(b) the ways in which enterprises, and government and private schools, may finance increased technical education and vocational training, with a view to:

(i) reducing the costs of technical education and vocational training wherever possible, and

(ii) finding methods of finance appropriate to conditions in the developing countries.

B. The international agencies concerned should assist the developing countries in carrying out detailed inquiries into these financial questions, through their research and information programmes and under their programmes of technical co-operation.

C. The investment made in training by enterprises must be emphasized as an important factor in the industrialization of developing countries. Educational and training plans in the developing countries should take due account of this importance.

D. The development of systems of part-time education and training which reach a wide population of people who can not afford the income lost during full-time education and training, is an essential ingredient of an equitable and effective technical educational and vocational training system.

CHAPTER 5

TRAINING OF TECHNICAL PERSONNEL FROM THE DEVELOPING COUNTRIES IN THE INDUSTRIALLY ADVANCED COUNTRIES

I. INTRODUCTION

315. General Assembly resolution 1824 (XVII) in its operative paragraph 2 (c), requested "information concerning the progress being made in the training of technical personnel for the developing countries in the industrially advanced countries, and the method employed". In this chapter, available information on the subject is reviewed, and in particular information on the experience acquired by the developed countries in transferring the technical know-how to the developing countries through training programmes. Reference will be made to the extent of the use of training facilities available in the developed countries rather than to providing the data on facilities themselves.[1/]

316. A preliminary inquiry into the available sources of information on the above indicated that there are serious gaps in the data. While there is considerable material on the subject of training generally, it was difficult to ascertain the industrial component of the training programmes. The reports dealing with bilateral aid programmes generally dealt with assistance in the field of training as a whole which, in itself, was a part of the over-all discussion of the programmes of assistance. Training provided under the bilateral and international organizations is only a part of the picture. The bulk of training in industry is provided by the equipment producers, parent companies with industrial establishments in the developing countries, trade organizations, etc. In addition, various private foundations sponsor and finance training of technical personnel in the developed countries. Data on such training are not available. It is also difficult to collect data from thousands of private industrial establishments within the time and resources available in preparing the present report.

1/ Considerable data on the training facilities both in the established educational institutions and in the ad hoc training institutions exist in publications such as UNESCO, Training Abroad; OECD, Third Country Training Newsletter, International Association of Universities, International Handbook of Universities, Paris: 1959; American Council on Education; American Universities and Colleges, 8th Edition, Columbus, 1960.

317. Under the circumstances, it was decided to circulate a questionnaire to donor Governments seeking data on certain important aspects of training.[2/] In order to extend the coverage as far as possible, the Governments were also requested to provide data on training provided by private companies. The questionnaire, which was sent to twenty Governments, was prepared by the Centre for Industrial Development and approved by the Inter-Secretariat Working Parties in May 1965.[3/] A copy of the questionnaire and the list of the countries to which it was sent are attached as annex A and B to this chapter, in Part Three of this report.

318. In order to make the questionnaire more specific, the following definitions were provided in the questionnaire:

The term "technical personnel of the intermediate and higher levels" has been defined to cover skilled workers, foremen and engineers including top management. For this purpose, the term "industrialization" has been defined broadly to include manufacturing, transport, energy and other supporting services.

(a) Skilled Workers: Persons who have received a broad education and training in the exercise of a trade or craft in a particular field. These persons have normally undergone a certain number of hours as apprentices in a factory and can set machines and take work from daily paid or unskilled workers. (Example - tool and die maker, repair and maintenance mechanics.)

(b) Foremen or Technician: The term applies to persons in occupations requiring a knowledge of technology and related sciences between that of a skilled worker and that of an engineer; duties at this level would require inspection and maintenance, detailed development plans, supervision of production work, etc.

(c) Engineers or Technologists: The term applies to persons working in occupations for which the need of education in appropriate sciences in universities or equivalent institutions of higher education is officially or traditionally recognized; this level of occupation would cover such activities as research, development, organization, production, etc.

2/ Many developing countries offer training facilities to other countries under certain regional arrangements. These were excluded from the inquiry.

3/ See Part One, paragraph 5.

(d) Management: Personnel for making decisions and supervising their implementation.

319. Of the twenty countries to which the questionnaire was sent, sixteen replied. Valuable information was provided by the Governments in their replies. The information, however, lacked uniformity and, in many cases, it was limited. Although it would be difficult to draw any substantial conclusions, the data provide a concrete base to illustrate the problems involved in training.

