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THE DEVELOPMENT OF INDUSTRIAL INFORMATION SYSTEMS IN THE ARAB REGION - A REVIEW OF PAST EXPERIENCES, NEEDS AND TRENDS*

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Synopsis

After a brief introduction highlighting the distinguishing features of industrial technological information, this report proceeds to review the efforts exerted over the last fifteen years to develop industrial information systems and networks in the Arab Region and to draw some conclusions relevant to future development of INTIB.

It then moves on to present some comments on INTIB operations so far and conclude with some tentative recommendations for future development of its activities.

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I. The Genesis of Industrial Technological Information

1. It is important to emphasise, at the outset of our deliberations, the specific nature of industrial and technological information and the enormous magnitude and unusual variety of the tasks its systems and services are called up on to carry out, as well as the particular features that distinguish it from other types of information. This - in the author's opinion - would save us from falling prey to one of two undesirable extremes that are both counterproductive: starry-eyed optimism that is not firmly rooted in the realities of the situation, or a discouraging defeatist pessimism that exaggerates the problems we face. The specificity of the situation we are dealing with here is due to two main factors. First, there is the nature of industrial and technological information itself. Secondly, and related to the first, there is the genesis of its systems and services and the hard fact that they could only build in their early stages of development on past experiences in other fields that are quite different in nature and scope.

2. Scholarly knowledge, the most ancient form of information man has known, never ages nor does it become redundant. It is basically cumulative, in the sense that new knowledge does not render older knowledge obsolete. It does not replace older knowledge; but is closely related to it. Later on with the Renaissance, scientific information emerged as a distinctive type, quite different in nature

from the knowledge base of the philosopher, the historian, or the theologian. We gradually came to realise that scientific information has a span of useful life, after which it is either discarded or is assimilated in the scientific knowledge base of the educational system. Consequently, it brought with it entirely different concepts and methods of handling information that we are all quite familiar with. What concerns us here are two characteristics of scientific information. First, it is freely available at no, or at best nominal, cost. Secondly, it is not meant to "inform", in the strict sense of the word; but essentially to establish the claim of the author for originality in a certain field, viz. the "Publish or Perish" creed. Exchange of scientific information has been shown to occur in entirely different modes, such as personal contacts and "invisible" colleges.

3. Industrial and technological information is also essentially different from both scholarly and scientific information. It is meant to be used in one way or the other to produce a profit or an added value. Hence, it is a commodity of very unusual properties that often has a price tag on it, and which is traded in a market and through transactions that have distinctive features. Those seeking such information need to know the correct answer to specific questions. Unfortunately, the questions are so diffuse and cover a vast range of sources and types of information. It is very difficult, if not wellneigh impossible in some cases, for a system to provide meaningful answers to all questions addressed to it. Even more important is the fact that, in most developing countries, there is no active demand for the services of industrial and technological information systems, as well as a serious lack of their credibility. It is within this rather complex situation that we are trying to build INTIB and develop its activities.

4. One obvious consequence of this situation is that INTIB had to define its scope of competence clearly as assisting in the selection of technologies, either through the provision of assessed information, or through building capabilities for sound selection. Even within this limited scope, it has to tap an unusually heterogeneous assortment of sources of information, both in-house, within the UN system, as well as from manufacturers, R&D institutions, consulting firms and individuals, etc. What is even more significant is that it does not simply function as a switching station transferring "raw" information from source to user. It is called upon to assess information, that is to generate new knowledge. The original concept went even further and envisaged INTIB as a means of disseminating information about successful experiences in industrial development in developing countries. Finally, comes the task of building capabilities in developing countries for proper technology selection - a task that involves formulating criteria, preparing guides and developing human resources. This is indeed a tall order and its priorities need to be carefully sorted out. In an attempt to clarify some of the issues involved, this report proceeds to review and analyse experience in the Arab Region in establishing and operating industrial information systems, before ending with some comments and recommendations on future INTIB activities.

