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ALTERNATIVE OPTIONS FOR INFORMATION TRANSFER TO INDUSTRY*

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CONTENTS

1.- The process of Information transfer

Information (scientific, technological, economic etc.) is the vehicle through which new knowledge is transferred from its origin to the place where it can be transformed to something useful to further progress or to improve the standard of living of the communities. If we refer to scientific and technical information, among the various types of information needed for industrial development, it originates, generally, in a research laboratory and has to be transmitted to the productive sector, where it could be effectively transformed into innovation.

The process of information transfer comprises the following steps:

1. Generation
2. Primary communication
3. Analysis
4. Storage and retrieval
5. Dissemination
6. Utilization

The new knowledge, ususally born in a research laboratory, is first of all communicated through the primary scientific and technical literature (step 2). Then, and going already to the information process properly, information is analyzed and stored, so as to be retrieved (steps 3 and 4) and disseminated (step 5) to reach the user, who finally will transform it into practical results (step 6)

Steps number 3, 4 and 5, among the six above mentioned phases, form the basic task of information services. But the real fundamental step of the whole process is the last one, utilization, as the best and most efficient information service will completely fail if it has no users. Utilization is the "raison d'etre" of any information service and information is not good or bad when it is produced or transmitted, but when it is used. Therefore, the key element of the information chain is the user, and the whole process will acquire different aspects according to the particular features and needs of the users.

We will examine the process of information transfer when the user is the industrial enterprise and, specially, small and medium-size firms which form the fundamental part of the industrial sector in developing countries and are, therefore the main target group for UNIDO action through its Industrial and Technological Information Bank (INTIB).

2.- The small and medium-size industry as information user

Among the defining characteristics of small and medium-size firms, there are three, which are particularly important, from our point of view, due to their influence on

firms behaviour as information users: a) The shortage, or even total absence, of qualified technical personnel, able to search and absorb information. b) The inability to define adequately the information problems of the enterprise. c) The need for a certain type of information, factual and concrete, which cannot be found in the conventional information channels; it is not recorded on documents and is transmitted through the personal experience of those who know certain problems and their possible solutions.

These special features require, in fact, the presence of an "human interface" between the sources of information and the industrial users: an "Information Officer"who will translate the information needs of the industrialist in their real terms, formulate them, look for the solution, either in documentary sources or getting in touch with appropiate experts, reshape it in a language adapted to the user's understanding, and finally deliver it in a directly usable way.

In other words, the particular features of industrial users have a decisive influence on the whole process of information transfer, so that while maintaining the above mentioned basic pattern, they create a second and alternative transmission channel, which is of fundamental importance in this case. Therefore, aside the transfer of information operated within the traditional system of documentation centres and libraries, where information is contained in documentary sources, there is another circuit, where information is based on the knowledge derived from industrial experience (either personal or institutional) and is transmitted, almost exclusively, through personal contact between the indus-

trial user and the information officer. The whole pattern is represented in fig. 1

The two alternative channels are not independent, but have contact points, both at the beginning and at the end of the process. At the starting point, because both channels could be considered as two modalities of a question-and-answer system or, more generally, of a demand-supply system. A certain request for information could be addressed to any of the two channels and, taking into account the peculiarities of small and medium-size firms, the intervention of an Information Officer will be convenient, or even indispensable, also to formulate adequately the request and address it to the documentary channel. And, at the end of the process, because the Information Officer will receive the request and, once formulated, he will frequently look for the solution through the documentary system, although he should "repackage" or adapt the information before delivering it to the user. Finally, we could draw a modified pattern as showed in fig. 2.

Then, we will analyze separately these two basic options: first, Information services operating through "liaison officers", which are, undoubtedly, the best adapted to small and medium-size firms. Nevertheless, they are not introduced in many countries, even in developing ones, due to a number of reasons, as we shall see. The alternative option, represented by the conventional documentary information services, is formed by a series of various services that we should examine, as regards their possibilities of adaptation to the actual needs of industrial enterprises, particularly in the conditions prevailing in developing countries.