320. It must be stated here that the discussion of the problems in the present chapter is based primarily on the data contained in the replies. While an effort is made to supplement this information from other sources, one cannot but feel the inadequacy of information in general, which is bound to reflect on the treatment of the problems in this chapter.

II. NUMBER OF TRAINEES IN THE DEVELOPED COUNTRIES

321. Each year a large number of technical personnel from the developing countries travel to the developed countries to undergo training in various aspects of industrial development in the universities, government-sponsored institutions and in industrial establishments. The number of trainees undergoing such training has grown considerably since 1950. The intensification of efforts by the developing nations to promote and accelerate the process of industrialization has provided considerable stimulus to the increased flow of trainees to the developed countries. There is also a growing desire, which is a part of the over-all process of learning and doing, to seek better understanding of the process of development in general and to acquire technical knowledge in particular.

322. The number of trainees in a developing country is determined by the size of its aid programme, historical ties with developing countries and the extent of training facilities available for education and training. Table 5.1 gives an estimated student and trainee population in various countries receiving training in all fields. The data are not firm, largely owing to the fact that estimates lack uniformity. On the other hand, they provide rough orders of magnitude. Generally, students are supposed to be preparing for a diploma in the established educational institutions and the trainees are undergoing ad hoc training programmes both inside and outside of the educational system.

TABLE 5.1

Average Number of Students and Trainees from Developing Countries in 1962

COUNTRY	TOTAL NUMBER FINANCED BY THE BILATERAL PROGRAMMES			TOTAL NUMBER FINANCED BY OTHER SOURCES	
	Students	Trainees	Total	United Nations	Private Students
Austria[a]	7,731	N.A.	7,731	45	N.A.
Australia[a]	N.A.	429[b]	4,624[c]	56	N.A.
Belgium	1,329	667	1,996	146	1,329
Canada	736	307	1,043[d]	93	2,500
Czechoslovakia[a]	N.A.	N.A.	386	135	N.A.
Denmark[a]	N.A.	N.A.	58	516	500
France[a]	2,716	6,806	9,522	941	25,000
Federal Republic of Germany	2,407[a]	3,529[a]	5,936	325	22,361[a]
Italy	N.A.	N.A.	2,073	277	2,073
Japan	684	87	771	216	4,470[e]
Netherlands	N.A.	N.A.	179	212	506
Switzerland	156	370	526	476	2,248
USSR[a]	7,037[f]	2,500[g]	9,537	463	N.A.
U.K.	N.A.	N.A.	8,521	948	2,248
U.S.A.	5,640	2,632	10,388[h]	785	40,000

Source: O.E.C.D. Preliminary Comparative Information on the Volume of Technical Assistance: Note by the Secretariat. DAC/TC(63)4, 17 September 1963, page 3.

United Nations: Annual Report of the Technical Assistance Board for 1962, E/3739/Rev.1. Annex XI

a/ Data obtained from the reply to the United Nations questionnaire.
b/ Data refers to 1955-1963 in industry obtained from the reply to the United Nations questionnaire.
c/ Data refers to total training in every field within the Colombo Plan during 1950-1963.
d/ Data refers to industry only.
e/ Data refers to 1961.
f/ Data refers to past few years of which 2,307 is for 1963.
g/ Data refers to past few years.
h/ Includes 2,116 Third Country Trainees.

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323. The replies to the questionnaire contained specific data on trainees in the field of industrial development. The detailed tables are contained in Annex C to this Chapter in Part Three of this report. From the available information, it is apparent that most of the training in the field of industrial development is provided at the professional level; namely engineers, technicians, and scientific personnel. The emphasis on providing training facilities at the intermediate and higher levels is based on both financial considerations and the nature of facilities available for training. In Canada, a similar approach was evident but exceptions were made in the case of supervisors and instructors in machine-shop practice, mill and foundry practice, power house operation and maintenance, etc. In the case of the United States, the training programmes undertaken under the auspices of the Agency for International Development related to foremen or technicians, engineers or technologists, and management categories. Similarly, in the USSR, nearly all the nationals of the developing countries were studying in higher technical establishments, which train intermediate and higher level specialists in various fields. Of 2,307 trainees in 1963, only 310 were in the secondary technical schools.