II. The Development of Industrial Information Systems in the Arab Region

5. No specialized information system existed in the Arab Region when the Industrial Development Centre for Arab States (IDCAS) was established in 1969. One of the very early projects - apart from setting up an in-house information unit - was the establishment of regional specialized centres, each dealing with one specific industrial branch, and with its headquarters in one Arab state. The attraction of this approach was that it allowed IDCAS to set up, within months of its creation, an embryo network based on the development of national institutes already in existence and upgrading their capabilities to function as regional centres.

The main thrust of IDCAS support was towards the creation, in each one of these "national-regional" centres, of an information unit specializing in the centre's specific industrial branch and concentrating on information about technology choices. Three years later, the information unit in IDCAS headquarters became a fully-fledged department acting as the focal point in the system. The design concept of IDCAS industrial information network during this early phase is illustrated in Fig. (1). It is worth mentioning here that UNIDO/UNDP played a prominent role in setting up the specialized information units in these hybrid centres.

6. This concept did not work for a variety of reasons, some of which are of a generic nature and are common to many developing countries. Perhaps the most important from our point of view were, first, that the design did not take full account of the weak communication infrastructure between Arab states at the time. Consequently, the specialized centre failed to become a node of information for one industrial branch, effectively integrated within the network, with other specialized centres and with IDCAS main information department. Furthermore, the viability of the centre depended to a large extent on the status and capabilities of the host national institution in which the centre resided. Of the six centres established, only one functioned at a minimum level of acceptable performance.

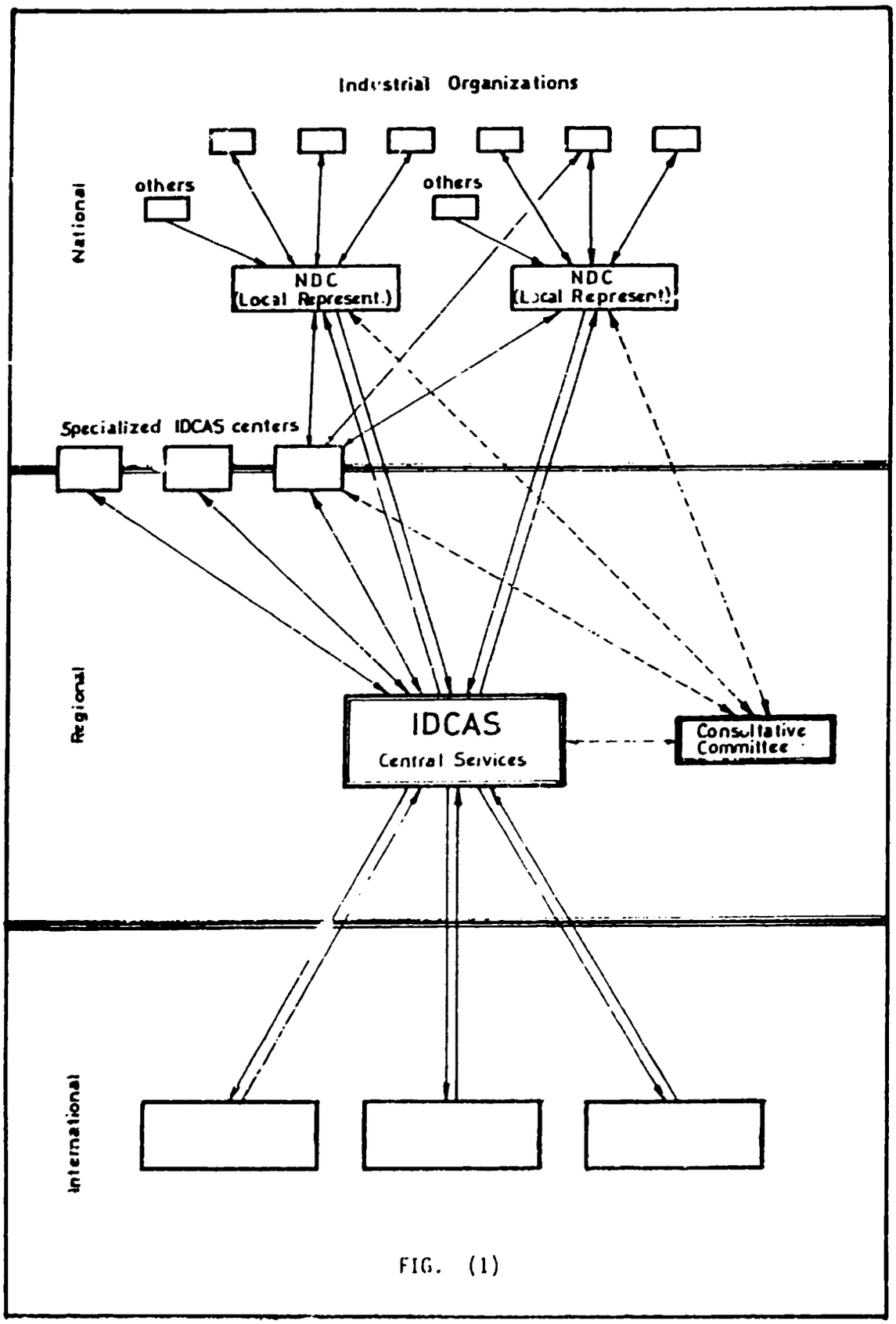
Industrial Organizations
National
others
others
NDC
(Local Represent.)
NDC
(Local Represent.)
Specialized IDCAS centers
Regional
IDCAS
Central Services
Consultative
Committee
International

