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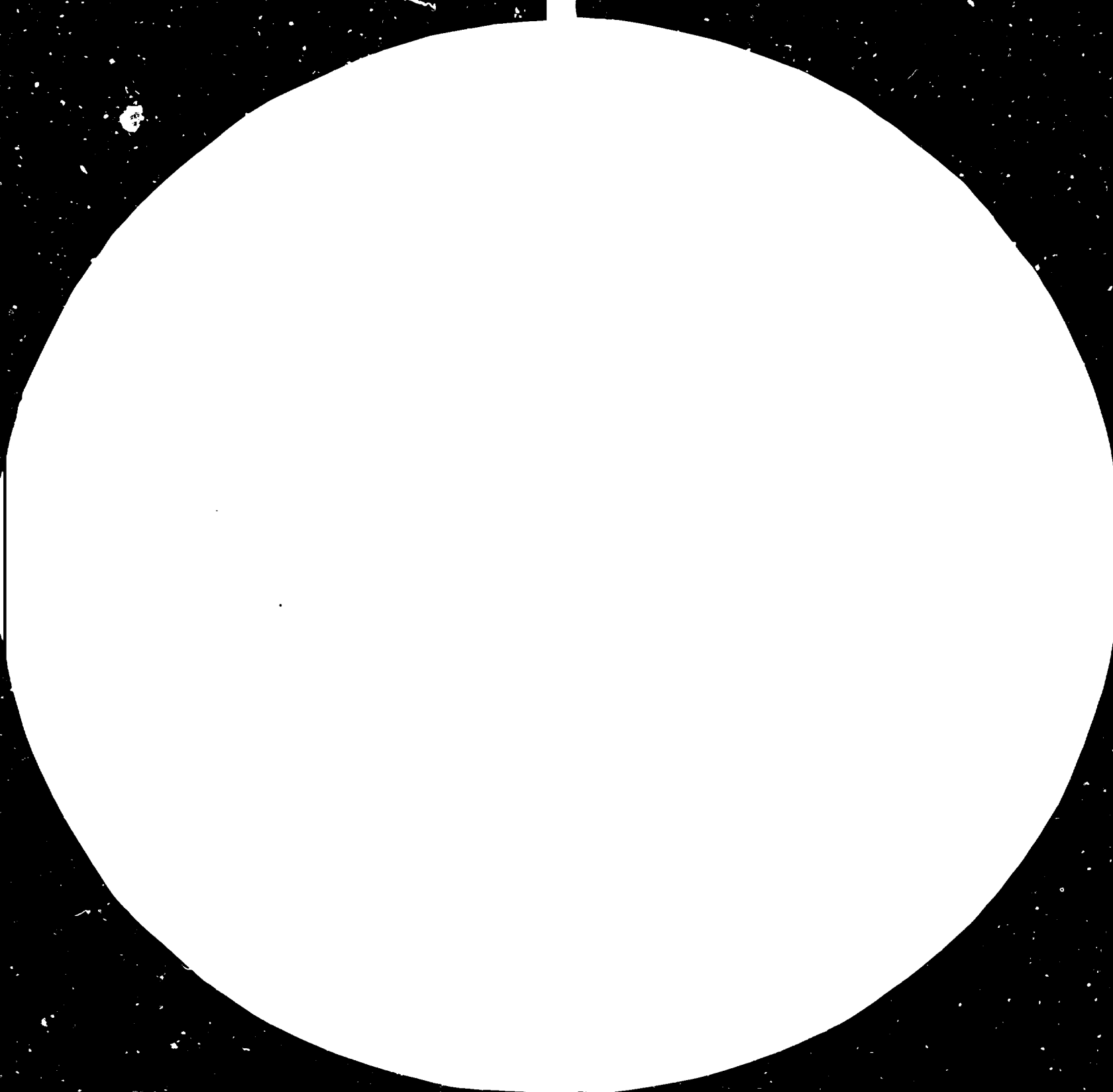
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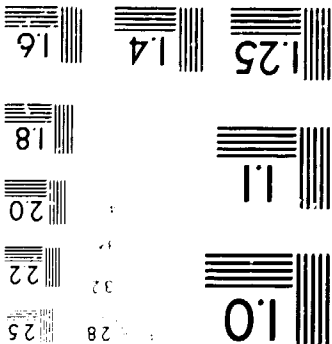
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CONTENTS

| | <u>Paragraphs</u> | <u>Page</u> |
|---|-------------------|-------------|
| I. INTRODUCTION | 1 - 4 | 1 |
| II. GENERAL CONSIDERATIONS | 5 - 19 | 2 |
| - The rationale of human resources development | 5 - 8 | 2 |
| - Human resources development in industrial strategy | 9 - 10 | 3 |
| - Types of capabilities | 11 - 15 | 4 |
| - Prerequisites for human resources development | 16 - 19 | 6 |
| III. THE CURRENT SITUATION IN DEVELOPING COUNTRIES | 20 - 41 | 8 |
| IV. POSSIBLE ELEMENTS OF A NEW APPROACH | 42 - 59 | 15 |
| - Reorientation of education | 43 - 49 | 15 |
| - Productivity of the population | 50 - 53 | 17 |
| - Education and industry | 54 - 55 | 18 |
| - Emerging technologies | 56 - 59 | 18 |
| V. ACTIONS TO BE TAKEN AT THE NATIONAL LEVEL | 60 - 72 | 20 |
| - Long-term measures | 62 - 67 | 21 |
| - Short-term measures | 68 - 72 | 23 |
| VI. INTERNATIONAL CO-OPERATION | 73 - 85 | 24 |
| - Co-operation among developing countries | 75 - 80 | 25 |
| - Co-operation between developing and developed countries | 81 - 82 | 27 |
| - The role of UNIDO and other international organizations | 83 - 85 | 28 |
| VII. CONCLUDING OBSERVATIONS | 86 - 91 | 29 |