3.- Information services through "liaison officers" (Industrial Extension services)

It is generally admitted that personal contact is indispensable for the transfer of information to small and medium-size industry and, thus, the "liaison officer" is the key element in this type of service. His role will be twofold: to solve the problems raised by industry, on the one hand; and to bring to the firms the new ideas, on the other, to detect problems and possibilities of improvement where the industrialist perhaps has not perceived them. In conclusion: to contribute to the creation of a favourable climate for innovation in industry. From these objectives, a second feature of these services could be derived: the necessity of visiting firms, in a systematic way and without previous request, as, quite often, problems will only appear during visits, and frequently after several ones. Within our Committee on Information for Industry of the International Federation for Documentation (FID/II) we are familiarized with a sentence, usually illustrated with a picture: "It is necessary to pay visits... to get results"

It could be observed, from the first experiences of liaison services, that many small industrialists do not realize the existence of certain problems within their firms; if they perceive them, they usually don't know where to look for the solution; and even if they know the existence of information centres, only a small proportion will ask for it, in writing. On the contrary, industrialists will explain their problems more easily by word, once the information officer has won their confidence. The first goal of the information

officer will be, therefore, to win the confidence of the industrialist; to convince him that he should use his services because, otherwise, he is granting a certain advantage to his competitors. Therefore, personal conditions are quite essential in information officers. Besides a sound industrial experience and knowledge of information and documentation techniques, he should have mainly human talents to relate with industrialists, to speak their own language and to understand their problems.

The first step in the work of the Information Officer will be the diagnosis of the problem. The industrialist's questions are often a partial and inaccurate expression of a deeper problem, which should be brought to the surface. Once the problem has been correctly defined, it will probably fit into one of the following four categories:

- Problems which the Information Officer can solve by himself, based on his own experience;

- Those which can be solved by getting in touch with a suitable specialist;

- Problems for which a solution can be found in the literature;

- Those which require some experimental work.

According to data gathered by Industrial Extension Services, a great majority of problems (80%) belong to the first three categories, with a 50-50 % distribution between the two first categories, on the one hand, and the third, on the other. Obviously, the Information Officer will need a sound

knowledge of the research potential and research organization in his country, to know where to ask; and he should also know the possibilities offered by Information/Documentation centres.' And, in every case, he should repackage the results, in order to adapt them to the user's level of understanding.'

According to a typical pattern, an Industrial Extension Service operates through the systematic visits of its Information Officers to the industrial firms. During those visits, problems will be collected and then should be solved by referring to the adequate sources. But, at the same time, the Information Officer builds up the "profile" of each firm, which will enable him to send written information in a systematic and selective way. Therefore, an important part of the time of Information Officers will be devoted to the screening of literature, to collect pieces of information of potential interest for their enterprises, according to the above mentioned "profiles".

Geographic size of the countries where Industrial Extension Services operate has a big influence on their activities. In small countries (Denmark) the service can be centralized and firms can be distributed by industrial branches thus permitting a greater specialization of the liaison officers. On the contrary, in bigger countries (France, Canada) it is compulsory to decentralize the service, through regional organizations which will serve the industry in each region. Some specialization can be often obtained in the second case too, as, usually, there is a concentration of certain types of industries in each region.

On the basis of those features of Industrial Extension Services, it would appear that they should have reached a great importance in developing countries, and even in countries of medium level of development, where small and medium-size industry plays a fundamental role. This is not the case, however, in many instances. In my own cultural area, that of spanish-speaking countries in both sides of the Atlantic, Industrial Extension Services have been implemented only in very few countries. In my country, Spain, we have a real paradox: while we have a well established Agricultural Extension Service, it has not been possible, up to know, to create a similar service in the industrial sector, in spite of the various attempts carried out. Perhaps the reason, or at least one of the reasons, can be found in the library tradition prevailing in these countries which have led to the establishment of information services, even those addressed to Industry, according to the classical documentation models. A second consideration can be added, more recently, as regards the attraction of the modern computerized information systems, which certainly have increased the professional prestige of librarians and documentalists. As a consequence, the majority of existing projects to establish information services for industry are based on computerized documentation systems, ignoring other possibilities perhaps better adapted to the actual needs of Industry. But this situation, although not completely desirable, exists in reality and, rather than fighting against it, it would be better to study methods of adapting those services, so as to serve industrial needs in the best possible way. We shall refer to this

matter in the next chapter.

Besides that, and going to the level of political planning, decision-makers should bear in mind that Information for Industry is certainly a part of the Scientific and Technical Information Policy of a country; but, at the same time, it is also an essential part of Industrial Development Policy. If this dual character is considered a more coherent approach to the planning of Industrial Information services will be feasible, to get a better adaptation to the actual needs of Industry.