FIG. (1)

7. In 1976, it was decided to undertake a thorough overhaul and re-design of the network. IDRC carried out an intensive study annd proposed an entirely different approach. A group of information "officers" were to be nominated, one in each member state. They were to function as IDCAS staff members seconded to a national institution involved in industrial development activities. The officers were characterised as possessing the competence and the capability to identify user needs, and the ability to tap sources, within the country and abroad, for the required information. They were expected to move freely and invtensively amongst industrialists, research centres and nvestment institutions, to have good access to responsible people in the country, to help in establishing national industrial information networks and in training local staff. The study gave details of the implementation plan, emphasising the importance of standardising procedures, and outlining phases of implementation. The proposal was reviewed jointly by UNIDO and IDCAS and funds were allocated for the training of the information officers. The concept was not implemented as planned for administrative and political reasons that need not concern us here. However, its main weakness was its almost total reliance on the information officer, who was really the backbone of the whole system. A competent national information officer is indeed a very rare species in developing countries, while an expatriate would not be able to interact smoothly and effectively with nationals. All the same, the approach was cognisant of one very important fact, viz. the absence of active demand for technological information and the need for aggresive "supply-push" of such information that would eventually generate a "demand-pull". Finally, it should be noted here, while we discuss INTIB, that this approach blurs the emphasis on technology choices that was more sharply in focus under the system of the specialised information units of the earlier phase.

8. The Arab Industrial Development Organization (AIDO) which replaced IDCAS, has been actively involved, since 1982, in establishing an Arab Industrial Information Bank (ARIFO) and a regional network. The types of information and users of the "bank" are indicated in

Fig. (2). The prominence of technological information is clearly shown in the types of information for industry, listed on the left-hand side of the diagram. Three groups of sources of information were identified: national, regional and international. These included government departments, industrial units, institutes, consultants, banks, chambers of commerce, publishers, data banks, and specialised regional and international organizations. The system was to provide its users with the usual services, such as current awareness, SDI, enquiries, bulletins and guides. So far, most of the effort in ARIFO has been in setting up a bilingual automated system concerned primarily with information about industry (the right-side of Fig. (2)). Currently, requests for information on technologies were either obtained from the in-house collection of references, or referred to outside sources.