I. INTRODUCTION

1. The Lima Declaration and Plan of Action on Industrial Development, adopted in 1975, drew world attention to the gap in industrial output, between the developed and the developing countries, and set a target share of at least 25 per cent of total world industrial production for the developing countries by the year 2000. At the time of the Conference, the developing countries' share was about 9 per cent. High on the list of measures to be taken to achieve the Lima Target was industrial manpower training. The need for concentration on the development of human resources for industry was emphasized, and the developing countries were called upon to "... establish training programmes to cover the needs of their industrial development... thus facilitating the establishment of structures to absorb modern technologies".

2. When the Third General Conference of UNIDO was convened in New Delhi some five years later, the situation with respect to the industrialization of the developing countries was seen to be particularly acute. Indeed, it was observed, the "25 per cent share ... was far from attainment". In 1980, it was estimated, the share of the developing countries was less than 11 per cent. If current trends in manufacturing production continue, in developed as well as developing countries, the share of the latter will be a mere 14 per cent by the end of this century. If this situation is to be avoided, the annual industrial production growth rate of the developing countries must climb to 10.5 per cent, from the present approximate 7 per cent.

3. The Conference, once again, emphasized the need to focus on human resource development. Training was seen to be "essential to the industrial development of developing countries. It provided the most effective vehicle for technology transfer and the creation of endogenous technological capability".

4. More recently, the First Consultation on the Training of Industrial Manpower, convened by UNIDO with the collaboration of UNESCO and ILO, in Stuttgart, Federal Republic of Germany, in November 1982, acknowledged the necessity for developing countries to carry-out "integrated economic and human resource planning, including a clear national policy to develop the training of industrial manpower to meet present and foreseeable future needs..."^{1/} if they are to master the industrialization process. The Stuttgart Consultation on the Training of Industrial Manpower also concluded that developing countries should develop a system or mechanism "whereby education and training requirements of industries of all sizes can be clearly identified and met, quantitatively and qualitatively".

II. GENERAL CONSIDERATIONS

The rationale of human resources development

5. Human resources are recognized to be simultaneously the instrument for development and the objective of development. The goal of any country is to improve the standard of living and the quality of life of its people. At the same time, a trained labour force is an indispensable factor of production. This is the basis for the so-called "human resources-led development strategy" by which man is the centre of development, both as a producer and a consumer.

6. The concept of human resource development would therefore involve a systematic strategy to raise the skills, the productive capacities, the creative and innovative abilities, the enterprising spirit of the nation's population through training, education and research.

^{1/} Report of the First Consultation on the Training of Industrial Manpower (ID/WG. 381/3), para. 8 (a).

7. Indeed, as has been pointed out by Harbison and Myers ^{2/} :

"The wealth of a country is based upon its power to develop and effectively utilize the innate capacities of its people. The economic development of nations, therefore, is ultimately the result of human effort. It takes skilled human agents to discover and exploit natural resources, to mobilize capital, to develop technology, to produce goods, to carry on trade, and to structure effective organization for these purposes. Indeed, if a country is unable to develop its human resources, it cannot build anything else, whether it be a modern political system, a sense of national unity, or a prosperous country".

8. Training and education need to be distinguished. Training has as its primary objective the improvement of performance at a given job. It involves the acquisition of skills and improvement of discipline, quality, excellence and the scientific attitude to carry out a job. Education, on the other hand, involves improvement of the overall competence of the individual to enable him to develop and release his human potential for creativity, innovation and greater self-reliance. The subject of human resources development covers a wider range of considerations than the more limited subject of manpower training.

Human resources development in industrial strategy

9. The role of industry as the prime-mover for overall economic development is well known. It is the function of industry to generate the national wealth required to achieve the objectives of a national development plan. For this purpose, industry must have an adequate supply of the right kind of trained manpower, in the right numbers, at the right time, in the right place and with the right balance of technical knowledge and practical skills. Their availability determines the pace and direction of industrial growth, industrial innovation and economic and social development.

^{2/} Frederick H. Harbison and Charles A. Myers, Manpower and Education: Country Studies in Economic Development.

10. Every country has traditional industries, tools, techniques and technologies. The industry may be at different levels of development, existing in cottage, village, small, medium or large-scale sectors. It is clear, therefore, that any attempts at manpower planning must start with a clear national vision for industrial development, a clear definition of the objectives of industrialization, and a meaningful and well-laid down industrial plan and strategy covering the respective industrial branches, sectors, sub-sectors and service sector. This would, in turn, influence priorities in education, choices between training at home and abroad, the mix of occupations and critical skills required and the nature of institutions for education and training.

Types of capabilities

11. The work force in industry can be divided into six broad occupational categories: managers, industrial scientists, technologists and professional engineers, technicians, craftsmen and skilled workers, semi-skilled operatives and unskilled workers.

12. Support services need personnel trained in a variety of skills (engineering design, production technology, testing and quality control, material management and value engineering, R and D, feasibility studies, industrial consultancy, etc.), all of which are essential in industrial development. Similarly, a well-developed core of expertise is needed for the survey, exploration, extraction, development and processing of natural raw materials. One should not, however, overlook the other important segments of this category of staff (economists, accountants, information scientists, sociologists, material, marketing and financial experts, etc.), very much needed in carrying out such functions as financial management, marketing, raw materials, storage, inventory control,

maintenance and repair of equipment and machinery and other related services which complement the engineering and technological component of industrial operations.