324. It will be interesting to refer to United Nations experience in providing training in industrial development under its various programmes of technical experience.[4/] Of 603 fellowships awarded by the United Nations in 1963 under its Expanded and Regular Programmes of Technical Assistance (See Table 5.2) 645 fellowships were awarded in the field of industrial development. Almost all the Fellows received their training in the developed countries. The number of fellowships awarded for industry is rather small which, to some extent, is due to the narrow definition employed in the tabulation. Nevertheless, it is surprising that, despite high priority accorded to industrialization programmes in the developing countries, the number trained in industrial development and technology is very small. The Economic and Social Council noted this trend with concern in its resolution 898 (XXXIV) of 2 August 1962 and invited the Technical Assistance Board, the Special Fund and the organizations participating in the United Nations

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4/ A detailed study on the subject is to be found in the article, "United Nations Fellowships for Industrial Development": Industrialization and Productivity, Bulletin No. 6, pp. 47-56.

TABLE 5.2

NUMBER OF FELLOWSHIPS AWARDED UNDER THE EXPANDED AND REGULAR PROGRAMMES OF THE PARTICIPATING ORGANIZATIONS, 1957 TO 1961

Year	All fields		Industrial Development			
	All organi-nations a/	United Nations	United Nations b/	ILO c/	FAO d/	UNESCO e/
1957	3,589	718	152	290	650	48
1958	3,638	798	124	222	45	124
1959	4,259	1,028	180	289	52	103
1960	4,913	919	139	229	80	136
1961	5,424	1,095	80	317	48	110
1962	7,606	1,830	285	385	127	235
1963	6,031	1,603 f/	187	389	32	37

Source: Official Records of the Economic and Social Council, Twenty-sixth, Twenty-eighth, Thirtieth, Thirty-second, Thirty-fourth and Thirty-sixth Sessions, Supplement No. 5; Annual Report of the Technical Assistance Board for 1957, 1958, 1959 1960, 1961 and 1962; Industrialization and Productivity, Bulletin No. 6, page 48.

a/ United Nations, specialized agencies and the International Atomic Energy Agency.

b/ Including chemical industries, engineering (machinery and tools) industrial management, primary metal industries, printing, pulp and paper, small-scale industries, textile industries, and others.

c/ Vocational training and, since 1960, manpower organization, which has been combined with this heading, have not been excluded from the ILO data in this Table, since the article is not concerned with fellowships of this type. In the ILO programme, these amounted to: 1957, 286; 1958, 185; 1959, 276; 1960, 330; 1961, 226; 1962, 397. The ILO figures include social security, co-operation handicrafts and small-scale industries, labour conditions and administration, workers' education, productivity and management development. It is assumed that most of the fellowships in these fields relate to industrial development.

d/ Fisheries and forestry. The Food and Agriculture Organization of the United Nations (FAO) also grants fellowships for land and water development, plant and animal production and protection, rural institutions, nutrition, etc.

e/ Natural sciences - UNESCO also grants fellowships in education, social sciences, cultural activities and mass-communication.

f/ In addition, during 1959-1963, 310 persons, working on 56 projects supported by the United Nations Special Fund, were sent abroad for advanced training.

Technical Co-operation Programmes "..... to give favourable consideration to requests aimed at the education and training ....." for industrial development of developing countries.

325. Data on the training in industrial development as a percentage of total training under the bilateral programmes are not readily available. However, some data for the United States and Colombo Plan countries indicate the similar experience as encountered by the United Nations. The following Tables 5.3 and 5.4 show the number trained in industrial development. The number of trainees in industry is considerably low as compared to training in other fields.

TABLE 5.3

Arrivals of Foreign Participants in the U.S.A.
1956-1961

(By Field of Study)
(Participants in Third Countries Excluded)

Field/Year	1956	1957	1958	1959	1960	1961
Agriculture and Natural Resources	887	945	907	1,148	1,141	1,061
Industry and Mining	1,363	1,303	1,271	1,599	1,577	1,580
Transportation	322	507	470	476	514	620
Labour	582	615	600	749	680	615
Health and Sanitation	451	392	340	471	428	441
Education	494	674	759	606	1,138	798
Public Administration	431	449	566	664	724	823
Community Development	77	148	129	135	133	72
General and Miscellaneous[a/]	127	7	89	229	249	279
Atomic Energy	-	264	168	134	205	221

Source: ICA, Annual Operations Report.

a/ Figure for "General and Miscellaneous" in 1956 includes Atomic Energy; no separate figures available for Atomic Energy in 1956.