9. Soon after, AIDO concluded an agreement with the Gulf Organization for Industrial Consulting (GOIC) for cooperation in establishing a Technological Data Bank (TDB). Once more, UNIDO stepped into the breech and undertook to provide TDB with a copy of its industrial-technological data base. Since TDB is specifically concerned with industrial technology, it merits a closer look. The structure and scope of TDB are outlined in Fig. (3). Presently, both AIDO and GOIC have the basic infrastructure needed for establishing TDB. They have the essential trained cadre, well-organized libraries and information services, as well as the necessary computer hardware and software systems. AIDO has a Hewlet-Packard HP 3000/40 and uses MINISIS for bibliographic information retrieval, while GOIC operates a digital PDP 11/70 using a number of software packages for socio-economic and statistical applications. Standard communication methods are used and it is felt that the upgrading of telecommunication networks in the Region as a whole, since the first approach of setting up specialised centres (see para. 6) was abondoned, meets the current level of operations. With the commisioning of "ARABSAT" the Region's communication satellite, communication with users of the system is not expected to become a bottleneck.

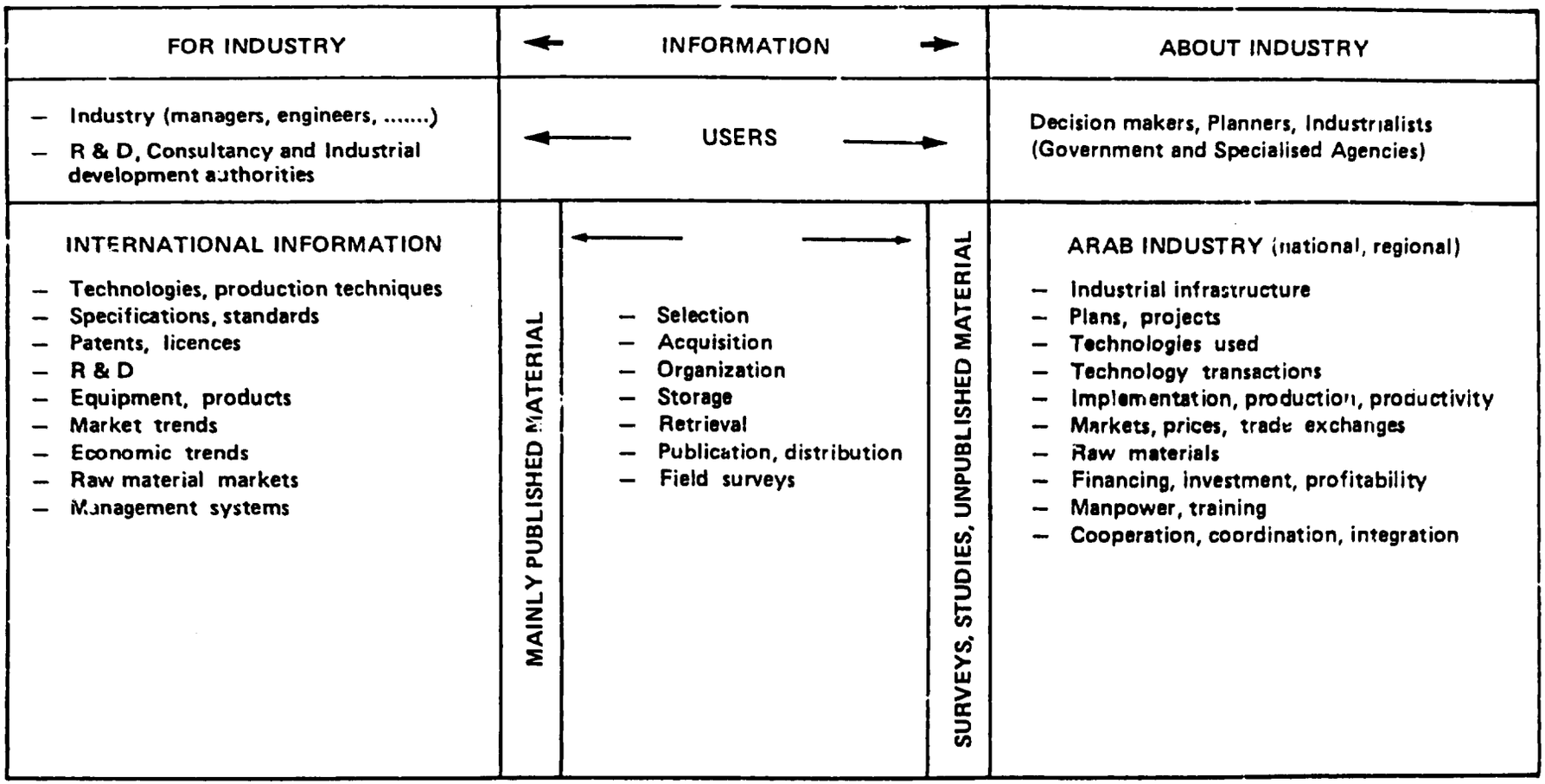

Fig. (2). Types of information and users (ARIFO)