13. The success of any company or industrial undertaking depends very much on the quality of its management. Management is involved in decision-making, in policies of manpower planning, recruitment, selection, induction, placement, technical education, vocational training and development. The efficient use of expensively trained manpower and maintaining of profitable, productive industrial and human relations is perhaps the most difficult responsibility of most managers. Though the manager may be assisted in his work by specialists, in the final analysis he is responsible for co-ordinating product design, development, field tests, manufacture, quality control, inspection, distribution, profits, etc.

14. Scientists, technologists and engineers are engaged in industry to conduct research, generate and transfer technology to production processes, to control processes, products, plant and machine layouts, industrial designs, etc. They will be employed in departmental and line management, as works and maintenance supervisors, and in co-ordinating technical processes, quality control, inspection, value and cost effectiveness. Technologists and managers in modern industry also need added ability to deal with people as much as with things, to use data from computers and from operational research, to apply techniques of critical analysis, to innovate, organize, plan, direct and manage, to solve problems of product development and of industrial relations. They also have to take note of the growth of knowledge, the speed and direction of new technological advances which have a

likely social implication, especially on such aspects as employment, re-allocation of industrial work force to new jobs and the disappearance of certain human skills, the implications thereof on the work force, work habits, etc. The flexibility and the capacity for a quick response to rapid changes are much needed.

15. Technicians function between the technologist or professional engineer on the one hand, and the craftsmen or skilled worker on the other. As the professional engineer and technologist become increasingly employed on research and development, design and industrial engineering, technicians have to take over some of the duties they formerly held. As a result, more and more technicians are required to have higher-level technical knowledge, the practical know-how and the necessary skills to build, install and service sophisticated equipment and operate complex processes. They constitute the middle ranks of a country's highly trained skilled manpower.

Prerequisites for human resources development

16. Industrial manpower policy and planning should be an integral part of national education and training policy and industrial development policy, which, in turn, are integrated with other policies, priorities and goals of development. Full involvement of the concerned people in industry, government training and the educational system in the planning process from the very beginning will ensure identification of the manpower needs and priorities and the successful implementation of plans. It is, however, not enough to have a clear policy. It must be accompanied by a firm political will and commitment to implement it, backed up with the necessary financial, material and other support.

17. A policy decision should include specification of the institutional instrument for its implementation and a mechanism to monitor its effectiveness. This would include not only educational, training, research and service institutions and support services, but also institutional mechanisms for co-ordinating, implementing, monitoring and for consultation and co-operation within the country on policies, strategies, plans and programmes for effective formulation of human resources development for industrialization. Similar mechanisms are essential for consultation between government departments, the business sector (including public and private enterprises) and educational institutions on policies, strategies and programmes and their means of implementation.

18. An important, though frequently neglected, precondition for human resources development for industrialization is their effective utilization. There is no point in developing peoples' capabilities if they cannot be properly utilized. While a large part of training deals with skills and techniques, proper utilization of those resources is also dependent upon a host of factors, many of which are extraneous to the enterprise, over which the individual manager has little or no control, e.g. pay scales, opportunities and constraints on promotion/assignments, social values and tradition, etc.

19. Action will also have to be taken to provide a suitable environment to change social values and attitudes towards various job types. The traditional respect for academic education and academic achievement and the greater salary, status and prestige for white collar jobs and similar value systems, have to be changed to overcome the shortage of technicians, on one side, and unemployed graduates, on the other. This situation will have to be overcome by having more effective education and vocational guidance programmes and more production-oriented education courses and reinforced by mass media education programmes

to convince young people about the career prospects, job satisfaction and material rewards that exist in the middle and higher levels of industry. Governments will also have to create a suitable environment with built-in incentives and social recognition to stimulate creativity and innovation and to foster entrepreneurship and self-employment. It is only through such steps that human resources development, in its fullest sense, can be achieved.

III. THE CURRENT SITUATION IN DEVELOPING COUNTRIES

20. Before presenting possible actions for the accelerated development of human resources for industrialization, it would be worthwhile examining the current situation in the developing countries, in regard to the problems associated with human resources development for industrialization.

21. Many developing countries have recognized the necessity to develop their human resources and are allocating increasingly larger portions of their national budgets to education and educational expansion. However, the fact remains that educational expansion has not resulted in the generation of the required manpower for industrialization and this can be traced to certain strongly entrenched practices.

22. The present educational system in most developing countries has been patterned as in the Western industrialized countries. But while the industrialized countries themselves regularly review their own educational system in response to ever-changing industrial manpower requirements and in the face of changing industrial structures, industrial activity and industrial processes, most developing countries have never bothered to review the educational systems they copied or, in many cases, inherited from the colonial past.

23. It is no surprise therefore that many developing countries have experienced disappointment in the outcome of their educational programmes, in spite of the large expenditures on educational expansion. The system has proved, in many cases, not to be relevant, responsive or sensitive to the changing needs of the country, hinders initiative and creative talent, and generally fails to meet the need for a better educated and more rounded, more versatile work force. It is clear, therefore, that the educational system would have to undergo review, rationalization and qualitative improvement.

24. Where training has taken place in advanced countries or in imitative institutes set up within developing countries, it has resulted in elitist, alien attitudes, values and life-styles not rooted in the soil of developing countries. Foreign management courses, seminars and workshops do not seem to have clear career objectives, and often do not deal with priority issues faced by developing country enterprizes.

