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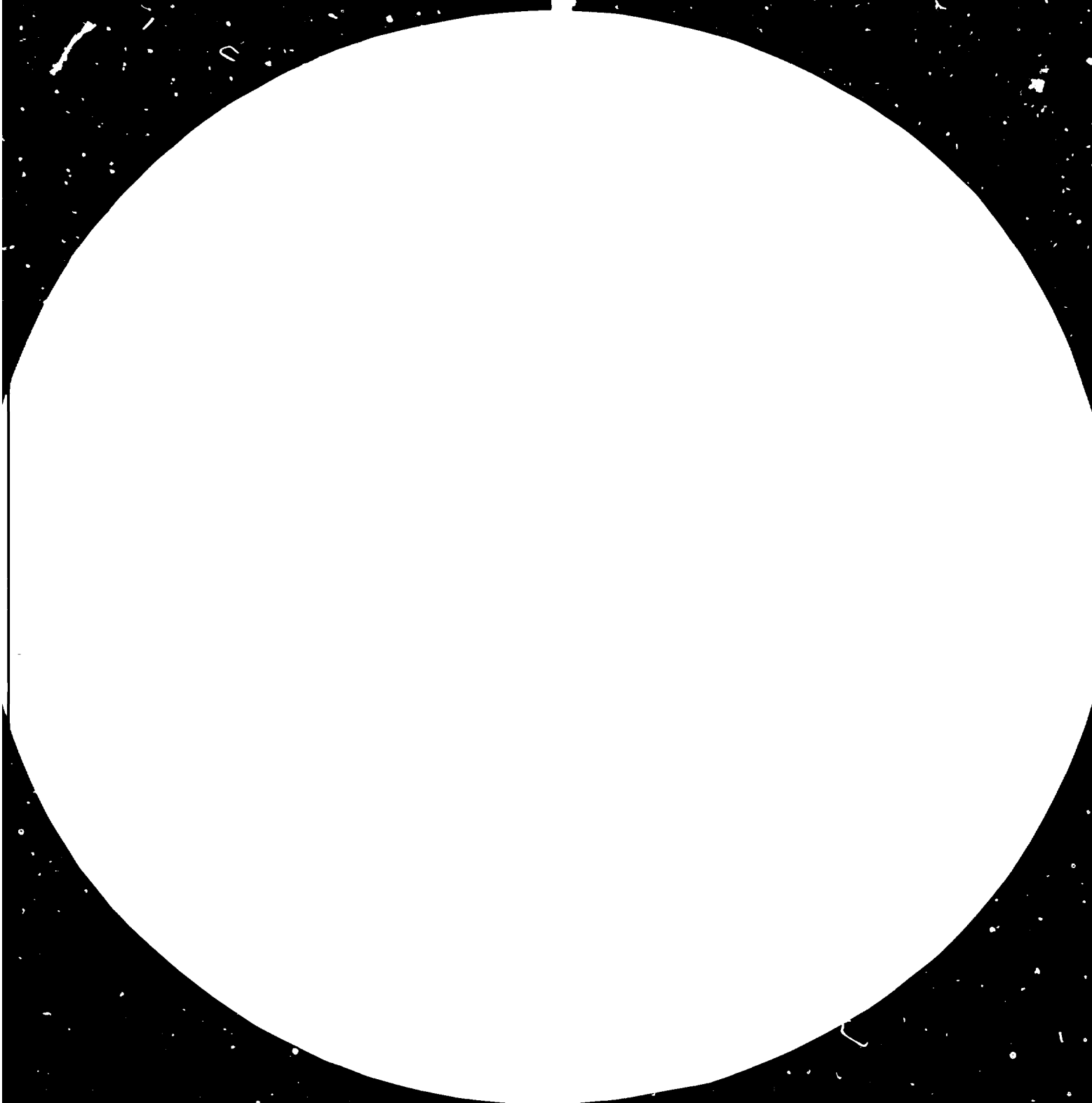
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ACTION IN THE FIELD OF
INDUSTRIAL AND TECHNOLOGICAL INFORMATION
IN AFRICA

