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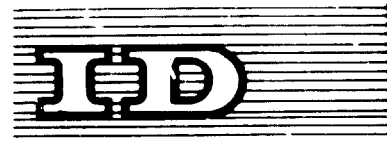
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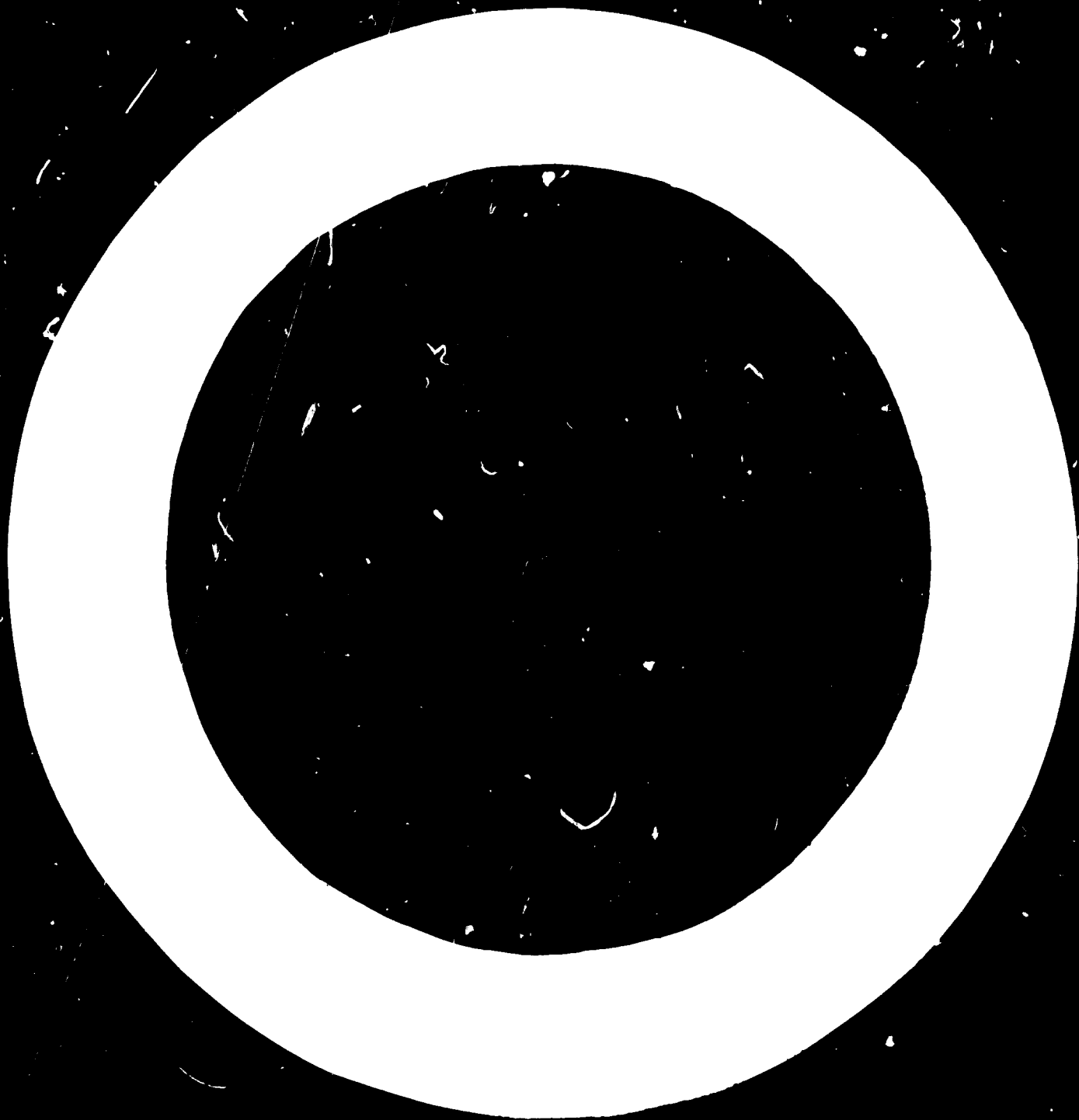
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Background paper