25. Average starting wages in the urban labour market are often double the wages in the rural labour market. Urban employers typically require completion of at least primary school. This generates pressure to expand primary schools. These schools can be expanded and staffed more rapidly than there are employment opportunities. Unemployment results. Employers - including the government, which is generally the most important single employer - then elevate educational requirements so that secondary school education is required for jobs that were previously available to primary school graduates. The attainment finally is in terms of possession of a degree and not in terms of skills required to perform jobs.

26. As a consequence, the expansion of universities has often resulted not in meeting manpower requirements for industrial development, or in creating

a mass of unemployed lawyers, accountants, economists, historians, sociologists and other social scientists. This forces many countries to seek means of creating high-quality training for science, engineering and management outside the regular system in which the bulk of university students are trained.

27. One important effect of the drive to secure a university degree as a credential is to reduce sharply, in the eyes of many prospective students, the value of technical training and of attendance at polytechnics and other types of vocational schools. Aversion to attendance at such schools is increased by the presumed superiority of work which does not dirty the hands over manual labour which is viewed as degrading.

28. There is a mismatch between university products and industry needs; between job opportunities and vocational training courses. For example, very few courses are offered in agro-based, animal, fish and forest-based industries which are growth points for self employment. The mismatch between the industry needs and educational products perpetuates continued heavy reliance on expatriate technicians to support industries.

29. Although the educational infrastructure must continue to expand and to develop, major advances are more likely to come through rationalization and qualitative improvement in this sector with relatively little additional investments or assistance by strengthening the linkages between industry and the educational system and by re-orientation of the programmes.

30. Many schools and colleges, including polytechnics, do not have the necessary facilities for practical work. Theory without practice is of little

help to industry. Similarly, there is a paucity for good teachers, instructors and educational materials like books, journals, educational kits, etc.

31. There is a perennial question of funds for educational institutions. In many developing countries, state security and defense take an increasing share of the budget, and if there are to be budget cuts, the worst sufferers will be education and social welfare.

32. While acknowledging the important role of international experts, it must be pointed out that undue reliance on foreign experts and their advice, and imitative patterns of educational system obtained from the colonial past, have proved to be irrelevant and irresponsive to changing needs of people in several developing countries and only helped to perpetuate intellectual dependence. This position has to change and education should be linked with development.

3. The rapid revolution of "knowledge industry" has to be taken into account to cover all forms of education and to reach all ages and levels of people by production and distribution of newspapers, journals, books, educational materials, equipment, fixed and mobile libraries and bookshops, use of radio, video, TV, mobile science centres, etc. Both knowledge skills and funds are lacking for this purpose in developing countries. Also, there is no systematic educational research to evaluate educational tools and techniques; teaching/learning aids for accelerated education and training and to reach larger segments of the population. Both hardware and software for this purpose are not easily found. Second level education is ill-designed to provide either a sufficiently rounded product with worthwhile skills for absorption in industry, or for entry into professional courses. What it takes to enter into a technical or industrial civilization is generally missing.

34. There are a number of obstacles in the development of a demand for technical personnel. Local producers - private or state - find it easier, more reliable and profitable to import technology than to take risks and develop technology locally. Furthermore, captive markets and subsidized industries with no competition do not encourage innovation and change. The universal need for capital in developing countries has forced reliance on loans from developed countries and from national and international banks, which directly or indirectly introduce turn-key projects, effectively precluding the indigenous efforts and skills.

35. An indication of the magnitude of the challenge that developing countries face in developing human resources for industrialization may be seen from the following :

Industry in the developing countries was expected to be able to absorb about 30 million new entrants into the labour force during the Second U.N. Development Decade (1970-1979). This meant that on the average, about 3 (three) million new entrants per annum should receive some form of industrial training. To those estimates it would be necessary to add the number of workers on the existing industrial labour force in developing countries who would require continuing training during this period - estimated at 100 million.^{3/}

36. For the Third U.N. Development Decade (1980 - 1989), UNIDO has formulated a number of alternative scenarios from which may be deduced the idea of magnitude of the labour force and training effort needed.

37. In Scenario I, related to industrial growth for developing countries to the year 1990 (assuming performance better than current trend but not linked to the LIMA objective), it is estimated that the labour force in the manufacturing industry is likely to expand by 50 per cent over the 1975 level.

^{3/} See UNIDO Report on the Training of National Personnel for Industrial Development, ID/B/10, para. 15 (dated 18 January 1972).

In Scenario II, related to industry in general, to the year 2000 (geared to the LIMA objective), it is estimated that there would be an increase of approximately 150 million persons in the industrial labour force (excluding China).^{4/} The following table presents the share of the industrial labour force as a percentage of total labour force, estimated on the basis of the LIMA Industrial Development Objective Model :

| | <u>Industrial Labour Force as a % of Total Labour Force</u> | | | |
|------|---|-------------|----------------------|--------------------|
| | <u>Africa</u> | <u>Asia</u> | <u>Latin America</u> | <u>Middle East</u> |
| 1960 | 7.6 | 10.2 | 20.0 | 14.5 |
| 1975 | 11.9 | 12.3 | 23.7 | 19.4 |
| 2000 | 15.0 | 17.1 | 27.6 | 23.3 |

38. The above figures indicate that the share of industrial labour force is increasing and will continue to increase over time. Appropriate institutional arrangements must therefore be made to develop the necessary capabilities.^{5/} In terms of structural relations within the industrial work force, Kahne^{6/} provides the following model of the manpower profile of a technical department in a productive industry in the United Kingdom :

1 manager
4 engineers - graduate engineers
16 technicians - 2 year technician diploma
20 craftsmen
20 clerical and administrative
59 semi-skilled and unskilled
120

39. If the above ratios are applied to the 30 million estimated in 1964, or to the increase in the labour force of over 50 per cent in Scenario I,

4/ See Issues Paper ID/WG.381/1, paras. 14 and 15 (September 1982).