Prepared by
the UNIDO secretariat

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INDUSTRIAL AND TECHNOLOGICAL INFORMATION

I. THE SPECIFIC FEATURES OF INDUSTRIAL AND TECHNOLOGICAL INFORMATION

1. Information for industrial and technological development serves the needs of a variety of end users. These encompass R and D personnel, technologists, managers of industrial plants engineers, economists, planners, investors, financiers, entrepreneurs, as well as market analysts, sales personnel, Government and decision makers. The type of information they need is also of considerable diversity. It includes socio-economic data and statistics, information on current plans and projects for the public and private sectors, financial data, information on technologies, equipment, management practices, patents, on-going industrial-technological research and technology contracts and legislation. Such information which has to be recent and continuously updated has to be obtained from a large number of sources inside the country, at the regional and global level. It is transmitted to the end users in many forms ranging from oral communication to computer printouts. It includes the provision of on-site expertise, advice at a distance as well as supply of documentary information. Consequently an industrial and technological information system needs to have three main features:-

(a) a multidisciplinary outlook, combining technical and socio-economic interests so as to meet the variety of needs of its clients;

(b) an ability to find its way around the world of relevant knowledge, some of it proprietary, together with mastery of documentation, analysis and retrieval techniques, that would permit it to find answers to its clients' questions, from any source along the streams of flow of information and package them in the form that directly meets their needs;

(c) a capacity to inspire confidence at whatever target level of end users through the ability to provide the right information in the right form at the right time.

2. It is important to contrast these features with the work of the information scientist and technologist who carries out a conventional information function which is mostly concerned with the down-flow of information from its original source where knowledge is stored, towards its destination where knowledge is in demand. The industrial and technological information system works in the reverse direction, upstream flows of information from needs relating to the specific purpose of optimizing industrial and technological development and operations to points along the information flow or stores of

knowledge yet untapped, where such needs can most likely be met.

3. A discussion of industrial and technological information needs in Africa and how best to approach them at the international, regional and national levels, will therefore be marked by the characteristics of the industrial and technological information system. It will refer to a very limited extent to the availability of documentation systems, which will be useful where they are in operation, but will not be of much immediate and direct service to industry where industrial and technological information is largely proprietary and only accessible at a cost, contrary to the world of science, education and culture where knowledge is literature-based and free.

4. The industrial information officer, at the core of this system, provides an irreplaceable interface between end users of industrial and technological information with advisory or decision-making responsibilities, particularly in pre-investment technology selection, as well as managerial, engineering or mercantile responsibilities in ongoing industrial operations.

5. The objective viewpoint is that no country with a measure of industrial development ambitions, relating to cottage, small, medium and heavy-scale industry in any quantitative combination should do without an industrial and technological information structure. Such structures do exist in almost every country in Africa, either as a fully-fledged servicing centre or in an embryonic state within a broader structure ^{1/}. Various training programmes for industrial information officers have been organized by UNIDO, particularly an annual eleven-week course at the All-Union Institute of Scientific and Technical Information (VINITI), Moscow. Diverse other courses are offered on an ad hoc basis in countries with particular experiences and success in the industrial information function.

II. INDUSTRIAL AND TECHNOLOGICAL INFORMATION SOURCES

6. As regards the upstream sources of information, several organizations in the United Nations system are involved in channelling information of relevance towards a particular target group of socio-economic activity. They do this with a measure of co-ordination between them but with differing emphasis

^{1/} UNIDO is compiling a directory of information systems and services in developing countries. Information so far collected in this regard is available.

placed on ways and means to reach end users. The United Nations Educational, Scientific and Cultural Organization (UNESCO) has made progress towards developing a world-wide unified governmental approach to information policy-making as well as the functions of the librarian, the archivist and the data bank operator or distant interrogator on the professional level. Through appropriately equipped recipient focal points, the developing countries have a closer access to world-wide sources of information in a specific area. Plans for the development of a world-wide system for the exchange of scientific and technological information that emerged from the United Nations Conference on Science and Technology for Development (UNCSTD), Vienna 21-30 August 1979, foresee the accelerated progress of tele-informatics to bridge the information gap to give access to data banks and other sources of information on an instant world-wide answer-to-question basis. The World Bank is a valuable source of economic and financial information on a world-wide scale. Bibliographic data banks giving access to literature have been developed, such as INIS to cover non-restricted literature on atomic energy; AGRIS to cover world-wide publications on agriculture; DEVSIS on a regional basis, including DEVSIS-AFRICA, for papers on development policy-making. The referral system of the United Nations Environment Programme, INFOTERRA, has been developed to serve environmental concerns as a data bank giving access to individuals and institutions as sources of knowledge to tap on an ad hoc basis rather than as authors of studies and reports. Under the programme of technical co-operation among developing countries (TCDC) a network is also being established for developing countries to exchange information among each other.