TABLE 5.4

COLOMBO PLAN: Number of Trainees by field of Training[a/]

Field	1957-58	1958-59	1959-60	1960-61	1961-62
Education	168	344	215	505	528
Medical and Health	146	221	231	235	311
Food, Agriculture, Forestry	160	169	184	248	251
Power and Fuel	20	44	70	47	55
Engineering, Industry, Trade	343	363	476	365	404
Transport and Communications	100	165	210	224	212
Administration	170	215	174	219	235
Banking, Finance, etc.	64	67	77	57	142
Other fields	93	129	120	161	168
TOTAL	1,264	1,717	1,757	2,061	2,306

Source: The Colombo Plan, Technical Co-operation Council, Annual Reports.

a/ Excluding participants under the AID Programme.

III. ORGANIZATIONAL MACHINERY IN THE DONOR COUNTRIES

326. In order to handle a large number of trainees, the host Governments have set up, in some cases, special machinery to deal with evaluation of requests for training and administration of training programmes. Very often, such organizational machinery forms a part of aid operations. In the case of countries where the volume of aid is comparatively small, the services of the diplomatic offices in the developing countries are utilized for receiving and transmitting applications to the appropriate ministries in the host Governments. In the case of the United States, the International Training Division in the Agency for International Development handles the requests submitted by the AID offices located in the developing countries. The AID training officers arrange and supervise programmes of training with the assistance of various federal agencies and scientific and technological institutes in the country. The Department of Technical Co-operation

in the United Kingdom is responsible for programmes of training in the United Kingdom which are financed under British technical assistance. Applications for facilities for training are made through British diplomatic missions in developing countries within the limits of aid available. The arrangements for placing of the trainees in the United Kingdom are handled by the British Council and the Ministry of Labour, in consultation with manufacturers' associations, scientific organizations, etc. In the USSR, the training programmes, as in the case of their bilateral aid programmes, are handled by the State Committee for Cultural Relations with Foreign Countries, in close co-operation with the Academy of Sciences of the USSR, the Ministry of Higher and Specialized Education, and other bodies.

327. In France, the Association for the Organization of Training Courses (ASTEF) was established in 1958 to deal with the training of personnel from the developing countries. This organization is sponsored by the Government and several industrial enterprises, both public and private. In Czechoslovakia, the state organization Polytechna is in charge of technical co-operation with developing countries. Its function consists of planning, provisional finance, organization of individual schooling and provision of social facilities for trainees, evaluation of the results of training, and co-ordination of the work of individual institutions participating in training. Preparation of schooling of trainees is made by the department for foreign relations of every ministry and specialized agency. In Japan, the quasi-governmental Overseas Technical Co-operation Agency performs the planning, programming and executing of training of foreign personnel, under the supervision of the Ministry of Foreign Affairs. In the Netherlands, the Office for International Technical Assistance is set up to handle, among other activities, the training of personnel from developing countries.

328. While the above-mentioned donor countries administer individually their bilateral aid in training of tehcnical personnel from the developing countries, Norway and Denmark launched a special system by channeling their aid through the United Nations, which is expected to result in a wider choice of placement, better selection of training institutes, larger economy on over-all expenses, etc.[5/]

5/ Organizational procedures adopted by the United Nations and the specialized agencies are treated in detail in Annual Report of the Technical Assistance Board for 1962 (E/3739/Rev.1): Review of Fellowships, pp. 89-99.

IV. METHODS OF TRAINING

329. The formulation of a training programme is undertaken by the developing country in the light of its needs and of facilities for training in the donor countries. In the selection of trainees, considerations applicable to programming of technical assistance at the country level applied to questions of training as well. The candidates were chosen by the host Governments in the light of their ability to benefit from training. Considerable work was involved in the processing of applications and in arranging a training programme. In this, much experience has been obtained and fairly well established procedures have been set up with a resulting economy of time and resources, although much needs to be done in terms of reducing the waiting period between the date of application and the commencement of the training programme in the host country.

330. While efforts are made on the part of the aid-giving Governments to provide opportunities to obtain training in a number of institutions, the general preference of the trainees from the developing countries, on the whole, is in favour of acquiring a university degree as a part of their training programme. It is realized that obtaining a degree involves a longer period of stay and higher outlay for the training programme. In view of the considerable importance attached to foreign degrees and diplomas, a trainee prefers, as far as possible, to plan his programme leading to a degree or a diploma. The training programmes arranged by the aid-giving countries on the other hand, emphasized training in skills which could be obtained quickly.

