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Seminar organized by the United Nations Industrial Development Organization in Co-operation with the Pan African Telecommunications Union

Harare, Zimbabwe
6-11 January 1986

TECHNICAL ADVISORY SERVICES ON PROSPECTS FOR THE MANUFACTURE OF TELECOMMUNICATIONS EQUIPMENT IN AFRICA

Report*

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INTRODUCTION

1. In connection with its activities for the Industrial Development Decade for Africa, the United Nations Industrial Development Organization has undertaken a programme of Technical Advisory Services for African countries. The programme intends to demonstrate various technologies which could be brought to bear on pressing needs of the African continent and to formulate project possibilities to introduce such technologies at the national, sub-regional or regional levels. The principle vehicle for the programme is the organization of seminars in which technical demonstrations are presented by UNIDO staff members and international experts before technical personnel, policy makers and financial institutions involved in African development efforts. One of the sectors chosen for this programme was the telecommunications industry on which UNIDO, in co-operation with PATU organized the regional seminar "Prospects for the Manufacture of Telecommunications Equipment in Africa' held in Harare, Zimbabwe, 6-11 January 1986. The Seminar was attended by 25 participants from 19 African countries and 19 observers. (See Annex 1)

2. The Seminar reviewed five issues:

(i) The use of repair and maintenance facilities as a means of entering the manufacture of telecommunications equipment;

(ii) Changing technologies from electromechanical to electronic switching systems: Problems and options within the African context;

(iii) Design, contracting and management of projects in order to enhance local participation in realization of projects;

(iv) Possibilities of manufacture of specific sub-components of the telecommunications system such as sheet metal components, electronic maintenance systems, transmission poles and accessories, insulators, cables, etc., and

(v) Possibilities of regional co-operation in areas such as standardization, the regional manufacture of equipment and components and the formulation of manufacturing joint ventures.

In addition to these issues, country papers were presented by participating delegations and papers on specific topics were presented by observers (see annex 4).

3. The proceedings recorded here under the substantive chapters on the working sessions contain conclusions, recommendations and technical assistance project proposals which should be submitted for consideration to the third session of the PATU Conference of Plenipotentiaries, scheduled to be held in Arusha, Tanzania, 17 February - 7 March 1986, and subsequently these project proposals should be elaborated in their technical and financial aspects for submission to a UNIDO sponsored donors conference, which is proposed to be held by October 1986, in Vienna.

OPENING SESSION

4. The Seminar was opened by the Honourable Dr. N. P. Nhiwatiwa, Deputy Minister of Information, Posts and Telecommunications, Government of Zimbabwe, who welcomed the participants on behalf of the Government of Zimbabwe. She pointed out that the Seminar was in line with the objectives of the Organization of African Unity as enunciated in the Lagos Plan of Action. She drew attention of participants to the regional and national efforts being undertaken to develop telecommunications and related sectors of African economies. She also emphasized the importance of regional co-operation and assistance from developed and advanced developing countries. However, she said, the African continent faced numerous constraints on their development objectives. She welcomed the opportunity offered by the Seminar to enhance regional and international co-operation for the development of this sector in Africa.

5. The Resident Representative made an introductory statement on behalf of the organizers of the Seminar. He welcomed the participants and thanked the Government of Zimbabwe for hosting the Seminar. He recalled the background to the Seminar which was being organized as an activity under UNIDO's programme for the Industrial Development Decade for Africa. He noted the central importance of telecommunications to Africa and the opportunities offered by the manufacture of telecommunications equipment to economic consolidation and mastery of industrial processes and technologies. The issues raised in the Seminar, he said, were chosen due to their importance to the manufacture of telecommunications to Africa and the opportunities offered by the manufacture of telecommunications equipment to economic consolidation and mastery of industrial processes and technologies. He hoped that the deliberations of the Seminar would analyze technological options and formulate precise project areas in which assistance could be provided at the national, subregional and regional levels to realize the objectives of African countries. Finally, he mentioned some of the technical assistance activities already being undertaken in this field by the U.N. system in Zimbabwe, and suggested that the Seminar arrive at proposals which would be complementary to existing efforts such as those mentioned by him.