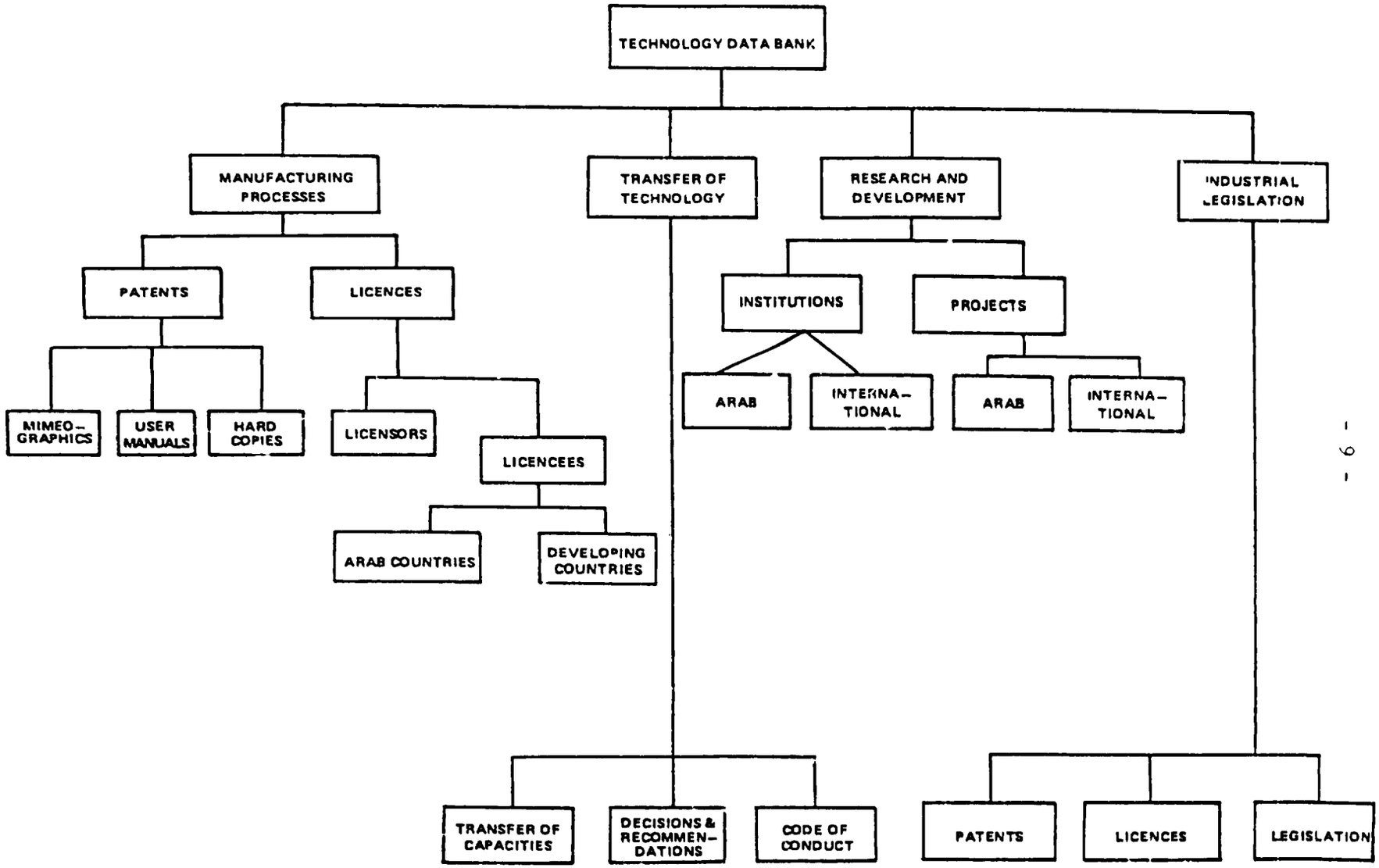

Fig. (3). TDB structure and scope.

10. It is too early to judge the effectiveness of this development. It is significant, however, to note that information on technology, per se, is now clearly identified as the sole concern of TDB. It is no coincidence, that at the same time that TDB was being launched, AIDO was actively involved in formulating a large-scale programme on industrial technology as such, which will cover a variety of activities centred on technology choices and keeping track of technological developments worldwide. Although this has been an obvious gap in the activities of IDCAS/AIDO, it was only quite recently that their governing bodies gave this issue the attention it merits. This reflects a degree of maturity in current thinking in the Region, resulting in all probability from the assimilation of past experiences in industrial development that has revealed technological choice as a crucial element in successful industrialization efforts. This is an important issue which we refer to later on (para. 18).

11. If we were to attempt some sort of summing up of experiences in the Region over a span of over fifteen years, that have witnessed intensive industrialisation in almost every Arab state, we note that industrial and technological information systems have proceeded along a tortuous path, as depicted by the rapid and drastic changes in approach. It is still not clear that the optimum approach has been identified, nor are there clear indications that a major achievement is in the offing. The reasons for this are not far to seek. First and foremost, this relates to the stage of industrial development in the Region. Furthermore, it reflects the complexity and peculiarity of this type of information, hinted at in paras. 1,3. More specifically, we may add that even the purely scientific information systems in the Region, which were the only available stock of similar expertise available, were not particularly well developed. Finally, one may cite the rapid changes in information-handling techniques and the phenomenal growth in the scope and volume of industrial technological information.