7. UNIDO operates on a wavelength of its own, which has been chosen not through any search for institutional originality, but rather to fit in with UNIDO's specific responsibility which is to improve and accelerate industrialization towards the 25 per cent Lima target. Advertising UNIDO's Industrial Inquiry Service as the mail order technical assistance clearly reflects its orientation towards the solution of specific practical problems. The pre-investment stage and the decision-making responsibility have priority over the ongoing operation of existing enterprises, as stressed by developing countries themselves in the Lima Declaration and Plan of Action. The technology selection process was singled out from the total field being covered under industrial information activities, to be served by the recently established Industrial and Technological Information Bank (INTIB) of UNIDO. Another useful system for information on technology contracts is UNIDO's

Technology Information Exchange System (TIES) ^{2/}. The more TIES continues to grow and the larger the number of countries participating in it, the greater its value in negotiating technology contracts becomes. While most information activities generated within the United Nations system tend to come forward as information systems and data banks, what UNIDO has to offer consists of computer assisted services. United Nations information systems and services have all been identified and listed by the Inter-Organization Board for Information in the United Nations, together with listings of the corresponding national institutions ^{3/}.

8. Outside the United Nations system, there exists a large number of sectoral data banks and information systems of particular relevance to industrial development. These are too numerous to list or discuss here. The main point is that access to them is now quite simple and not costly. However, the value of the information obtained through these networks and its relevance to the needs of African industrial development remains to be carefully assessed for the variety of situations and needs to be found in Africa. Nevertheless, it is possible to state that while information from some of the large international banks and investment houses is particularly useful on statistical, economic and financial matter, it is doubtful whether other commercial information banks and data bases fully and directly meet the requirements of the selection and acquisition of technology.

9. There is a lack of information on Africa itself, particularly in the area of relevant information for the sound planning of industrial development. Some information is mainly statistical data. African countries still have to embark on the formidable job of ensuring that such data is gathered systematically, in a regular and reliable manner, and according to relevant definitions that need not necessarily be those of other regions, or even the international organizations. However, they should not cut themselves off from these statistical data bases. The problem was recognized and solved in Latin America some time ago. The other type of information that is still lacking is that of the socio-economic structures, their trends and future plans, as well as ongoing technological research and industrial activities and projects.

^{2/} To date, 25 countries have joined TIES, UNIDO publishes the TIES Newsletter bi-monthly.

^{3/} Directory of United Nations Information Systems and Service, Inter-Organization Board for Information Systems (IOB), Geneva, 1978.

10. The TCDC Conference identified this gap and called for South-South exchange of information and UNDP is starting a pilot scheme for the purpose. In short, most information on Africa comes from non-African sources.

III. INDUSTRIAL AND TECHNOLOGICAL INFORMATION NEEDS IN AFRICA

11. Many African information institutions, essentially libraries and documentation centres, seem to have been established without much thought as to whether, and to what extent, they might consider joining forces and budgets to develop between them the capability of accessing at a distance data banks and other sources of information as a joint service, for the benefit of all sectoral user groups. This is a course of action which will obviously be forced upon them by the spread of the world-wide network. However, their diversity is commendable when it is considered that information needs in science, education, agriculture, medicine and industry, are neither served by the same sources nor through the same methods. Industry presents the specific feature of being based on knowledge, much of which is proprietary and little of which is literature-based, and which involves end users of information who want their problems solved rather than material to look up, read and ponder over.

12. Industrial technology consists of hardware and software. The majority of foreign technology is transferred in Africa today as equipment. The bulk of investment and foreign capital goes into the purchase of equipment. Information on equipment is perhaps a top priority in Africa today. It is this knowledge, or know-how, which has not been consciously transferred; hence the continued dependence and the failure to develop the stock stream through mastery of the know-how and its transformation into equipment and processes. It is necessary for the sound development of industry that in each African country one specific structure employing one or more industrial information officers, serve industry exclusively, developing by constant and concentrated practice a capability to interface with the end user of industrial and technological information in industry, so as to become their antenna and problem solver.

13. To date many people from African countries have participated in UNIDO training programmes designed to assist them to become competent information seekers, analysts and re-packagers, but even more so, to become extension officers on the widely recognized model that has long applied to agriculture, visiting their industrial and technological clientele at whatever level, gaining their confidence, identifying their problems, supplying information, whether solicited or not. The measure of success in this latter function seems to have been limited. The function is not only related to the information specialist. There has always been a problem in identifying specific information needs in African countries in advance of demand and in channelling whatever inquiries were received through national industrial information structures to sources of information within the country or, more commonly, abroad.