SCIENTIFIC AND TECHNICAL DOCUMENTATION

Presented by the

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Introduction

1. In several parts of the world there is a complete lack of scientific and technical documentation and information services. Some of the services which do exist are totally inadequate to cope with the volume of original articles, reports, reviews and patents which are being published in increasing numbers in forms more or less accessible to research workers, professors, industrialists, technicians, students and those actively engaged in the fields of pure and applied natural sciences and technology.
2. The World Guide to Science Information and Documentation Services published by UNESCO in 1965 describes such services in existence in sixty-five countries, including eleven in Africa, fifteen in Asia and eleven in Latin America. UNESCO has also collected information from about the same number of countries for a similar volume on technical documentation services and for the revised 1965 edition of National Technical Information Services. The Worldwide Directory issued by the International Federation for Documentation also lists (apart from a few governmental offices) centres in only some sixty-five countries.
3. It is therefore not surprising to find mention of "the lack of fully-fledged national or regional scientific and technical documentation centres in the region" appearing in the final report of the Working Party of Specialists in Scientific and Technical Documentation in Africa which was convened by UNESCO in Nairobi (Kenya) in July 1966. Similar statements could also be applied to other developing areas.
4. This lack is all the more serious because two parallel and growing trends have appeared in the world, especially since the Second World War. First, an accelerated scientific, technical and economic development; and second, an extraordinary increase in the volume of documentation produced and used in the field of natural sciences. To keep pace with this increase it has been necessary to replace traditional systems of information, such as personal subscriptions to periodicals, reprints and consultations in science libraries, by other systems - industrial, dynamic and even aggressive. In response to this challenge, scientific and technical documentation and information centres have appeared. Their function is

to collect and classify documents^{1/} in their respective fields and to distribute them rapidly and at the lowest possible cost to interested individuals and institutions.

Scientific and technical documentation centres

5. Since 1950 UNESCO has advised its member States to establish scientific and technical documentation centres as a means of accelerating scientific, economic and industrial progress. This advice has been accompanied by effective assistance in the form of experts, fellowships and equipment for the creation of such centres. Such action has been carried out within the framework of the technical assistance programme following the specific request of countries wishing to benefit from the help of UNESCO in setting up scientific and technical documentation centres more rapidly and on a larger scale than would have been possible with the use of national resources only.

6. The general scheme of such assistance has been very similar in all countries concerned. Usually UNESCO provides a team of two to four experts, in exceptional cases only one expert. A full team is comprised of: a specialist, chief of the mission; a documentalist, in charge of publications; a specialist in bibliography or translations; and an expert in document reproduction. The mission stays in a country from three to five years, participating in the organization and operation of the centre. It also trains the local staff that will replace the international experts. The training of the senior members of a local staff is completed abroad through fellowships provided by UNESCO, which also provides funds to purchase equipment, materials, books and subscriptions to periodicals. In general, all local expenses for staff, buildings, equipment, materials, etc. are paid for in national currency and are borne by the Government.

7. Other United Nations agencies also provide assistance in their respective fields of competence to information services in member States, but on a more limited

^{1/} A "document", as referred to in this paper, is any graphically recorded material, whatever its form or nature, that provides information. This term includes books and similar materials (booklets, catalogues, yearbooks); periodicals and similar publications (reports, bulletins); patents; all kind of photo-reproductions (microfilms, microcards, microfiches, paper copies) and films, maps, drawings and other forms of reproductions.

scale than UNESCO, which has over-all responsibility for activities related to scientific and technical information. Outside the United Nations a few international organizations are also active in helping to establish national information services.

8. Under the general scheme described above, UNESCO has collaborated with Governments in the establishment of scientific and technical documentation centres in a dozen countries. The centres are now financially supported by national funds and are operated exclusively by national staff. In other countries UNESCO missions are actively collaborating in the operation of centres and in the training of local staff.