6. The representative of the Secretary General of PATU conveyed the apologies of the Secretary General of the Union for not having been able to attend the Seminar. The representative pointed out that the programme for the Seminar was of vital importance to Africa since no country had been able to succeed in developing its telecommunications system without first having established its own manufacture of equipment. He welcomed the co-operation with UNIDO in the effort to lend its support and assistance to Africa's regional efforts. He pointed out that this Seminar was part of a process initiated in 1982, when a seminar was held on the same subject in Algiers, as a result of the co-operation between UNIDO and PATU and with the assistance of the Government of Algeria. Finally, he welcomed the opportunity afforded by the Seminar for participants to engage in a practical exercise in the transfer of know-how.

Election of Officers

7. Mr. L. P. Tavaya (Zimbabwe) was elected Chairman. Messrs. E. Kamdem-Kamga (Cameroon) and Abdennasser Lounis (Algeria) were elected Vice-Chairman.

WORKING SESSION I

UNIDO Presentation of its Technical Co-operation Programme

8. A representative of the UNIDO Secretariat presented the UNIDO Technical Co-operation Programme in the field of industry, covering the following points:

- The nature of UNIDO technical assistance;
- Sources of financing of UNIDO projects;
- Procedures for seeking UNIDO Technical Assistance, and
- The content of UNIDO executed technical co-operation projects.

9. These points were discussed in relation to the objectives of the Seminar and it was emphasized that the Seminar should establish project concepts for the manufacture of telecommunications equipment. These concepts would, in due course, be elaborated and considered for funding for execution by UNIDO's Technical Co-operation Programme.

PATU Presentation on the situation of the Telecommunications Industry in Africa

10. The representative of PATU compared the situation in Africa to that of other regions and analyzed the constraints on the growth of this sector and of the poor quality of service offered. This situation war detrimental to economic growth hence it was important for African countries to remedy it by improving growth rates and the efficiency of networks. He said that the weakness of African telecommunications was essentially due to the weakness in the manufacture of telecommunications equipment. In order to ensure the viability of the sector, there was a need to establish a balance between manufacturing activity and the provision of services.

11. He further stated that there was an advantage to be gained by traditional suppliers of equipment to Africa in the promotion and progressive development of manufacture of such equipment in the African continent. This equipment should be suited to the local needs and constraints of Africa.

12. Finally, he outlined a strategy proposed by UNIDO and PATU for attempting to achieve self-sufficiency and a better planned development of the African telecommunications network. The elements of this strategy were:

- Systematic use of existing supplier industries, such as metalworking, plastics, electronics and electrical industries;

- Development of local know-how and expertise through the depackaging of turnkey operations;

- Creation of research and development facilities, and

- Development of industrial co-operation in this sector among African countries.

Country Presentations

13. Country papers were presented by Zimbabwe, Zambia, Kenya, Madagascar, Comoros, Mauritius, Tanzania and Egypt. These outlined existing facilities, development prospects and constraints on the manufacture of telecommunications equipment in the countries. These papers are appended as Annex 4.

WORKING SESSION II

The use of Repair and Maintenance facilities as a means of Entering the Manufacture of Telecommunications Equipment

Summary of Presentation

14. The presentation reviewed in detail the approach to repair and maintenance. It placed emphasis on maintenance phases required to rectify failures in a telecommunications network. A typical maintenance operation was discussed at its different levels, starting with local level replacement of faulty parts of equipment and ascending to central stores and workshops for the repair of equipment. Based on the maintenance approach and the facilities reviewed, the following possibilities were identified for the production of spare parts:

- Small scale production at existing workshops with a certain stock of machine tools;
- Assembly of equipment from components, and
- Establishment of multipurpose production units, manufacturing small batches of a variety of spare parts for existing equipment and installations.

15. An appraisal was presented of the conditions for a practical approach to such manufacture of spare parts. These conditions emphasized the need to evaluate the demand for spare parts, the establishment of linkages with suppliers of the original equipment and with national industries in allied fields and the need to obtain licenses and standardize equipment.