5/ See "Co-operation Among the Developing Countries in the Field of Human Resources Development", Bucharest, 31 May - 4 June 1982.

6/ Professor Stephen Kahne: "Worldwide Engineering Manpower Needs for Development" Case Institute of Technology, Cleveland, Ohio, USA.

or to the 150 million increase by the year 2000 in Scenario II above, some idea of the tremendous pressures on the education and training of engineers, technologists, skilled and semi-skilled operatives begins to emerge. Kahne goes further to cite the following calculations based on other engineering and technician manpower profiles in selected industries per 1,000 employees :

| Industry | Engineers and Technicians | Chemical Engineers | Electrical Technicians |
|---------------------------|---------------------------|--------------------|------------------------|
| Mining and Quarrying | 33 | 1 | 1 |
| Petroleum and natural gas | 81 | 5 | 4 |
| Food and Beverages | 9 | 1 | 0 |
| Iron and Steel | 28 | 0 | 0 |
| Air transportation | 35 | 0 | 7 |

40. Another indication of magnitude is provided by the following comparative figures on the number of engineers produced annually in some developed countries: Japan (1981) - 87,000; U.S.A. (1981) - 63,000 (lower estimate) and 81,000 (higher estimate); USSR (1979) - 300,000; U.K. (1978) - 11,000; Canada (1978) - 4,000 trained in Canada and 2,000 migrated into Canada.

41. Two points may be deduced from these figures :

(a) that, in order to accelerate the process of industrialization, developing countries need to drastically increase the numbers of engineers trained;

(b) that, because of the large number of engineers needed to be trained, and the strain that this is already causing on advanced country engineering and other technical institutions, developing countries will have to give serious thought to creating their own institutions.

IV. POSSIBLE ELEMENTS OF A NEW APPROACH

42. Having examined the needs, preconditions and present situation in developing countries, it would be interesting to examine some of the newer developments in education, training and research, which could be possible elements of a new approach to human resources development for industrialization.

Re-orientation of education

43. It is now increasingly accepted that education should be linked to development: that higher education must be for the development of a full, "complete" well-balanced person and the university must provide "development leadership" in addition to importing knowledge and skills. The goal of education and research must include "development" philosophy for the engineers, technologists and administrators to act as change agents and catalysts for development. One cannot be an instrument of social change unless one is involved with the society and unless the curriculum of education covers a perspective of human behaviour, social, economic, political, cultural environment, and is sensitized to the problems of economics, equity, employment, energy, environment, efficiency and enterprise.

44. Where education and development are linked, formal and non-formal education, schools, colleges, mass media, radio, television, satellite, cinema, library, science museum, etc., form a total network of educational means and media to develop the "complete" person. Education would then be related to real life problems and aspirations of people and linked with agriculture, food, nutrition, health, family, community living, industry, etc.

45. The primary school could be made a hub of change, relating education to real life problems, centered around fauna and flora, and every aspect of community life: agriculture, food, nutrition, health, etc. It also helps

to survey the natural resources.

46. At the level of high-schools and colleges, several modern educational tools, equipments and kits should be provided to play and tinker with. Greater emphasis on creative innovative attitudes and work experiences are incorporated in such exercises. In several countries, computer education has already been introduced and made compulsory. Learning by doing is emphasized in vocational schools.

47. Mobile Science Museums and Science Centres help to educate the young and the old and to promote scientific attitudes. Science Centres also provide facilities to do-it-yourself, radio, video, electronic, electrical kits, etc. This could also lead to setting up of production units in and around schools and colleges, producing audiovisual aids, educational toys and kits, books and journals, etc.

48. Adoption is another possible mechanism to improve the content and method of teaching, by which higher institutes of learning adopt colleges in the vicinity, which in turn adopt high schools, in turn elementary schools, providing them with educational kits, guest lecturers, etc. Also, the bright students from schools are brought to academic institutions in summer holidays to broaden their vision and understanding, and to kindle their curiosity.

49. Similarly, higher institutes of learning could adopt clusters of villages or districts to bring the latest technologies to the doors of the people that need it, to understand the people's needs, demands and priorities and to make their training and research relevant.

Productivity of the population

50. A small increase in productivity in a large number of people is likely to be more important than a large increase in productivity of a small number of people. Education and training should be viewed in this light. To improve productive capacity of each person, several steps may be taken, e.g. large-scale training of artisans, improvement of traditional tools, techniques, technologies and occupations, educational aids, kits, toys, do-it-yourself kits, etc., promotion of self-employment, vocational orientation to school curricula, rural orientation to engineering and diploma courses; problem oriented approach in research institutes to traditional technologies and rural development problems; extension services utilizing radio, television, science centres and mobile science museums; on-the-job training in schools, in the field and in industry, particularly where growth points for technological capabilities reside, like agriculture, transport, electric power, agro-processing and engineering industries.

51. Establishing a National Youth Resource Corps is another mechanism to involve the youth at all levels in national service and national development projects - to give them a sense of participation, a pride of achievement and to become responsible citizens with much needed values of dignity of work, discipline, integrity and character that are at a low premium at this time.

52. Rural institutes could also be created to conduct research on problems relevant to rural areas and to train extension personnel to improve tools, techniques and skills and to improve leadership and entrepreneurial qualities at village level. Institutes could also be set up to offer credit, technology, extension services and to train people in rural projects.