9. Full information on the creation, organization and operation of the centres established with UNESCO's assistance is given in the booklet Scientific and Technical Documentation Centres - UNESCO's Contribution to Their Development. The ways and means - conventional, mechanical and electronic - of exploiting and disseminating available information depends on its volume and on the local resources of a documentation centre. Examples of what may be done include: bibliographical lists or bulletins, such as those published by several of the scientific and technical documentation centres set up in developing areas with UNESCO's assistance; technical cards; microfiches and microcards; microfilms; collections of reprints, assembled and distributed by research and academic institutions. Local conditions are an important factor to be considered when selecting ways of disseminating information. For instance, it is useless to provide an institution that does not have microfilm or microcard readers with thousands of metres of microfilm or a collection of microcards. The languages in which the documentation is provided should also be taken into consideration. Finally, the most sophisticated devices are not necessarily the most effective in every case, and certainly are not automatically the most appropriate for use in newly created centres in developing areas.

Mechanization

10. In this connexion, neither the super-optimistic line - "button-pushing documentation is for tomorrow", nor the super-pessimistic line - "machines will not replace the human brain in the documentation field", should be adopted. At the present stage, taking into account the volume of information available or handled in existing centres in developing countries and the number of users, the

introduction of electronic apparatus is, generally speaking, neither practical nor economical. For the preparation of lists of titles similar to those currently published by the centres, punched cards, special typewriters and computers are used frequently (e.g., for permuted title indexes). However, in view of the actual size of the lists published by the centres, the conventional system of compilation is still appropriate; it is more economical and avoids the various drawbacks which offset the advantage of high speed offered by mechanical preparation of long lists.

11. Even in the oldest centres existing in developing areas, the period of organization, consolidation and extension is not over. Effort, time and money could be better employed to strengthen the organization of existing services so as to improve the speed and quality of their work and provide new services; in consolidating and developing library holdings and attending to equipment; in making the facilities offered by the centres known to potential users, especially those in industry; in improving the regularity and quality of the publications issued and increasing their number where necessary; in training full-time and part-time staff so as to improve the quality of services rendered to users.

12. As long as these essential activities are kept in mind and given priority, caution does not necessarily mean inactivity. Where funds and staff permit, studies on mechanization may be undertaken. The results will provide information on the advisability of applying mechanized methods in the centre and on the extent of such mechanization; they will also complement the results obtained in older and larger centres established in well-developed areas.

13. When it exists, the hiring of the free time of machines belonging to other institutions offers a possible solution to the financial problems raised when the use of costly electronic computers and electro-mechanical apparatus is contemplated. It does not, of course, obviate the need for another expensive part of the operation, namely, the intellectual and material preparatory efforts required for working mechanized systems correctly.

Technological information services

14. Scientists more often than industrialists make use of the documentation centres established in developing areas. However, it has been shown that the scheme described above may be well adapted to meet the needs of industry. In Yugoslavia, it was stressed from the outset that the need for information was

mainly in the industrial field. This need was reflected in the importance attached by the Belgrade centre to collections of technical and engineering periodicals. The indexing and abstracting of articles is limited to applied sciences and is carried out by a central staff with the help of engineers working largely in factories. The result has been the regular publication of sixteen abstracting bulletins in the Serbo-Croat language in strictly industrial fields, namely: plant production; animal husbandry; forestry and wood industry; internal combustion engines and machine parts; mechanical engineering; transport engineering; electrical engineering; mining and geology; metallurgy; chemistry and chemical industry; food industry; ceramic and glass industries; textile and paper industries; fuel and lubricants; civil engineering and architecture; and transportation.

15. The level of industries in the different countries in which centres have been established with UNESCO assistance varies greatly. Some industries are well developed, but others are practically non-existent. But whatever the situation, in all cases scanty use was made of the various services offered by the centre. This means that, in addition to the general publicity employed to make known the centre's services, a special effort is required for the industrial field, in order to make industrialists aware of the various information facilities available to them.