4.- Documentary Information Services and their adaptation to industrial needs

In those countries, like my own, where no Industrial Extension Service exists, Information and Documentation centres had to fill the gap, by adapting their services to the needs of industrial users. In my country, in addition, our Institute for Information and Documentation in Science and Technology belonged for many years to the branch of the Research Council specially responsible for Industrial Research. As a consequence, a good proportion of its activities were focalized towards the industrial sector; and even now, after a reorganization of the Institute that shifted the emphasis towards the Research Council itself, about seventy five per cent of our users are industrial firms.

Generally speaking, the first task an Information/Documentation centre can perform is to serve as documentary backup to the needs of Information Liaison Officers working in other institutions. We have already mentioned that a high

proportion of problems encountered by Information Officers (up to 40 %) can be solved by referring to the literature. The liaison officer will come, then, to the Documentation centre to perform his searches and should find there as many facilities as he would need, including a staff able to speak the same language and to understand the same problems.

But, besides that, the centre itself can adapt directly its traditional documentary information services, so as to serve the needs of industrial users in the best possible way. Among the various services, we shall refer specially to three typical examples: current awareness services, retrospective bibliographic searches and Selective Dissemination of Information (SDI).

4.1.- Current awareness services

In any of its various possible forms, a current awareness service operates by selecting material from primary sources of information, classifying it according to certain criteria, and providing it to the potential users in such a way that they can easily review what is being published in the subjects interesting them. Many Information/Documentation centres prepare and publish current awareness services, either in form of abstracts journals, classified lists of titles, permuted indexes, current contents and so on. They should be distinguished from SDI services, as these are based on individual profiles, while current awareness services are based on the knowledge the centre has of the needs and interests of its users, taken as a group.

To adapt this pattern to industrial users, particular-

ly to small and medium-size firms, requires a sound knowledge of their specific needs by those who are responsible for carrying out the service. This knowledge can only be acquired through close contact with industrialists. Therefore, the staff of the service becomes, to a certain extent, liaison officers. The situation is reciprocal with that we have mentioned before: we have seen that liaison officers spend a good part of their time selecting written information for their clients, that is, doing documentation work; while documentalists in current awareness services for industry have to get in touch with industrialists to be duly informed on their needs, though, perhaps in a less personalized way. In other words, Industrial Extension Services frequently combine their basic visiting activities with the provision of current awareness services; but these services could also be provided directly by Information Centres without visiting personnel, but capable of maintaining an adequate contact with their industrial users.

4.2.- Retrospective searches and SDI services

The importance of these two classical services of Information/Documentation centres has significantly increased with the application of modern computerized and on-line techniques. However, the output of these systems, usually in the form of lists of bibliographic references, is well adapted to the needs of research workers, but not to the needs of industrial users, specially to small and medium-size firms. The use of those systems in Industrial Information services requires the close contact between the user and the information specialist in two key moments: to formulate the search profile,

which should be defined as precisely as possible; and once the results have been obtained, to evaluate and adapt them for presentation to the user in a directly usable form.

To this respect, both services (which are actually based on the same philosophy) could operate in the same way, by introducing an interface between the end user and the system. Again, both the request for information and the provision of the results are channeled through the Information Officer, who will receive the enquiries, look for the solution into the systems, adapt or "repackage" the results and deliver them to the users.

Now, we have defined an operating pattern, which is basically the same in all cases, and stress the importance of Information Officers as intermediaries for the supply of information to Industry. But, once information has reached the firm, it will be necessary to secure the flow of information within the firm itself. We shall refer to this point in the next chapter, specially as regards medium-size industry, which have at least certain possibilities to diversify tasks, while in smaller firms practically all activities are concentrated in the same hands.

5 .- Information services within the firms

The final goal of information arriving in the firm is to be transformed in the source of new applications, in innovation. Innovation is nothing but to meet social demands or needs by converting knowledge into practical results, to ful-

fill those needs. From this simple statement, we can derive the importance of getting adequate information and assuring its efficient use.