16. The presentation concluded by summarizing the issues under this topic, i.e.,:

- The need for regular maintenance;
- The need to ensure adequate spare part inventories for new exchanges;
- The dynamic role of multipurpose production units in local production of spare parts, and
- The importance of training in maintenance as well as that of maintenance facilities as a means of entering the manufacture of telecommunications equipment.

Conclusion

17. The Seminar concluded that repair and maintenance was an activity which needed continuous attention. The situation of repair and maintenance was however complicated, in African circumstances, by the non-availability of spare parts due to outdated equipment made for the conditions of other regions. Furthermore it was recognized that repair and maintenance offered the prospects for the manufacture of telecommunications equipment, starting initially with the fabrication of spare parts.

Recommendations:

18. Given the lack of environmental testing of facilities and adaptation/design efforts to tropicalize telecommunications and other electronic equipment to African conditions, UNIDO should be requested to provide assistance in the establishment of a Regional Environmental Test Centre and a Regional Tropicalization Centre along the following concept:

(a) Objectives:

- To provide environmental testing (temperature, humidity, salt spray, vibration, shock, etc.) facilities for purchased and locally designed and/or adapted telecommunications and other electronic equipment;

- To act as focal point for information on environmental specifications, standards, test procedures;

- To advise countries of the region on practical aspects of tropicalization;

- To develop appropriate low-cost tropicalization techniques, materials and processes, and

- To certify equipment according to tropical operating conditions.

(b) Background:

Severe environmental conditions in Africa necessitate the application of special design and manufacturing techniques to the production of telecommunication equipment. Special consideration should also be given to:

- Preparation of specifications;
- Selection/acceptance tests;
- Design/adaptation, and
- operations

of the telecommunications equipment. The cost and technical/technological skill involved in the establishment and operation of such centres justify a regional approach.

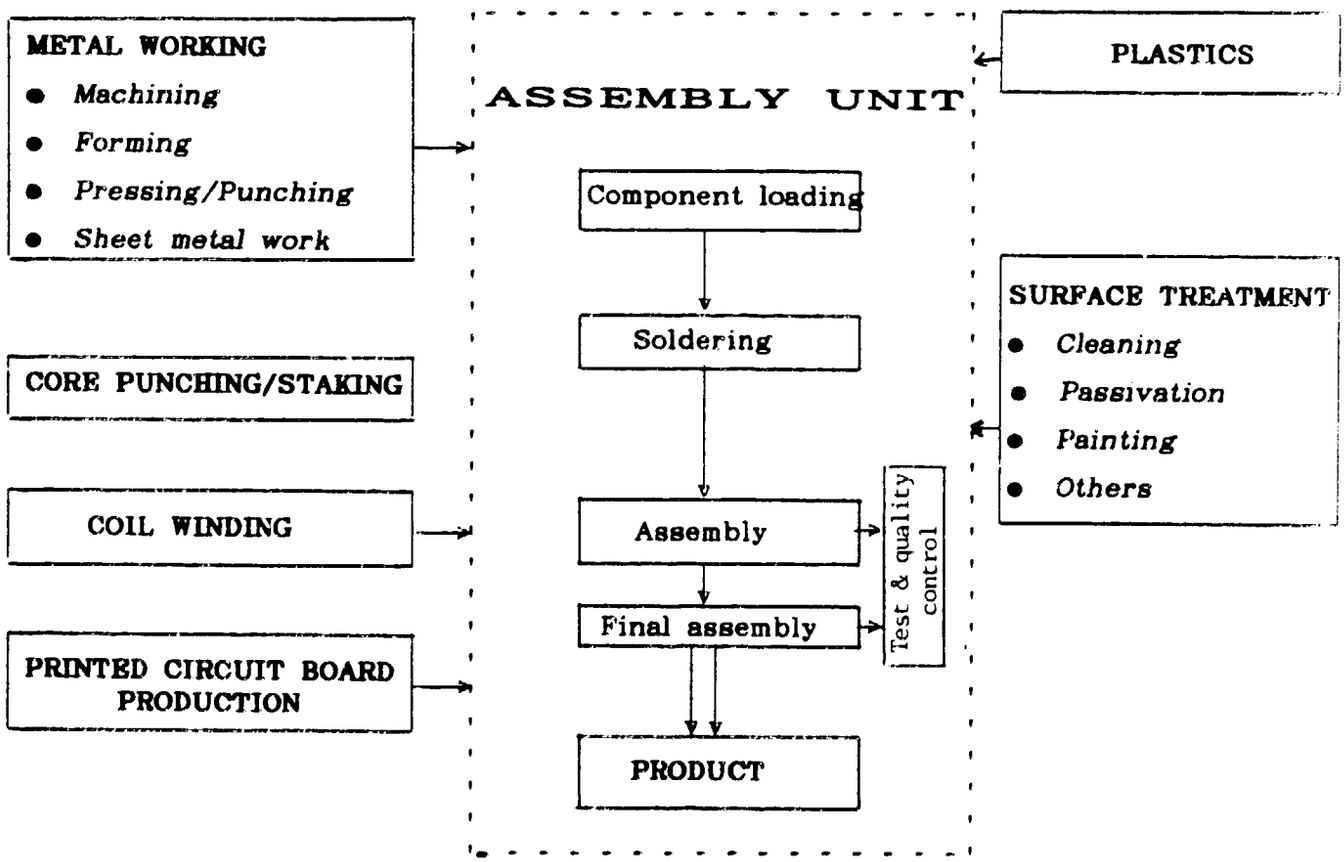
(c) Project Formulation Phases:

- Project concept - draft (UNIDO);
- Review by interested regional or sub-regional bodies;
- Submission of requests by governments through UNDP to UNIDO;
- Preparatory assistance by UNIDO and selection of location of centres;
- Finalization of project document (UNIDO + governments + regional organizations + donor agencies), and
- Implementation

19. Further, UNIDO was requested to assist African countries in the establishment of pilot repair and maintenance workshops and to rehabilitate existing workshops, laying emphasis on training of repair and maintenance staff. In addition, three multipurpose pilot workshops should be established in three African countries to demonstrate the prospects for multipurpose production in the following areas:

- Electromechanics;
- Electronics, and
- Metalworking.

20. The chart given below indicates the manufacturing possibilities offered by these workshops:



21. Three dominant production routes have been identified for the proposed multi-purpose repair and maintenance workshops:

- Electromechanical route: Involves processes such as core punching, coil winding, press work, sheet metal work, some plastic work and related assembly work. This type of multi-purpose workshop, in addition to carrying out electromechanical repairs, can manufacture relays, transformers, high-frequency coils, chokes, motor driven uniselectors, ac voltage stabilizers, etc.

- Electronic route: Can be formed by combining processes such as printed circuit board production, surface treatment, some plastics, some metal working and related assembly work. It can manufacture equipment such as PABX, telephone sets, lightning protectors, battery chargers, intercoms, dc power supplies/adapters etc.

- Mechanical route: Consists of metal working and surface treatment prccesses. It can carry out the manufacture of machined parts such as shafts, jigs, fixtures, dies, tools, and sheet and profile work such as racks, cabinets, line attachments.

Changing technologies from electromechanical to electronic switching systems: problems and options within the African context

Summary of Presentation

22. According to ITU statistics, the viable production in Africa of electronic switching equipment might not be possible for some time to come. However, the production of small private exchanges and their modification for public applications involving capacities of between 100 and 1,000 lines seemed reasonable. The purpose of those exchanges would be to satisfy rural public switching needs. The models adopted should be modular and flexible so as to satisfy PABX needs, accommodating capacities of between 10 and 50 lines, as well as being suitable for other applications.

23. The production of electromechanical equipment, limited mainly to assembly, and requiring the purchase of parts, would be feasible but might run counter to the network development objectives of the countries concerned. Assuming that electromechanical exchanges would continue to be used for another 30 to 50 years, it would be reasonable to consider producing electromechanical equipment. The current production of such equipment in Algeria, Egypt, Kenya and Zimbabwe was noted.