16. This may be carried out in several ways. For instance, a bilingual Arabic-English booklet was published in Cairo under the title The First Scientific and Technical Documentation Service in the Middle East, and a similar one was issued in Spanish, in Mexico City. The 2,000 copies produced were distributed to industrialists in the respective countries, with the help of each local chamber of industry. The pocket size of the booklet facilitated rapid consultation: the summary could be scanned in a minute and the full text in five minutes. After a short historical introduction, a description was given of the means and services available at the centre and the best way to use them for industry. Special details were provided concerning the different sections of the centre's bulletin (monthly lists of titles of articles) and their relation to specific industries.

17. In each country, the official journal of the chamber of industry published a regular technical bibliographical section, based on material provided by the centres, to help industrialists in the search for appropriate information. The efficacy of this publication was seen by the increase in subscriptions to the bulletins and the increase in requests for general information, translations, bibliographies, etc., received from industrial firms.

18. The publication of special bulletins devoted to specific branches of industry is an efficient way of drawing industrialists and technicians into the sphere of action of the centres. As a practical example, the monthly Technical Information for the Textile Industry published by the Cairo centre may be mentioned. It was prepared jointly by a technical specialist of the largest textile factory in the United Arab Republic and the UNESCO mission. Each issue contained, in English or in French, abstracts of all articles concerning the textile industry received either in the factory's library or in the centre. Up to 250 abstracts were published monthly. The journal was distributed free of charge to all textile industrialists in the United Arab Republic and many others in Syria.

19. Under the title Technical Information Sheets, the Manila centre publishes a series of bibliographical notes on specific subjects of interest to local industrialists. Ceramics, coconut technology, plastics, pulp and paper, paints and varnishes, tobacco technology, and cottage industries are some of the fields covered. These sheets "are forwarded to a limited and well-selected group of individuals, organizations, schools and factories which are deemed to be in actual need of the information they contain". Their purpose is "to furnish a quick preliminary survey for a specialist on what he has to read to keep abreast of the latest developments in his field".

20. The scientific and technical documentation centres set up with UNESCO assistance operate all the basic services: publications, bibliographies, document reproduction, translations, etc., common to both scientific and technical information. The few examples given in the preceding pages show that most of the centres are able to provide the special information required by industry. In the areas where centres have been created, either with the assistance of UNESCO or, in a very few cases, by other means, the calls for technical information are already increasing substantially. It may be expected that they will continue to increase in the future. Obviously an increase will be needed in the number of technical periodicals taken and in technical documentation in general, such as "know-how" and technical digests at all industrial levels, patents, special reports, industrial catalogues, and other material. This increased demand should be reflected also in the background and special fields of knowledge of the technical staff of the centres, in the trends of the activities developed by the centres and in the facilities put at the disposal of local industrialists and technologists.

21. Some examples of these facilities have already been mentioned, others may include information and procurement services for patents, of which the importance in the field of technical documentation is generally acknowledged. The centres may gather and disseminate information on foreign patents received regularly from the main industrial countries. The centre in Cairo has been operating this kind of service successfully. It lists regularly in its monthly bulletin patents by number and country and provides on request, microfilm or paper reproductions of the patents available in its centre or obtains others from appropriate centres elsewhere. The selection and publication of summaries of patents of special interest in the area covered by the centre offers a further development of such a service.

22. A service of "technical cards" may be offered to laboratories and industrial firms to provide information on papers published throughout the world (even if not received in the centre) on any technical subject specified by the subscribers. Such a regular service allows laboratories and industries to obtain complete and up-to-date documentation on the subjects of direct interest to them. Information gathered by a specialized staff from thousands of publications can be provided at a reasonable price. The users save the cost of subscriptions to large numbers of periodicals and the salaries of a highly paid staff. In spite of all these advantages, when a service of this sort was set up in the Mexico centre it did not meet with great success. However, it should be workable and worth trying elsewhere.