12. As far as the writer knows, no systematic attempt has been carried out on a meaningful scale to ascertain with a minimum degree of confidence how technological choices are made in the Region[1]. He has, however, been involved in a mini-survey of some tens of industrial units, of different sizes (large, medium and small) and patterns of ownership (public, private and mixed; national and joint ventures) in a number of sectors. The results, for what they are worth, can be summarised as follows:

- the most common approach to technology selection in small (and to some extent, medium) industries is to duplicate the choices of existing industrial units. These are usually the result of active salesmanship of the representative or agent of an equipment manufacturer, or reference to periodicals and catalogues, and, to a lesser extent, visits to exhibitions and operating plant abroad. The final decision on technology selection is taken by top management, ususally the owner(s). In those rare cases, where some semblance of a feasibility study was carried out, consulting firms (mainly local) were relied upon. Behind this approach is a general feeling amongst the individual entrepreneur, or a small group of entrepreneurs, that allocating resources to expert studies was a waste of money. The criteria of selection were found to be (in descending order) return on investment, reputation of the supplier, contractual conditions (credit facilities and guarantees), operation and maintenance, and level of expertise of manpower needed. No cases where reference was made to INTIB, or other UNIDO information services, or even national industrial and technological services where they existed, could be identified. When technology choice was to be made within the framework of an extension or re-equipment of the plant, the situation was markedly improved. Greater sophistication could be discerned, even though commitment to a previous supplier and familiarity with his range of equipment tended to swing the decision away from what might have been a better choice. The improvement is obviously the result of experience gained in earlier phases of operation.

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(1) This is to be the first project in AIDO technology programme.