53. "Open Air University" provides a mechanism to reach the young and the old to improve their educational qualifications. Modern tools like radio/TV are effectively used for this purpose.

Education and Industry

54. Industry, research and education become a trinity with firm linkages which include setting up of science and technology parks, industry-sponsored or owned research centres in and around the university campuses, industry-sponsored research projects, exchange of trained personnel, joint development of circular and educational programmes, in employment and manpower planning, etc. Setting up of polytechnology clinics like polymedical clinics is yet another avenue to deal with the problems of industry and to train personnel in regard to design, engineering and consultancy.

55. A new approach is the establishment of Teaching Companies - established and operated primarily by government, industry and university as a business venture but with the main purpose of training industrial manpower, as a complement to or substitute for formal education of an engineer or technologist in every aspect of production. Similar to this approach are the "sandwich" courses, where formal education in school is coupled with field or factory experience. Local railway engineering departments can also be utilized for such teaching companies. Yet another recent innovation is setting up of Technical Universities.

Emerging Technologies

56. There are a number of emerging technologies like biotechnology and genetic engineering, microelectronics, material science, etc. which are going to have a significant impact on long-term development problems, and

developing countries should build or strengthen national or regional centres to participate fully in the work of science.

57. Traditional patterns of education and research are not geared to this new phenomenon of technological advances based on interdisciplinary basic research with a converging character. There is a dire need for curriculum review and re-designing the courses with an interdisciplinary approach like life sciences, environmental, material, space sciences, etc.

58. Education is one of the principle levers which will make it possible to meet the challenges of the future. Ultimately, the nation's education system will have to prepare future workers for functioning in an electronic and biosociety, and to meet the challenge of a changing economy. Computer literacy is becoming an important requirement for many jobs. Increasing technological complexity of the work place is creating a need for a strong background in mathematics and science, even at elementary and high school levels. Employment trends suggest that such education is going to be even more of a prerequisite for employment in future, and a significant portion of the workforce is going to have to acquire new work skills and habits relating to the use of new technologies with increased technological literacy. The link between scientific education of the public at large and their support for R and D is also well established. Retraining of teachers, workers, mathematics and science networks, computers in class rooms augmenting text books with more challenging materials, changes in curricula, encouraging collaborative programmes between high schools and higher institutes of learning and industry, exchanging software and increased computer use, etc., are already taking place.

59. Another of the consequences of technological change is that some people may have to change their occupations one or more times during their lifetime, while others have to change their work functions as they are upgraded in their jobs. The educational systems should provide a means by which these changes can be accepted and effected without undue social stress. Greater vocational adaptability is necessary. This can be achieved by the following :

- improved relationship between the initial, basic education and the latter, more specialized training;
- problem-oriented rather than technique-oriented teaching;
- psychological preparation for change as a part of the fundamental school training;
- systematic teaching of how to learn by oneself or with a limited amount of assistance;
- giving introductory interdisciplinary concepts.

V. ACTIONS TO BE TAKEN AT THE NATIONAL LEVEL

60. World-wide experience suggests that difficult as it is, manpower planning is essential for overall development. The future leaders of industry, science, technology, management, etc., are today still within the educational system. The way in which they are educated and trained today should equip them to meet the challenges of one or two decades from now. However, possible avenues should be explored for accelerated development of human resources at all levels.

61. Any action plan for accelerated development would have to consider both short and long-term measures that include planning, assessment of manpower needs, provision of adequate infrastructure and funds, optimum utilization of existing facilities, etc. A number of suggestions in this regard are presented here.

A. Long-term measures

62. Industrial manpower policy and planning is a continuous long-term process to be integrated with national education, industrial and economic policy. First and foremost, an estimation has to be made for the manpower needs based on appropriate reliable information and data covering industrial branches, sectors, sub-sectors accorded priority in the industrial development plan, as well as in the service sector. This, in turn, would facilitate the estimation of the required institutional structures and funds. A similar exercise on the inventory of the existing infrastructure and an evaluation of the strengths and weaknesses of existing educational, research and training institutes will give a clue about the gaps to be filled, modifications to be made in the existing structures, the new ones to be created and the means and mechanisms to do it.

63. The general education system is the foundation on which industrial manpower rests. Improvement in this system at all levels including the up-grading of skills of the population for self-employment and enterprising ability affect the industrial sector. Special attention should be paid to women, who constitute a larger segment of the population.

64. Special consideration would also have to be given to the time and costs involved for accelerated development of the required manpower. Financial resources have to be mobilized internally by greater and direct investment of industry, by suitable fiscal policies providing tax incentives, exemptions, etc., or through ECDC/TCDC, bilateral and multilateral agreements. Similarly, funds saved by technology changes leading to job displacement can be made available for retraining to up-grade skills so as to qualify them for new work functions.

65. Vocational and technical education, especially oriented towards producing skilled-workers and technicians required in much larger numbers for industrial operations need to be emphasized along with management training for senior and middle level managers. Advanced technical training beyond the secondary school level also needs to be emphasized. Priority needs to be accorded to programmes of mass science and technical education in the rural areas and greater use made of the mass media, e.g. television, cassettes, films, mobile training units, radio, etc. How to weave-in modern tools and techniques into traditional skills is yet another area that demands greater attention. Skills and ages of experience that obtain in traditional industry have to be fully utilized.

66. The advances in technology (microprocessors, microelectronics, computer technology, genetic engineering and biotechnology, etc.) are creating new types of requirements for industry in terms of job types and skills requirements, etc. This calls for an integration of discipline and the development of new types of curricula geared to meet the present and future needs. In some cases it may mean the establishment of new types of institutions, either of a general or of a specialized type.