14. It is felt that the strengthening of industrial and technological information structures in African countries, relating these more intimately to development bank activities, engineering consultancy and industrial R and D functions internally and to whatever documentation structures are being developed locally, as well as to outside reliable, independent and comprehensive information sources abroad (for instance INTIB) should be a broadly recognized priority.

15. Industrial information services, though distinct in nature and mode of operation will, by necessity, be developed within the general framework of the national information policy in each country. It is a matter of information policy for a developing country to take a hard look at government level at the situation of information activities in order to determine whether a computer capability ought to be established at the service of all to access information sources abroad and collect information generated on site or whether a central, completely multi-disciplinary documentation base might most usefully be established or strengthened. However, when it comes to relate this to industrial information needs, and to determine where to establish an industrial and technological information sub-system this definitely belongs in the zone of overlap between industrial and technological information needs and national information policies.

16. In that zone, two visions are likely to be brought to bear and possibly to blur issues for the governmental decision-maker to decide upon: the vision of the information scientist and technologist as passed on to related practitioners, the archivist, the librarian, the data bank operator

or distant interrogator; and the vision of the industrial and technological information officer. As described earlier, the latter looks upstream the flow of information based on the end users' needs in a certain field. Called upon to contribute to information policy, he or she will remind decision-makers in the government that the end users' needs have to be given equal importance to those of information system operators; that industry in particular may prefer to take information preferably in a few words or lines provided through personal contact rather than from computer print-outs of references to documents, the original of which are distant and difficult to acquire, and the analysis of which is tiring and time-consuming.

17. Between national documentation bases and computer terminals, there is an absolutely essential information analysis and information extension service that has to be filled in order to meet information needs in industry at any scale (cottage, small, medium or heavy). Such a function cannot be left unfilled without seriously impairing the capability of nascent industries to operate knowledgeably. This is the basic difference between information and knowledge. It adds a new function of information generation, rather than just information handling. In order that such an industrial information officer not only contribute wisely to the determination of an information policy under which the interests of industry can be served, but also serve the requirements of industrial planning, management, engineering and salesmanship, he or she will most likely have to be a technical person with experience in industrial operations and exposure to the economic aspects of industrial investment and operation. The industrial and technological information structure to be set up should be operated by a person with such a profile, with a broad-minded polytechnical scope of intellectual interest, belonging to the same background in social and economic terms as the officials or entrepreneurs. He or she should be versed in documentation techniques. On the basis of the best international experience available (that of Canada, Denmark and France among industrialized countries, Mexico, Ecuador and seven countries in South-East Asia, interlinked by the TECHNUNET network in Singapore), it can be stated that whenever African countries wish to place an industrial information officer, or a team of such, in an autonomous centre or as part of some Ministry or R and D centre, industrial and technological development will surely profit. It might even be suggested that a young internationally educated engineer-cum-business school graduate, looking forward to playing a leading role in the industrialization of his or her country,

whether at the governmental level or in a spearheading capacity in the private sector, could do no better than to devote himself for several years to the problem-solving function of an industrial information officer.

18. The problems of technology selection, acquisition and development figure prominently throughout this paper. It is thus necessary to look a little more closely at the process of developing INTIB to serve the technology selection process. If INTIB is to be brought to bear upon concrete technology selection dilemmas as they arise in African countries, it is obviously imperative that some national structure be established with an INTIB responsibility of its own at the national scale. Naturally, the national partners of INTIB will be industrial information officers rather than information scientists and technologists. They should also be very close to the individuals or institutions entrusted with the responsibility of carrying out these functions.

19. INTIB, addressing itself as it does to the technology selection process in 20 sectors of industry, is not only of concern to a multiplicity of entrepreneurs, whether from the private or the public sectors, all of whom are difficult to reach, even for a national industrial information structure. It also concerns a more limited and accessible circle of investment bankers responsible for the economic aspect of projects submitted to them for funding rather than for the technological contents of such projects. Furthermore, engineering consultants, many of whom are setting up firms in developing countries, endeavour to win the confidence of a local clientele in advising on technologies to be set in motion but who still need an information back-up, that can be provided by INTIB. The teams of industrial information officers will also have their hands full in identifying operational needs of ongoing industrial enterprises and helping them to meet these from a multiplicity of information sources.