23. The inertia of potential users is one hindrance to the spreading of technological information, but there are other negative factors, including industrial competition, vested interests and trade secrecy. These factors explain why abstracting and indexing periodicals devoted exclusively to technological fields began to appear much later than similar publications in basic scientific disciplines. Concerted international action to organize technical documentation and information services in the various branches of industry have developed only in very recent years and although successful enterprises of this type are not yet numerous, they are increasing steadily.

Reviewing progress in technical fields

24. The original delay in documentary activities in technology is reflected in all aspects of these activities. An example is found in the publications devoted to reviewing the progress in scientific and technical fields, as described in the some

two and a half million papers published annually. UNESCO has issued a comprehensive list of over 200 titles of such reviews^{2/} and only twenty-two of them deal with engineering and technology. This shows that basic sciences are rather well covered whereas the situation in the technological field is not satisfactory. Efforts should be made to improve it.

25. The task of encouraging initiative in fields where reviewing is required could be continued by UNESCO and other United Nations agencies and by scientific and technical governmental and non-governmental organizations. However, in view of the nature and volume of the work required, permanent reviewing activities could be carried out better by bodies outside of the United Nations and its agencies and committees. Non-governmental scientific and technical organizations and even commercial firms could more appropriately undertake this work; some guidance by the United Nations agencies both in the selection of subjects and in their treatment might be desirable and effective in some cases. Periodical reviews are greatly appreciated by specialists who find in them a selection of subjects in their own field critically examined and commented upon by other specialists.

26. Another way of reviewing technological progress, more limited but not less important, consists in selecting from the mass of documentation published throughout the world, all technical innovations directly and easily applicable to developing areas. The spreading of these innovations is one of the basic problems of industrial development since new ideas are generated and applied much more rapidly than the developing countries can absorb them.

27. An example of this kind of reviewing, carried out systematically was provided by the publication Technological Digests issued by the Organisation for Economic Co-operation and Development (OECD) from 1956 until 1964. The purpose of this, and similar publications, is to disseminate ideas concerning technical developments and discoveries suitable for immediate application. The abstracts published are selected mainly for the use of engineers, technicians and the managers of small- and medium-sized undertakings. This type of publication is useful for the development of under-developed areas.

28. The value of a publication of this kind is increased if, as was the case in OECD, a technical information service is available to the readers not only to deal with inquiries concerning particular digests, but also to try to help readers to solve their technical problems.

^{2/} Document UNESCO/AVS/Doc LT 1.

29. The kind of publication mentioned above shows one of the directions in which useful work might be undertaken. To improve its usefulness the geographical scope should be enlarged to a maximum. This applies not only to its distribution in the field, but also to the preparation of the text. It would be advisable to encourage the developing countries to participate in the preparation of digests, and at the same time to review their own contributions to technical progress. It is certain that innovations originated in one developing country could be applied easily in other developing countries with similar local conditions.

30. Whatever kind of reviewing is planned and whatever body (national or international, governmental or non-governmental) is entrusted with the actual work of reviewing, the availability of information is the essential starting point. Therefore the establishment or the development of scientific and technical documentation centres should be encouraged, either at the national or regional level. Besides providing the basic materials for the preparation of any kind of review, the scientific and technical documentation services also provide the best channel for the systematic diffusion of the reviews themselves. The increasing number of facilities for processing information provided by mechanical and electronic methods will help in the permanent reviewing of progress made in science and technology. However, it is essential that the documentation centres should collect and classify the information itself. This is an additional reason for setting up these institutions in countries or areas where they do not yet exist. The close collaboration and exchanges between those already existing is no less important, the final aim being the establishment of a network of co-ordinated scientific and technical information services throughout the world. Towards this aim, important results will certainly be obtained from the joint ICSU/UNESCO project on the communication of scientific information and on the feasibility of a world science information system, initiated this year.