- large-scale industries depended mainly on reputable consulting and engineering firms in the design and implementation of projects, on a turn-key or cost-plus basis. In some cases, e.g. textile, food (particularly sugar, oils and fats), and petro-chemical industries, where capability has built up, various degrees of unpackaging, plant design, as well as drafting specifications and making technology choices, were carried out in-house. The technical offices making recommendations on technology choices seemed to be well acquainted with sources of information, and capable of assessing the information received on the basis of accumulated experience of operation under local conditions.

13. We conclude this section by pointing out a recent development in the Region in dealing with the more complicated situation arising in technology choice when dealing with new and unfamiliar technologies. One oil-rich Arab state has adopted an interesting approach whereby, under an umbrella agreement between two governments, the owner of the new technology in an industrialised country cooperates with an R&D institution in the developing country in field testing under local conditions of the former's plant and equipment, on a cost-sharing basis, that is usually 50-50. This is obviously mutually-advantageous to both parties. The potential user of the technology gets first-hand experience of its performance under local conditions and is able to carry out his techno-economic feasibility with a much higher degree of confidence. The supplier, while also ascertaining the performance of his technology, gains the credibility and prestige resulting from the testimony of the recipient. This has been remarkably successful in testing new technologies in oil refining and in reverse osmosis desalination of seawater.

III. Needs and Demand: The Horns of INTIB's Dilemma

14. One obvious conclusion from the preceeding broad-brush review of the status of industrial and technological information systems in the Arab Region, is that the systems are still building on rather shaky ground and have yet to demonstrate their effectiveness, inspite of the persistence of governments and regional organizations in supporting them. This phenomenon impacts forecefully on the development of any international system, and perhaps more particularly on INTIB, which is confined to technology assessment and selection, and which was expected to establish "effective and well-publicised means of communication" through national and regional industrial information centres and networks, technology registries, institutions involved in technology selection, negotiation and contracting, public enterprises and development finance institutions.(1)

15. It is perhaps no exaggeration to state that almost all gatherings of experts, specialists or government officials dealing with industrial development in the Region emphasise the importance of relaible, up-to-date information in industrial development and the need for providing such service. In flagrant contradiction to this attitude, is the absence of any worthwhile demand for information as a pre-requisite for sound decision. In between, one discerns a general disenchantment with the capabilities and performance of existing information services, national, regional or international. The prevailing view is that the information they provide is either irrelevant to their needs, or presented in an unsuitable form, or is received too late to serve a useful purpose. This situation is in marked contrast to that in industrialised countries where the pressure of demand is the motor of developing information systems and services in a meaningful and cost-effective manner. One approach that has been adopted in some Arab states, as well as elsewhere in the Third World, was to rely on the regulatory and monitoring ograns of the state to promote active demand for information. Licensing authorities for

(1) ID/WG294/3/Rev.2, p.9

new industries and technology registries are examples of such organs. In many cases, this approach has failed to achieve its purpose and has complicated the situation even further, as they became inefficient bureaucracies, viewed as bigoted and ill-informed hindrances to entrepreneurship and bold initiative. In one or two rare cases, where the advisory, rather than the regulatory, role of such offices was also emphasised, the situation improved considerably. However, this called for a level of expertise, professional competence, and funding which is unlikely to be available in many developing countries, particularly smaller ones at an early stage of industrialization. Paradoxically, these are the ones that need this service more than any others. This is perhaps the core problem in INTIB's dealings with its potential users and with which this report is mainly concerned.