To this aim, the flow of information within the firm should be under the responsibility of a concrete group or service (sometimes only one person), which will perform three basic tasks: to maintain the firm internal information tools; to establish contact with external information services; and to secure the internal dissemination of information within the firm. As applied to medium-size firms, the tasks of the information service could be developed into the following specific activities:

a) To organize and maintain the library and documentation service of the firm. Ideally, the firm should have a small but well selected number of sources of information to be used directly. First responsibility of the Information Service will be to select those sources.

b) To organize the internal circulation of documents, in order to reach quickly the potential users. That will be specially important with journals, patents and standards. As regards journals, it will be often necessary to analyze them, for drawing the attention of technical staff to articles of special relevance.

c) To establish the inventory of external information services and maintain the contact with them. There are several possibilities here: when Industrial Extension Services exist, to secure contacts with them. When they do not exist, Documentation centres should be used and then the Internal In-

formation Service will play an important role to prepare requests for retrospective search, prepare profiles for SDI services, ask for reproductions of concrete documents and so on. Probably SDI services could be best adapted in these circumstances, considering engineers or technical departments in the firm as end-users: the Internal Information Service will collect proposals for profiles, prepare them and send to the external Documentation centre for processing; and, then, receive the results and address them to the end users.

To perform efficiently all these tasks the person in charge of the Information activities should be placed in a relatively high position within the hierarchical organization of the firm and should participate actively in management activities. His action will be aimed at the creation of a favourable climate for innovation. For firms of a certain size, with possibilities of having a small information department or group, the place of this department within the company structure has to be considered. Until recently, information services formed part, usually, of research and development departments. Now, however, this situation has changed as information is not limited to pure scientific and technical aspects but includes other types: economic, statistical, legal, managerial, etc. They conform, altogether, information for decision-making, which, as such, should be placed close to management it serves or, at least, in a planning department. And this is not a purely theoretical approach: I have visited a firm, in Latin America, where Information Department was actually located within the management office, and participated

in all decisions leading to new developments. This approach has been succesful, as proved by the achievements of the firm, to which, by the way, a well known external Extension Service also contributed.

Finally, the last and decisive step in the process of information within the firm will be the evaluation of information received. It will be found that from all information received, only about 5 % is new; 15 % is review information and 80 % is old information made up in different forms ("a soup made with old bones"). In the evaluation process the Information service will act as a catalyzer, as, obviously, final decisions fall outside its scope. The creation of evaluation groups or committee for the various subjects, uses to be a good solution. Information staff will sit there, with the task of providing the raw material on which decisions are to be taken, and of collecting information which have been positively evaluated, to file them, prepare for further utilization and circulate them throughout the firm. The system of group discussion and decision to judge on the potential importance of information is probably good, as, generally speaking, the only information which has some value is that which provokes discussion.

To sum up some ideas: Industrial Extension Services, that is, Information services operating through liaison officers, are undoubtedly the most efficient way to supply information to Industry, particularly to small and medium-size firms, as personal contact is of paramount importance to

this respect. But conventional Documentation centres can also play an important role, by cooperating with Extension services, when they exist, or by replacing them, when they don't exist. In the first case, they serve as documentary support for the liaison officers to search information. In the second case, they provide services directly to firms, by adapting them to the actual industrial needs. This could be achieved in the best way when Internal Information Services exist within the companies, charged with the task of maintaining the contact with external services, and organizing the flow of information within the firm.

6.- Role of international organizations

On the basis of the general pattern we have just described, we can now consider what is the role International Organizations can play, and specially UNIDO/INTIB. Two general aspects could be considered: a) Direct supply of information from International Organizations, and its various alternative options. b) The support and cooperation of International Organizations to the creation and development of Industrial Information services at the national level.

Supply of industrial information from international organizations took frequently the form, in the past, of reference services or question-and-answer services. They operated, therefore, not by direct supply, but referring the enquiries to a network of national correspondents. Direct supply of information can also be carried out, however, and I would like to stress two important points: the value of the information store of certain international organizations, particularly UNIDO, as represented

by the reports of technical assistance missions. And, on the other hand, the importance of promoting the exchange of information between developing countries in different areas of the world, the so-called "horizontal" exchange of information. There is no doubt that some information generated in a certain developing area can be extremely useful in others, particularly when environmental conditions are, to some extent, similar. We could think of information being produced in Latin America, which could be very valuable in South East Asia, and viceversa. UNIDO/INTIB could have an important role in promoting the exchange of such information, by collecting it from the originating countries and facilitating its transmission to other developing areas in the world.