24. The manufacture of telephone sets could be viable at the regional level. They are currently being produced in Algeria, Egypt, Kenya, Sudan, Tunisia, Zambia and Zimbabwe.

25. The limited production of multiplex equipment, preferably combined with the production of single channel radio equipment, was possible at the regional level. It was noted that such equipment has been produced in Egypt.

26. The large and immediate demand for sophisticated components prevented their production in the region. However, basic components such as relays, could be suitable for production, both as spare parts for the repair and maintenance of existing equipment and for export, since they required a large supply of labour and raw materials. In conclusion, attention was drawn to the importance of maintaining a spirit of compromise if a viable regional industry was to be developed.

Conclusion

27. The participants noted the irreversible movement towards electronic switching. At the same time, however, the existing stock of electro-mechanical exchanges will have to be kept in service for as long as possible. Action is therefore called for at three levels:

- Maintenance, repair and replacement of components;
- Planning for the introduction of electronic technology;
- Study on the compatibility of the two types of systems during the transition period.

28. This difficult situation calls for action to be co-ordinted both at the national level, among all concerned (administrations, research and development institutions and industries), and at the regional or subregional level. There is also an urgent need for training planners and operators.

29. Given the potentials and uncertainties of tomorrow, decision makers must consider the options open to them today, never forgetting that the most appropriate technology for any country is the one which enables it to make the best possible use of its human, material and financial resources.

Recommendations

30. Regarding the continued use of electromechanical equipment, an inventory should be compiled of the quantitative and qualitative requirements for components of electromagnetic exchanges. In addition, production units should be created at the national, sub-regional or regional levels for the components selected by the study.

31. Regarding the compatibility of different systems, a study should be made of the needs for approriate interfaces. Further, R and D centres need to be created and co-ordination structure should be established on the basis of existing and new centres. This effort should be geared towards ensuring the reliability of new equipment and the need to develop the interfaces mentioned previously.

32. With regard to the digitilization of small capacities (20 to 50 lines), a study ought to be undertaken on needs for connection units and a pilot project should be established for the production of the relevant equipment.

33. Regarding the procurement of small private and public electronic exchanges, a study should be made on the modification of a standard PABX for public applications and a sub-regional or regional production unit should be set up for the manufacture of small electronic exchanges.

34. Considering the importance of solar energy in Africa and its relevance to telecommunications, especially to rural telecommunications, every effort should be mobilized to increase the utilization of this form of energy in the telecommunications sector.

WORKING SESSION III

Design, contracting and management of projects in order to enhance local participation in the realization of projects

Summary of Presentation

35. The presentation relied on the experience in Portugal to illustrate the issues under this topic. Three points were elaborated:

- the manufacture of telecommunications equipment in Portugal started in the 1930s, commencing with small simple items and transmission equipment and later progressing to electromechanical switching equipment.

- the experience thus accumulated was used to develop the manufacture of digital equipment, again starting with simple transmission equipment and graduating to switching equipment;

- finally, in areas for which domestic know-how did not exist, participation in manufacture was initiated by using a significant quantity of locally produced simple supplemental equipment.

- the experience thus accumulated was used to develop the manufacture of digital equipment, again starting with simple transmission equipment and graduating to switching equipment;

- finally, in areas for which domestic know-how did not exist, participation in manufacture was initiated by using a significant quantity of locally produced simple supplemental equipment.

36. It was stressed that this evolution was due to emphasis placed on some critical factors such as:

- training, to provide the necessary human resources;
- planning, in order to forecast market demand;
- specifications, which would allow for installation of the proper equipment;
- time devoted to the preparation of specifications, planning and co-ordination of the various contractors inputs,before starting the actual implementation of the project.

37. Purchase of technology in the form of logical sub-groups rather than a single package proved to have beneficial effects since it allowed for higher participation of local staff, thereby providing a major source of training and contributing to the preparation of maintenance procedures. Even if projects required higher initial capital investment, technology unpackaging would allow for low overall investment and direct operating costs of the project, as compared to turn key operations. Further, it allowed for a higher integration of local equipment and other less sophisticated equipment from supporting industrial branches in the telecommunications network. Lastly, it allowed for systems which were more appropriate for local requirements.