67. The government should adopt measures and incentives and provide an environment which stimulates and promotes the development of indigenous industrial entrepreneurs. Such measures would include the development and provision of various technical and supporting services, especially information and data relating to raw materials, markets and technology; common services related to storage, marketing, training, repair and maintenance of equipment and social welfare; financial incentives such as the opening of credit lines and the granting of loans and tax reliefs as well as import restrictions on products which could be produced locally; and extension services related

to feasibility studies, market research, assessment of alternative technologies, negotiations and purchase of equipment, etc.

B. Short-term Measures

68. The actions outlined above are of a long and medium-term nature. It is however necessary to take short term measures and immediate actions to meet the current needs. Such actions would predominantly consist of short-term training programmes augmenting the skills and experiences of the manpower dealing with immediate problems.

69. In the contracting and implementing of foreign-owned or aided projects, a systematic approach is needed to train the nationals during the process of design, fabrication, testing, erection and commissioning, apart from the usual drill of operation of plant and equipment and their maintenance and repair. In fact, such training may further include preparation of feasibility reports, technology choices, consultancy, design, erection, production, management and up to marketing.

70. Considerable progress could be made in upgrading and reorienting manpower in relatively shorter periods of time using integrated systems approach with a multidisciplinary team drawn from the existing institutions and with some flexibility in modes of operation. For example, universities may reorient and restructure their programmes giving courses in the much needed areas like production engineering, financial management, making their research more relevant, and accepting extension and consultancy as the third dimension in addition to training and research. Similarly, management institutions, poly-technics, vocational training institutes could well orient their problems to suit the immediate needs of an industry. Also, the functions and responsibilities of each institution would have to be clearly defined to avoid undue

duplication, conflict of interest and wastage of limited resources.

Furthermore, effective working links may be forged between them to supplement and complement each others' competence. They may also have working arrangements between institutions abroad and by exchange of experts, etc.

71. Similarly, professional institutions, like national engineering associations, could organize workshops, etc. to upgrade knowledge and skills of teachers, administrators, managers, coordinators, directors, etc. This may be supplemented with training abroad for short periods. Training of trainers and teachers is an important short cut.

72. Easy mobility of personnel between industry, research, government and educational institutions is yet another mechanism to build competence and common culture to assist each other. It is useful to remember that reorientation and upgrading of knowledge and skills of academically qualified personnel is perhaps one of the major tasks in the short run. This can be done through action measures at national and regional levels.

VI. INTERNATIONAL CO-OPERATION

73. The developing countries, as a group, have made and are making remarkable progress in creating an educational base for their development - in terms of numbers and kinds of institutions and the percentage of their people attending these institutions - particularly in comparison to the situation at independence for most of these countries. Although achievements in educational expansion have been spectacular, the same cannot be said of the field of industrial training - whether at the national, subregional or regional levels. This has been due to a variety of reasons, the most common of which is the cost factor. The costs of technical education and industrial training tend to be very high in terms of equipment, staff, etc.

74. A logical solution to this financial problem is co-operation of all types - subregional, regional, interregional and international. There is plenty of scope for co-operation among the developing countries themselves, on the one hand, and between the developing and the developed countries on the other. Such co-operation would include exchange of information, teachers (instructors) and students; joint development and sharing of training and research programmes and facilities such as educational kits and equipment, books, computer and video tape recorded programmes; joint financing of expensive training facilities; harmonization of industrial manpower development policies and plans, twinning of institutions, setting up centres of excellence to act as regional or international centres, and networking of institutions, etc. In these endeavours, many of them would require various forms of assistance which could be made available either through bilateral or multi-lateral assistance arrangements, or through the support of international organizations such as UNIDO, UNESCO, ILO, etc.

A. Co-operation Among Developing Countries

75. Perhaps the most important facilitator of co-operation among developing countries is the recognition by the developing countries themselves of the need for greater self-reliance and mutual assistance for formulation of requisite policies and strategies towards realization of accelerated human resources development. This implies overcoming attitudinal barriers and increasing confidence in each others' technical capabilities.

76. On the surface, there are at least two additional factors which should facilitate co-operation activities in industrial manpower development in the developing countries. The first of these is that, all other things being equal, industrial manpower training in another developing country should be more appropriate as the conditions, problems and obstacles are likely to be similar, and the communications between trainers and trainees is likely to be

simpler. The second is that in most cases it is less expensive.

77. Fortunately, several conditions favour such a co-operative endeavour: improved communications and greater awareness of common problems and knowledge of existing capacities as well as wider access to training facilities available in other developing countries, the increased recognition of the vital experience of industrial manpower training as a prerequisite to balanced socio-economic development, the greater willingness to view training as an investment at least equally as important as investment in physical facilities, and the political will to achieve individual as well as collective self-reliance, all contribute towards facilitating educational and training programmes and the exchange of teachers and trainees.

78. Whatever the scope of economic co-operation among developing countries relating to the development of human resources for accelerated industrialization (supply of information, organization of study visits, supply of technical assistance experts, education and training of personnel, particularly of teachers and instructors, joint establishment of teaching and training companies or education and training materials, implements, tools, equipment, research in industrial teaching/learning processes), it will require considerable efforts among policy-makers and planners in programming and planning, and considerable statesmanship at the highest level in negotiating mutual benefits and costs and foreign exchange implications. This applies as well to the effects of cultural differences on relations among foreign students or between foreign students and nationals. In some countries, particularly in Eastern Europe, provision is made for an obligatory language and cultural familiarization course before technical education or training commences. This reduces some of the bewilderment and sensitivity of foreign students. Some effort should be made to explore the advantages of this arrangement and to encourage their adoption.