16. A recent report presented by UNIDO to ACSTD Panel on Information Systems for Science and Technology for Development, held in Rome, January, 1985, seems to support the author's conculsions on the manner in which technology choices are made. An analysis of the industrial sectors for which information was sought from INTIB, shows that the Industrial Chemicals/Petrochemicals/ Pharmaceuticals sector tops the list, scoring 29% of requests for information, with Agro-industries/Food Processing a close second, scoring 26%. Together, they account for more than half the requests. This is a significant fact that merits attention. The first sector is a sophisticated one, that is capital-intensive, and in which the technology is almost completely monopolised by multi-nationals. The second is one of the oldest and better-established sectors in the Third World that usually has an appreciable level and variety of in-house expertise, (para. 12, p.12). What is even more significant, as we review present INTIB activities and consider future appropriate actions, is that industrial enterprises top the list of INTIB users, with 28% of enquiries, while information service centres, who come second with only 16%, are way behind. This seems to indicate two things. First, that such centres have so far failed to act as effective means of linking INTIB to its final users, and, secondly, that industrial enterprises are beginning to deal directly with INTIB without the help of an intermediary.

IV. Some Suggestions for Future Actions

17. The picture revealed by the figures cited above would be considerably clarified if more in-depth analysis of INTIB past experience is carried out, as well as instituting this as an on-going activity within the system to monitor changes and provide valuable feedback for further enhancement of INTIB performance. For example, it would be both interesting and useful to know the distribution of sector and size of the industrial enterprises that tapped the system for information, their localities, their age, the frequency of enquiry and the type of information requested. Similar analyses and correlations need also be carried out for other users, sectors and information demands. Furthermore, if carried out over the longest possible time horizons, such analyses acquire a historical depth that should be very useful in planning future activities.

18. Unpleasant and disturbing as it may be, we have seen that there are strong indications that demand for industrial and technological information grows with the build up of indigenous capabilities and the accumulation of industrial experience in the country (para. 10). This seems to indicate that INTIB can enhance its credibility further by giving careful consideration to information needs of the more developed enterprises, on the assumption that the "trickle effect" would eventually bring in the smaller or less sophisticated ones, in the less-developed country in a region. It is reasonable to expect the information needs of the more sophisticated industry or country to become more elaborate and difficult to satisfy, demanding matching elaboration and sophistication in INTIB.

19. This must not be construed as a recommendation to neglect those most in need of help in selecting technology, but rather as an indication of the need for a different approach in this more challenging task. It has been shown (para. 16) that national and regional information service centres have yet to become useful nodes in an international network disseminating technological information. Until such time as they manage to fulfil this function well, other venues have to be sought by INTIB for

reaching out to the small-scale industrial enterprise and the entrepreneur venturing into industry with limited, or no, experience. Here, the chambers of commerce and industry, to which such individuals belong, might well prove to be a good venue, at least for some time to come. Some of these are now developing advisory and training services for their members, in cooperation with regional and international organizations. They also help considerably in overcoming the language barrier that obstructs the smooth flow of communication in both directions. To this, we may add that there are signs that UNIDO secretariat has been showing more concern and interest in developing UNIDO national committees which have been almost dormant since their creation nearly two decades ago. INTIB may want to relate more effectively to such efforts and probe the possibility of the revived national committees working, either directly or through chambers of commerce and industry, government and professional organisations, as interfaces with the industrial community in those developing countries that are still in the early stages of industrial development.

20. In fact, INTIB is in need of a massive publicity campaign if it is to penetrate through to a majority of its potential users. Needless to say, the timing and nature of such a campaign should match the development of its capabilities, so as not to raise false hopes and result in disenchantment. No doubt, the formation of an advisory group of INTIB users, from various regions in the Third World will be quite helpful in this respect, were it to involve also representatives of the providers of information from the variety of sources and localities INTIB needs to tap.

21. One last word about the two additional tasks of INTIB, viz. information generation and building indigenous capabilities, neither of which is an easy task, or one that is amongst the usual information services. The series of monographs on technology development and transfer (DTT), of which several volumes were published in the last decade, are good examples of information generation. They have served as useful guides in the various phases of technology selection and acquisition, as well as good course material in manpower

development for such operations. It is felt that the level of this activity needs to be intensified and that cooperative agreements be concluded with local bodies for their publication in national languages and dissemination on a large-scale. It is perhaps not advisable for INTIB with its limited resources and its order of priorities to be directly involved in manpower development activities. It could however, provide advice and software for such activities and attempt to establish and maintain working relations with the participants.