38. The presentation concluded by stressing the importance of training, planning and the organization of manufacture and services in order to be able to acquire technology in the form of well defined components.

Conclusions:

39. The presentation clearly elaborated the point that turnkey projects do not stimulate the utilization of local skills, the transfer of technology or the maximum use of local resources.

40. There was a need for well defined specifications for telecommunications projects. It was established that information already exists in the region and sometimes in neighbouring countries and it should be used in preparing specifications.

41. Proper specifications formed a crucial starting point for elaborating and negotiating contracts. Time spent on preparing for project work in detail is well rewarded by benefits in timely completion as well as in savings of costs.

Recommendations:

42. Projects in this sector should be elaborated by the respective PTT's with well defined responsibilities and planned co-ordination of inputs provided by various agents. Careful project specification would favour local participation in relatively simple aspects such as civil works, sheet metal components, etc. Project specification should also concentrate on clear evaluation of technical assistance requirements for project implementation.

43. In the event that sources of telecommunication project specifications are not available to the PTT, the services of independent experts should be employed for project preparation. Such assistance could be provided by UNIDO and ITU.

WORKING SESSION IV:

Possibilities for the manufacture of specific components of the telecommunications systems

Summary of Presentation

44. The presentation highlighted various aspects of a telecommunication project and the sub-systems of a telecommunication network. It indicated investments in each subsystem in terms of material and installation.

45. Given the number of telephones in Africa, even with optimistic growth rates, the requirement of telecommunication equipment for individual countries would be such that no viable modern telecommunication equipment manufacturing plant could be set up unless some regional/subregional co-operation is resorted to in manufacture.

46. Referring to the "Maitland Report", the presentation highlighted the fact that design, development and manufacturing efforts in developing countries should be devoted to adapting already existing equipment, in order to make it more suitable to their environments.

47. Various stages were identified in the design, development and manufacture of telecommunications equipment as well as the support industries required. In this connection, the importance of standardisation was stressed to enable regional co-operation in setting up manufacturing industries.

48. Finally, India's development of her telecommunication industries was presented as an example of step-by-step development. The country's experience in design, development and manufacture was depicted and the methods adopted by India in absorption of new technologies were also presented.

Conclusions:

49. Materials and equipment amount to about 60% of a new telecommunications project. This consists of switching equipment, cables, transmission equipment and power plant. The remaining 40% comprises the cost of buildings, installation, testing and commissioning.

50. High traffic switching equipment is available from large corporations in the developed countries. Low traffic equipment is being developed in several developing countries in addition to that from developed countries.

51. Technology for manufacture of transmission equipment and cables is available from a number of sources both in developed and developing countries. The availability of large quantities of copper in a number of African countries provides an exclusive opportunity to manufacture conventional cables and wires particularly in those countries in Africa which are well placed for export. This manufacture would have to be associated with setting up of a well designed marketing strategy and network. The manufacturing plant could include manufacture of both electrical and telecommunication cables and wires.

52. A large number of items essential for telecommunications equipment are produced in industries and processes such as: mechanical and electrical engineering works, sheet metal works, extrusion, pressing, die casting, moulding and galvanising facilities. Such industrial processes are installed in practically all African countries, hence various components and fittings could be manufactured in the region.

53. The existing low telephone density as well as low penetration, would even at liberal rates of growth (around 10%per year) restrict the establishment of large plants for switching equipment in individual countries. The main avenue for resolving this constraint would be in regional or sub-regional co-operation and planned efforts for rationalized manufacture and acquisition of equipment by African countries.

Recommendations

54. Several African countries have with the co-operation of ITU, prepared master plans for development of telecommunications and some more are in the advanced stages of preparation. Assistance from UNIDO and PATU should be sought to identify projects which could be taken-up on sub-regional or regional basis relying on the statistics available in these plans. PATU and the regional economic organisations should take the initiative to seek UNIDO assistance in analysing and interpreting the master plans available, or expected to be available shortly, and to undertake completion of the remaining information required to identify manufacturing opportunities.