79. Developing countries are also establishing national centres of excellence which may also have an international character particularly in relevant subject areas like traditional technologies and medicine, desertification, sunbelt resources, mass communication, educational technology, social change, etc. Braindrain may be turned into "brainbank" utilizing the services partly or fully, of the experts that migrated to advanced countries for these centres of excellence.

80. One of the areas for active co-operation among developing countries is in the fields of educational research, education technology, tools and methods, bridging courses for producing education materials, equipment, kits, etc., and setting up regional and national institutions to respond quickly and flexibly to unexpected changes in the pattern of demand for industrial manpower particularly to meet the impact of emerging technologies.

B. Co-operation Between Developing and Developed Countries

81. While emphasis on the development of human resources for industrial development has to be placed on actions, first at the national level and, secondly, among the developing countries themselves, there is, nevertheless, great scope for co-operation between the developing and developed countries for the training of complete teams for production, maintenance and management purposes in connection with an industrial project and, to some degree, for the establishment of technology and training centres to support specific sectors of industry. The assistance of developed countries, through bilateral and multilateral co-operation arrangements, and through commercial relations at the enterprise level, could be quite useful.

82. In regard to the above, governments of developed countries need to adopt appropriate policy measures which would facilitate such co-operation, including greater access by students from developing countries to training institutions

in developed countries, particularly for practical training; reduction of training costs; supply of information, training programmes and aids to developing countries; and financing of industrial training programmes and facilities in developing countries. High priority should be given to industrial training in bilateral and multilateral technical assistance and aid programmes to developing countries as well as in contractual arrangements between companies in the developed countries and governments and/or enterprises in the developing countries relating to industrial and technology transfer projects. Consideration should be given to strengthening existing focal points in developed countries or the establishment of new ones to co-ordinate their co-operative programmes with the developing countries in the development of human resources for industrial development.

C. The Role of UNIDO and Other International Organizations

83. The subject of human resources development for industrialization is of direct importance and relevance to the work of UNIDO. UNIDO and other relevant international organizations - notably UNESCO and ILO - have an important role to play in assisting the developing countries, especially the Least Developed Countries, in the development of their industrial manpower. Such assistance has to cover the total spectrum of the development process but should be well-formulated and channelled to priority actions determined by the governments. The critical areas of such assistance would include the identification of the manpower needs, the formulation of policies, plans and programmes and the strengthening of mechanisms to co-ordinate the collection and dissemination of information on industrial manpower development. In this regard, assistance would be required in the identification of all relevant existing industrial training opportunities at the national, sub-regional, regional and global levels and the assessment and dissemination of information on each of them.

84. In addition to the above, the on-going programmes of these organizations related to industrial manpower development need to be critically re-examined, expanded in scope and re-directed towards meeting the actual needs and requirements of the developing countries. Measures to ensure greater multiplier effects on these programmes should be developed. Above all, efforts need to be intensified to assist the developing countries, especially the Least Developed Countries, in acquiring more financial resources and in the better utilization of existing ones in industrial training; acquiring, or sharing training programmes, facilities, equipment; and in promoting the exchange of teachers, instructors, students and experiences among the developing countries.

85. UNIDO is in a position to develop broad-based concerted programmes of assistance to developing countries, but also to find newer means and mechanisms for promoting greater regional and international co-operation, particularly among the developing countries. It could further promote the setting up of International Centres in emerging technologies, necessary pilot plants, consultancy, negotiation, production, marketing and other systems.

VII. CONCLUDING OBSERVATIONS

86. This paper has attempted to bring out the close correlation between the development of human resources and the economic development of the country. The latter is completely dependent on the former.

87. This relationship has then been extended to industrial development, and the point is made that industrial development is wholly dependent on the adequate supply of the right kind of trained manpower, in the right numbers, at the right time, in the right places, and with the right balance of technical

knowledge and practical skills. Their availability determines the pace and direction of industrial growth, industrial innovation and economic and social development.

88. The subject of human resources development for industrialization is clearly a wide and complex one. It starts with a careful and realistic national economic development plan, and a clear definition of the objectives of industrialization. It touches on the education system, the training programmes and the mix of occupations and critical skills required. It defines the levels of education, the quantities of enrollment at each level, the learning content and areas of specialization, the types of capabilities, and therefore the types of training institutions, etc.

89. Because national economic development plans and national industrialization objectives vary from one country to the other, it follows that human resources development strategies will vary from country to country. The strategy adopted by any country would have to take into consideration its own resources - both human and natural - its industrial development plan, the existing institutional infrastructure and mechanisms, the quantity and level of its national scientific and technological capability, etc.

90. In spite of the complexity of the subject, the paper has tried to identify a number of key issues related to human resources development which developing countries would have to tackle if they are serious in their desire to industrialize. It must be mentioned that the issues thus identified are not exhaustive, nor could they be fully discussed in a brief paper.

91. Several problems discussed in this paper are well-known, but remain nevertheless unresolved. In addition, the paper seeks to place the question of

human resources development in a broad perspective and to identify elements of a possible new approach to this question, whereby the level of technological competence of the population as a whole could be upgraded. Attention is also drawn to the emerging technologies and their implications for human resources development. National and international actions in this field are required to be taken with a sense of urgency to accelerate the industrialization of developing countries. The self-reliance of developing countries and the soundness of their production structures can only be achieved, in the ultimate analysis, through the development of their human resources.