331. The senior personnel in government and industry dealing with policy and management problems, as the data indicated, prefer general observation tours. The time period for such type of training is generally short and, in some cases, tends to be too short. This is largely because senior technical personnel, who are very scarce in the developing countries, can not afford to be away from their jobs for a longer period of time. However, it is not possible to generalize on the basis of time allotted to training alone, in view of the fact that each training programme is tailor-made and needs to be evaluated separately.

Placement in the factories

332. While every effort is being made by the aid-giving countries to provide facilities for training, placement for the trainees in the industrial establishments for a longer time has been found to be a very difficult problem. There has been a desire on the part of the trainees to obtain practical experience by being able to work in the factories as a part of their training. Although formal training with occasional visits to the factory is helpful, it is considered as no substitute for actual work in the plant itself. The number of trainees who are able to obtain placement in the plants in the United States, for example, is less than 8 per cent of the total trainees in the field of industrial development. The chart in annex D, in Part Three of this report, on the breakdown of the formulation of training in the United States, provides an interesting example. If data in similar detail were to be available for other countries they would have provided useful comparisons. Similar problems of placement have been experienced in the case of United Nations Fellows in the field of industrial development. As the data in the following table 5.5 indicate, it was possible to obtain placement for the United Nations Fellows for only 3 per cent of the total fellowships offered.

TABLE 5.5

Placement according to type of Fellowship Programme

	Percentage
Study tours	60
Placement in universities and training centres.	37
Placement in industry	3
	100

Source: Industrialization and Productivity, Bulletin No. 6, page 49.

333. There are, however, inherent problems in this task, since the industrial establishments will find it difficult to interrupt work schedules by accepting additional persons, which tends to hamper, to some extent, the routine of operations. Moreover, some of the industrial establishments are jealous of guarding certain advances in technology, on which they have spent large sums of money. In some countries, labour unions object to training of this type in the case of foreign participants. Since plant experience is valuable, alternative means of obtaining such experience will have to be found. Consideration, therefore, may be needed in formulating appropriate training programmes and providing facilities for them.6/

Group training

334. Recently, group training has received some attention and it is being encouraged both by the participants and the host Governments. From the point of view of the host Governments, group training provides advantages of economy, homogeneity of groups, language requirements, etc. Some countries such as the United States encourage, where possible, group training programmes, particularly if the duration of the training period is eight weeks. Two types of group training have been encouraged, namely personnel at all levels in a given industry, and personnel of similar levels of functions in a number of industries. In the experience of the United States, group training for longer periods may not be fruitful; the reason being that longer training will obviously require training in depth and this can be given only on an individual basis. From the data available, it was not possible to indicate the superiority of one type of training over the other. Much depends on the special situation involved in the question.

335. According to the United Nations experience; there are cases in which a fairly large number of Fellows from one country or from a group of countries with similar conditions can be given group training abroad. The International Labour Office reports success with group method in such fields as vocational training and labour administration, but it is not always suitable for senior officers or advanced specialized personnel who must continue to be dealt with individually.7/ Other

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6/ Proposals for in-plant training of engineers are included in Annex D to Chapter 3 of Part Three of this report.

7/ See Annual Report of the Technical Assistance Board for 1962 (E/3739/Rev.1), page 96.

organizations in the United Nations system had favourable experience with training by holding seminars for groups of senior officials. The United Nations Secretariat at New York has organized a training programme for development financing for the purpose of providing officials from developing countries with additional knowledge and information on the way development projects can be financed and the existing sources where such financing can be obtained. This training programme is a continuation of an earlier United Nations programme devoted to the training of African economists, which was first initiated in 1957.[8/] The International Bank for Reconstruction and Development has established since 1955 the Economic Development Institute which provides training in problems of economic development, including industrial development for senior officials of developing countries. This Institute, which is located at Washington, has so far trained 225 officials from over sixty countries.[9/]

336. The International Labour Office has established an International Centre for Advanced Technical and Vocational Training at Turin with the assistance of the Italian Government. The Government of Italy has provided buildings and some financial assistance, which is supplemented from financial contributions from other Governments, private foundations, etc. Training facilities will be available to 600 trainees in the first two years, leading to 2,000 trainees in 1970. Training will be given to highly skilled workers, technicians, foremen, instructors and senior management personnel from the developing countries. The training programme at the Turin Centre is designed to provide advanced technical training, for which facilities do not exist in the developing countries. The trainees will be selected from among those who have already attended various vocational and productivity centres sponsored by the ILO as a part of their technical assistance programmes. The Centre is to commence its activities in 1965.