20. It is worth remembering when discussing policy matters that the nature of the industrial information function does not differ between countries of differing levels of development even though the size of industrial information services may.

IV. A FRAMEWORK FOR ACTION

Clear Definition of Needs

21. The information needs of industrial and technological development are of an unusual variety and change very rapidly with further development, or along the path of progress from an identified investment opportunity up to production, marketing and upgrading of machinery and products. The needs vary from sector to sector and involve both national and foreign sources. The success of industrial and technological information services depends entirely on their ability to provide the information needed on the spot. The planning of such services should be anticipatory and one step ahead of the progress of industrial development. As mentioned earlier, the key activity is to have access to up-to-date sources of information rather than to build up huge data bases.

Identification of Sources

22. It is unfeasible to expect the national or regional industrial information service to physically possess all the sources of information it provides, nor is this necessary. What is essential is to know where the information can be obtained and the intrinsic value of this information.

23. A good information service should continually search for new sources of useful information needed in the country or the region, as well as assess the reliability and comprehensiveness of the information acquired from various sources. More often than not, the sources are much closer at hand than might be thought at first. The information may already be in the country or within a regional organization. Efforts in ascertaining the nature and availability of information from such sources close at hand should come before the search for sources far away. It is worthwhile, in an African context, to pay special attention to the number of newly-established data bases on appropriate technologies, particularly for rural development and small-scale industries in various parts of the world.

Efficient Linking with Information Sources

24. Because of its very diffuse and varied nature, industrial information is more dependent on a large number of sources than, for instance scientific or scholarly information. In the upstream search, characteristic of the industrial

information officer's approach, once the sources are identified, it becomes imperative to establish efficient linkages with these sources. This does not necessarily mean sophisticated and expensive telecommunication or information systems; a telephone conversation or a personal visit may be the most appropriate means of efficient linkage, because the volume of information from one source is not usually large, yet the sources may be varied in nature and scope.

Strong Relations with Users of Information

25. This is a key issue in developing effective information services today. The person called upon to take decisions in African industrial development, whether in the government, public sector or private business, does not necessarily appreciate the need for information in formulating optimum decisions, nor do they know, if they appreciate the value of information in decision-making, that valuable and relevant information can be speedily obtained.

26. They will only gain credibility if they adopt an active, if not relentless, attitude, going out of their way to provide unsolicited information until people come to appreciate the value of their services and seek them. This is a crucial function of the industrial information system and its officers and the test of success. It is obvious that in order to reach this stage the information officers will have to be well-informed about events in their country and capable of identifying the end users, on the one hand, and the existence of readily-available useful information on the other.

Building a Technological Intelligence Capacity

27. Industrial information on technology involves proprietary rights that cost money. Raw information in itself can be confusing, contradictory and even downright false. Very serious damage could occur if such information is relied upon. Besides, in the gathering and ordering functions, there is a pressing need in developing countries to assess and evaluate information, that is to turn it into intelligence or knowledge. The industrial information service will not only be handling information; but also generating information. INTIB is a clear case of this crucial activity in technological development. The subject of building technological intelligence capabilities in developing countries is now being debated on a world-wide scale. The most pressing needs are perhaps those for market intelligence and some capacity to keep track of new technologies and current thinking on technological forecasting, i.e. what is now known as technology awareness. This is a multi-disciplinary group activity that needs special training. Universities, technological

institutions, and particularly the African Regional Technology Centre (ARTC) could well pay increasing attention to this aspect of technological development and to building up a capability to assess and judge raw information on technology, particularly that obtained from sources that may have vested interests. They will have to link themselves closely to the individuals or institutions responsible for the various activities involved in technology transfer, on the one hand, and the sources of information, analysis and comparative studies on technology, on the other.

Building a Cadre of Industrial Information Officers

28. The whole approach to industrial information here is concentrated on the industrial information officer. As mentioned previously he or she is a multi-faceted person and it is obviously going to be difficult to select and train a sizeable cadre of such persons. Two basic problems militate against significant progress here, the rather low social status in the industrial development employment and the limited prospects of promotion and career development. Latin American countries have tried certain approaches, such as the involvement of young engineers and scientists in information work, to overcome similar problems and appropriate measures for African conditions have to be identified.