55. Given the variety of standards followed by different countries in the region, a gradual approach to standardising the equipment used in Africa and more particularly in contiguous states should be intiated. This action is expected to make significant contribution in obtaining spare parts and components from neighbouring countries in the event of emergencies, and make sub-regional manufacture as well as regional co-operation technically and economically viable. Sub-regional economic organizations such as PTA, ECOWAS, SADCC in co-operation with PATU should initiate steps to create sub-regional frameworks for the telecommunications industry. The technical assistance required from UNIDO in the creation of such networks may be sought by the sub-regional economic groupings.

56. UNIDO should carry out feasibility studies for setting up manufacturing industries in the African countries on national/sub-regional basis. Action had been initiated on the Seminar itself to prepare a directory of industries available in the electronics and telecommunications field in African countries. This may be continued with UNIDO assistance to provide ready information for planned growth and setting up new industries in the African countries.

WORKING SESSION V:

Possibilities of regional co-operation in areas such as standardisation, the regional manufacture of equipment and components and the formulation of manufacturing joint ventures

Summary of Presentation

57. The presentation dealt with the institutional structures for co-operation that exist in Africa both at the regional level through institutions such as OAU and PATU and at the sub-regional level through bodies such as ECOWAS, CEAO, CCEAC, UDEAC, CEPGL, PTA, SADCC, etc.

It recalled the objectives of the Lagos Plan of Action with respect to the communications sector and industrialization for the Development of its infrastructure and offered a series of technical, financial and economic arguments in favour of regional industrial co-operation in this sector.

58. The regional possibilities for the establishment of local industries were analysed taking into account foreseeable requirements and the need to create economically viable industries. This analysis showed that

(a) A small number of countries (eight) could engage in national production of telephone stations and exchanges;

(b) The other countries (42) should form groups for joint ventures to manufacture the same type of equipment;

(c) In general, the economically viable production of cables was possible only through joint ventures by groups of states.

59. It suggested that the countries in the first category should act as nuclei around which the countries of the same category should be grouped. This would help avoid economic risks and could promote a better utilization of certain existing infrastructure.

60. The presentation stressed the role that co-operating organizations could play in the formation of groups, the implementation of common industrial policies, marketing, and so forth.

61. It also suggested other possible fields of co-operation, such as:

- Research and development, through the creation of regional and sub-regional centres which might specialize in specific areas. Such centres might also be called on to perform expert functions, including the preparation of specifications, testing and monitoring, etc.

- The exchange of information among telecommunications administrations. Emphasis was laid on the strategic importance of information and its effects on the choice of technologies and the commissioning of systems.

Conclusions

62. *The participants while appreciating the existing mechanisms of co-operation in operation among the African States stressed the need to further strengthen these mechanisms for the benefit of the region.

63. It was also concluded that appropriate studies would be useful in enabling taking decisions on the establishment of production units. Emphasis was laid on the time factor as there was an urgent need to find industrial solutions to the situation of telecommnications in Africa.

64. The participants emphasized the need for standardization. the means of achieving it and referred to the role that ITU and PATU could play in that area.

65. There is a need for establishing in PATU a system for the collection and dissemination of technical information, for which assistance may be sought from UNIDO. It was also suggested that the possibilities of the PADIS system in ECA should be studied and utilized as appropriate.

66. Emphasis was also laid on the need to develop regional co-operation in training.

Recommendations

67. It is recommended the PATU undertake to consolidate information on the:

(i) Current production in the African countries;

(ii) Details of existing industrial project;

(iii) Estimation of the requirements of telecommunications equipment in Africa over a period of 10-15 years; and

(iv) Develop new project proposals setting out conditions for implementation of multinational projects in consultation with existing organizations engaged in industrial development through co-operation in Africa.

68. It is also recommended that a regional telecommunications information system (RTIS) should be set up in PATU with the assistance of UNIDO. The system may also include information on the R&D in the sector.

ANNEX I

LIST OF PARTICIPANTS

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