31. Once the appropriate structure for providing information has been established locally, a second step is the provision of facilities for the practical use of the information provided by a centre, either directly from its own holdings or through the network of information services. This activity goes beyond scientific and technical information, but it is mentioned here "pour mémoire" and because it is

essential for the full use of the documentation provided. Supplementary information on the application and adaptation of the elements provided through "know-how" and patents, as well as special training on specific techniques and tricks of the trade, will be required. This could be obtained through "twinning" and exchanges industry-industry; by special arrangements with a network of industries or experts (cf. Technological Digests above); by training abroad and in-service training, visits of experts, etc. UNIDO will play an essential rôle in encouraging, developing and harmonizing such initiatives.

Centralization of documentation and information services

32. In view of the increase in the demand for technical information, it might be considered advisable in developing areas, to create documentation centres devoted exclusively to the provision of technological information for industrial purposes. Some arguments against such a step have already been given in this paper. Others, no less convincing, may be added in favour of the creation of scientific and technical documentation centres, serving simultaneously scientists, technicians and industrialists. Three of them are discussed below: costs of the centres, availability of staff, training of personnel.

Cost of centres

33. (a) Information centres are expensive undertakings. In 1954 - and since then there has been a considerable increase in costs - the first scientific and technical documentation centre was created in Mexico with UNESCO's assistance. It became an entirely national institution with an annual budget of \$60,000; this sum did not include the value or the rental of the building in which the centre was housed. In 1966 the budget of the Thai National Documentation Centre included inter alia over \$16,000 for the purchase of books and periodicals and \$22,500 for staff expenses. A larger centre, the Indian National Scientific Documentation Centre, at present spends over \$255,000 yearly. Out of this total figure, over \$140,000 is devoted to staff salaries and some \$15,000 to the purchase of equipment.

34. These figures show that the establishment of scientific and technical documentation services may cause a number of financial difficulties in small countries, even if they receive assistance from international organizations.

A regional project, involving several neighbouring countries might then provide a convenient solution. If the setting up of one centre creates financial difficulties, it is easy to see how unrealistic it would be to establish two separate information centres, one for scientific information and the other for technical information.

Availability of staff

35. (b) Even a small scientific and technical documentation centre requires specialized staff, which is not always easy to recruit or to train. This is particularly true for the director and senior staff who should be scientists or engineers, or at least people with a good scientific or technical background. In areas where centres are created for the first time, scientific and technical information does not exist as a career, and scientists and engineers, especially men, hesitate to start working in a new field without any clear indication of the future openings in what appears to them to be an unknown profession. Furthermore, the salaries offered in these posts, particularly to young scientists, are often inadequate; in some cases administrative regulations and in others the low esteem in which the new activity is held are responsible for this. Senior scientists are still more reluctant to give up well-established positions. The difficulties in recruiting staff for the information centres are already very serious among scientists but they are much more so in the different engineering branches, where the shortage of professionals is almost general in all countries.

Training of staff

36. (c) Another problem concerns staff training. In the centres created with UNESCO assistance, the UNESCO missions have trained staff at all levels and in all the disciplines of the natural sciences. This has generally been done by in-service training, supplemented in some cases, by specially organized courses. As already mentioned, UNESCO allocates fellowships to senior staff members to enable them to complete their studies abroad.

37. Individual or collective training has also been organized for scientific documentalists and science librarians, other than the staff of the centres. This activity has been of special interest in countries where, due to material and financial difficulties, documentation or even library training schools do not

exist. Regional introductory courses on scientific documentation have been useful in awaking the interest of potential documentalists and in demonstrating how they can be trained through practical work.

38. Similar training courses for technical information staff could be organized in the existing centres where the necessary equipment, publications, and materials are already available. Additional specialized instructors could be appointed in accordance with needs.

39. In view of the scarcity of engineers available for documentation tasks, technical-industrial training for documentalists and other specialized staff of new centres might be envisaged in some cases. This could be done in close collaboration with appropriate national or international industrial bodies.