Short-term Actions

29. Certain short-term actions have to be carried out, while the above actions are being planned and executed over longer time horizons. These are:-

(a) the identification of present information priorities:-

The priority sectors for industrial technological development in Africa have now been established. As regards the type of information; types of equipment, technological processes, contractual and financial conditions and data, and patents are obvious priorities for a variety of sizes of industrial enterprise in the chosen sectors;

(b) the improvement of linkages between existing sources (nationally, regionally and internationally):-

- (i) Within the guidelines of the national information policy of the country, the relations between the industrial and technological information services, with their specific features, and other national information services should be streamlined. The location of the industrial and technological information function should be carefully examined, bearing in mind that rather than being a depository of information, it is an exchange that aims at the smooth and rapid connection of the user to the source of information needed;

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- (ii) Thus networking of existing services within the country as well as regionally, calls for immediate action, standardizing the modes of query, communication and reply and ensuring maximum availability of the sources of information with all their variety and dispersion through focal points and centres;
 - (iii) There is an immediate need for a thorough survey of industrial and technological information sources and services throughout Africa, with continuous updating and widespread dissemination of such information. This could lead to spontaneous or planned formation of groups of users in the development, finance and R and D areas so as to advise in good time on information needs;
 - (iv) Links with foreign sources should be strengthened selectively, bearing in mind the vast improvement in telecommunications and the remarkable reduction in the cost of using some of them. There is an immediate need for better awareness of UNIDO's services and publications and widespread use of such facilities.
- (c) strengthening local sources and data bases:-
- (i) There is particular need for readily-available information on patents, which should not be difficult nowadays, and on technologies, which is still a problem, particularly for new technologies, Omnibus Catalogues on equipment of various kinds is always in demand and should be always ready at hand;
 - (ii) National data bases in most countries still have a long way to go before they could provide reliable, up-to-date statistics and data. Putting the local data bases in order is a task which is essentially not that of industrial information; but which seriously affects its viability.
- (d) establishing a technological intelligence capability:-
- (i) This calls for the initiation of multi-disciplinary training programmes and the continuous involvement of a group, or groups, in monitoring events and performance with the country, the continent and world-wide. UNIDO has a direct responsibility in this area ;

- (ii) Being essentially an information generation exercise, it could address itself for a start to the immediate task of continuing to prepare industrial profiles for small-scale industries in the priority sectors, analysing, in particular, the alternative technologies available;
- (iii) The development of INTIB and the wider involvement of national information services both in disseminating information from it and in providing it with information is a task that involves both the international organization, as well as the developing countries;
- (iv) UNIDO should expand its work on the problems of technology selection and decision-making so as to provide suitable and relevant guidelines on actual current problems.
- (e) training of industrial and technological information personnel:-

In order that these short-term actions may be undertaken, there is an immediate need for greatly expanded activity in training, at all levels, and particularly on the regional and continental African levels, to complement UNIDO's training courses and to achieve considerable increases in qualified industrial information officers, familiarizing them with recent developments, and strengthening the working relations between sister organizations, nationally and regionally.

30. The above suggestions should not convey any sort of impression that engaging in a tangible industrial and technological information activity necessarily represents immediate progress which might prove costly in terms of funds and manpower. Any embryonic structure in a ministry of industry or planning board and any devoted individual attention to the function, even part-time is better than nothing, to begin with, and provides the basis for eventually building up something stronger, at the pace at which industrialization of a country progresses.

31. One suggestion, in line with UNIDO's mail order technical assistance function, is that in each African country one official be entrusted to study the matter, to examine the state of the art of the industrial information function in their country, and to correspond with UNIDO's Industrial Information Section. From a dialogue of this kind no doubt ways and means could be found to strengthen what exists, establish what does not, and to secure continent-wide co-operation in this area.

abbreviations used in this document

AGRIS	International Information System for the Agricultural Sciences and Technology, Food and Agriculture Organization of the United Nations (Rome, Italy)
DEVSIS-AFRICA	Development Sciences Information System (Addis Ababa, Ethiopia)
INFOTERRA	International Referral System for Sources of Environment Information, United Nations Environment Programme (Nairobi, Kenya)
INIS	International Nuclear Information System, International Atomic Energy Agency (Vienna, Austria)
INTIB	Industrial and Technological Information Bank, United Nations Industrial Development Organization (Vienna, Austria)
TECHNET	Asian Network for Industrial Technology Information and Extension (Singapore)
TIES	Technological Information Exchange System, United Nations Industrial Development Organization (Vienna, Austria)
URISIST	World Science Information System, United Nations Educational, Scientific and Cultural Organization (Paris, France)
VINITI	All-Union Institute of Scientific and Technical Information (Moscow, Union of Soviet Socialist Republics)