337. The Centre for Industrial Development has initiated recently, in co-operation with the Bureau of Technical Assistance Operations, the convening of seminars in the

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8/ United Nations Review, Volume 1, No. 3, March 1964: United Nations Training Programme in Development Financing.

9/ IBRD, The Economic Development Institute, 1963-64, Washington, D.C., September 1963.

industrially advanced countries in which technicians and engineers from both advanced and developing countries participate. These seminars and workshops deal with recent advances in technology including economic aspects of specific industries which are of importance to developing countries. In Prague and Geneva, an Inter-Regional Symposium on recent advances in iron and steel-making was convened in October 1963, in which representatives of fifty countries participated. Of these, twenty-nine were representatives of the developing countries.[10/] Another Seminar on the Cement Industry was convened in Denmark in May 1964. Another Seminar on Industrial Complexes is planned in September 1964 in the USSR.

Other training

338. In addition to the training given to the personnel of the developing countries in the developed countries, experts, technicians, teachers, etc. are sent out to train local personnel in the various countries themselves. They are engaged in teaching at the vocational, higher technical educational institutes, and instructing workers on the job within the local industries. Equipment is provided for the training and educational institutes in the developing countries. Some countries provided, in addition to the current aid programmes, special aid assistance (e.g. Peace Corps, United States; Overseas Training and Aid Development Service, Federal Republic of Germany).

339. In the experience of the organizations participating in the United Nations technical assistance programmes, fellowships are usually most effective when given in conjunction with expert advice. The counterpart of the expert, after an initial period of work, goes abroad as a Fellow to obtain the required training and subsequently replaces the expert. In this way, training is made more specific and directed to fill the gap. While such training will enhance the efficiency of a given technical assistance programme (bilateral and multilateral) in the developing country, it is only a step, perhaps an essential one, in the over-all training programme of a country. Also, this method may be relevant in the case of a country with a certain basis of technical skills. In the case of newly independent

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10/ Report of the Fourth Session of the Committee for Industrial Development (E/3869), page 12.

countries, where training requirements tend to be more basic, other methods will have to be considered.

Follow-up of training

340. The problem of follow-up has been considered as one of the important, though difficult, aspects in the completion of the training programme cycle. It is generally understood that the trainee, upon return to his country, will work in the area in which he has received training. However, there is not much data about the manner in which training abroad has been utilized in the home country. Recently, certain procedures have been developed, largely with a view to keep contacts between the trainees and the training establishments in the host countries. These are achieved through publications by the alumnae associations, organizing technical conferences among participants after returning from training, etc. This has been possible in the cases of trainees going to the United States, United Kingdom, etc., but in the case of countries where the volume of resources devoted to training is comparatively small, no formal follow-up efforts are made on the progress of the trainees after their return.

341. The United Nations recently undertook a survey to determine whether trainees under its programme have been working in their home countries in the fields in which they were trained. Questionnaires were sent to 1,850 trainees, of which 1,271 from eighty-two countries replied. The results showed that after a period of two years subsequent to their training, 91 per cent of the Fellows were still engaged in their home countries on work related to their fields of study. Of the remaining 9 per cent, it is also certain that some were contributing to the advancement of their countries on the basis of knowledge gained during their fellowships.[11/]

342. The Agency for International Development of the United States Government has recently undertaken a study of evaluation of training programmes and the progress made by the trainees in their countries. The objective of the survey is:

11/ Annual Report of theTechnical Assistance Board for 1962 (E/3739/Rev.1), paragraph 615.

(a) to ascertain if trainees have returned to designated jobs, are utilizing their training effectively and transmitting their knowledge and skills to others;

(b) to identify significant factors contributing to or hindering training utilization and communication of knowledge and skill;

(c) to determine if the training is at the appropriate level of good quality and relevant to the trainee's need in the context of the home country situation;

(d) to ascertain if AID administrative practices and procedures are adequate to identify training weaknesses; and

(e) to provide more reliable information concerning the most effective types of study and training for particular cultures, to evaluate age and work experience relevant to successful training accomplishments and subsequent utilization.

Detailed results of the entire survey are not yet known, but available data indicate that a large majority of the trainees are utilizing their training effectively and contributing directly to the economic development of their countries.