40. The shortage of qualified staff for scientific and technical documentation centres has been stressed repeatedly in numerous meetings in the developing areas of the world. To give a recent example, one of the resolutions of the "Working Party of Specialists in Scientific and Technical Documentation in Africa" convened by UNESCO in Nairobi in July 1966 reads as follows:

The Working Party having noted the complete lack of facilities for the training of scientific and technical documentalists in the region

considering that the lack of trained personnel is the main hindrance to any extensive plan of development of scientific and technical documentation services

Recommends:

(a) that the highest priority should be given by the Governments and by the national and international organizations to the urgent provision of ways and means for the training of information specialists needed in the various documentation aspects in special librarianship, abstracting, indexing, terminology, publication techniques, storage and retrieval, reproduction, etc.

(b) that as the first initiative towards this end UNESCO should provide assistance for the creation of regional training centres for scientific and technical documentation staff

(c) that training provided for specialists in the various fields of science and technology should be given in centres attached wherever possible to existing academic or scientific institutions

/...

(d) that the training facilities should be provided preferably in the various fields of learning, with appropriate specialized options

(e) that if the integrated plan outlined under (d) is not considered feasible, priority should be given to the training of specialists for scientific and technical documentation.

41. The proposal indicates the general directions for possible solutions. In addition, during the discussions, besides stressing that the only fully satisfactory solution to the problem is the creation of training institutions similar to those existing in other fields of knowledge, provisional and partial solutions were examined at length. It was considered that training courses within the region should be given preference over those organized in other areas. It was also considered worthwhile that UNESCO should examine the possibility of training by correspondence as a means of providing facilities for a large number of trainees.

42. The proposed regional centre(s) could be set up within the framework of UNDP, both under TA and SF programmes. In addition to all the sections and services of a fully fledged scientific and technical documentation centre, the centre should have the appropriate academic staff for training the specialized personnel required for the national centres of the region. It could also carry out studies and surveys on documentation and information matters in the corresponding geographical area. The centre could be an autonomous body, but it would be preferable for it to come within the framework of a scientific or technical academic or research institution, either national or regional.

43. This project is of paramount importance. As long as the problem of the shortage of qualified manpower is not solved, any sound plan for improving and enlarging the transfer of scientific and technical knowledge into and from developing areas will be impossible and purely theoretical.

Conclusions

44. It may be appropriate to terminate this general survey by listing some conclusions:

1. Governments and appropriate institutions in developing areas should be encouraged to establish, or enlarge and improve, national or regional documentation centres, covering both scientific and technological information.

To this end, full advantage should be taken of the assistance which may be provided under the United Nations Development Programme.

2. Existing scientific documentation centres should serve as the nucleus for establishing or expanding technological information services for industry and development.
3. Any new centre to be created should cover both scientific and technical documentation. Later on, when the need arises, specialized centres may be set up.
4. Close liaison should be maintained between national and international bodies interested in these matters, especially UNIDO and UNFSCO, in their plans for creating new institutions and for the best utilization of existing ones.
5. Close relations and exchanges between the documentation centres should be encouraged and developed. The final aim, strongly supported by UNESCO, being the establishment of a world network of these services with a central committee to co-ordinate their co-operation.
6. The training of staff for the various branches of scientific and technical documentation is essential for any real improvement in the transfer of information in developing areas.
7. The establishment of regional training centres large enough to produce a strong impact in providing suitably qualified staff is essential.
8. These regional centres should be maintained until conventional academic training institutions are established in the corresponding areas.

45. These conclusions do not offer complete solutions to the problems and sub-problems raised in the survey, but it is hoped that they will serve as a basis for collective thinking and discussion leading to realistic solutions acceptable to all concerned. This realism should not prevent us from aiming at very high goals, even if the initial results look meagre. In the field of scientific and technical documentation the well-known slogan of Guillaume le Taciturne: "Il n'est point besoin d'espérer pour entreprendre, ni de réussir pour persévérer" should be kept in mind as a permanent invitation to continuous action.





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