However, international cooperation, to be most effective needs to be channelled through national counterparts, and so, one of the most important tasks of international organizations will be to support and encourage the creation and strengthening of such national institutions, both in their structures and their staff. In the field of Information for Industry, UNIDO is obviously the main organization concerned, and is meeting that responsibility through a large number of technical assistance missions, support actions, financial aids and so on, both to individual countries and at multilateral level.

In the field of Information for Industry, I would like to stress, at this point, that international action should proceed carefully, to avoid situations which could damage its effectiveness. Sometimes in the past, the creation of Information Services in less developed countries was perhaps too mi-

metic, as regards the situation in industrialized countries. This risk has increased even more, with the arrival of modern on-line techniques, with their strong attraction and prestige, both for the users and, particularly, for the specialists themselves. In fact, on visiting certain developing countries, it could be realized that most projects to establish information services for Industry are based in computerized techniques, following the model of the big traditional documentation centres. Those services, created in developing countries, developed too slowly, while, on the other hand, they were insufficiently adapted to the actual needs of the users, as, in our case, the industrial enterprises. Another frequent situation has been the creation of coordinating bodies for national scientific and technical information policies, without the previous existence of an infrastructure of centres and services to be coordinated. This led to beautiful organigrams on the paper, without practial results.

In the context of international cooperation, I would like to refer now to the action of another international organization, a non-governmental one, the Committee on Information for Industry of the International Federation of Documentation (FID/II). Firstly, because I feel obliged to do so, as Chairman of the Committee; secondly, due to the close cooperation between FID/II and UNIDO; and last, but not least, because, from the professional point of view, FID/II concentrates a good deal of experience in this subject and brings together a group of prominent world specialists in the field. So, FID/II would be (and it has actually been on many occasions) - the ideal advisory group for planning international aid in Information for Industry.

The Committee on Information for Industry was created in 1967 and reconstituted in 1976, when its functions were redefined. Its central aim is to establish an international forum for gathering, evaluating and exchanging ideas, methods and means, on how to identify and how to meet efectively the needs of Information of industrial end-users in enterprises of any kind, any size and any statutory position, within the private and the public sector. FID/II has two types of members: those representing information services for Industry, usually governmental, and those coming from Information services within Industry, a maximum of two members per country being allowed.

Our definition of Technological Information is knowledge (technical, economic, marketing, managerial, social, etc.) which, by its application will further progress in the form of improvement and innovation. According to that, we conceive an Information service for Industry as an active professional service geared to the needs of the end-user and adapted to the end-user's level of understanding. It is therefore based, according to the guidelines we have already mentioned, on the personal contact between the specialized Information Officer and the industrialist, thus facilitating the marketing of new knowldge, and finally creating a favourable environment for innovation, where the conversion of knowledge into practical results can take place. With this background, it could be easily understood that FID/II has been, and still is, a sort of non-typical Committee within FID. In the sense that all other bodies of the Federation deal with documents and documentary Information, while FID/II emphasizes person-to-person Information transfer. We

could say that, while FID is generally based on Documentation, FID/II, is concerned with Information, and with a type of Information which is often not written on documents; and even when it is, it has to be repackaged or adapted to be easily understood and efficiently used by the industrialist.

FID/II activities have been varied in the past years: preparation of reference tools, as, for instance, national lists of journals of potential interest to Industry, or the Worldwide Directory of National Referral Centres for Industry; study and evaluation of important problems, like the place of Information services in the Company structure or the monetary value of Information; study, evaluation and promotion of means and methods for the training of Industrial Information Officers. At present, FID/II concentrates its efforts in one subject each year, so as to prepare and hold a seminar, at the occasion of its annual meetings. We have just held our 1985 meeting, together with a seminar on "The Integration of External and Internal Sources of Information in the Industrial Firm". For the next year, the seminar will be replaced, to a certain extent, by a special session to be held within FID International Congress, and devoted to "Information for Technology Transfer".

But besides and above its activities, I would like to stress here FID/II possibilities concerning the aid to developing countries, based on the experience of its members. Those possibilities could be summarized as follows:

Consultancy. Members of FID/II come from Information services for or within Industry with a broad experience. They

have, therefore, the capacity to act as consultants for countries wishing to establish their own structures on Information for Industry. That includes the study of users needs and operational aspects of the services.

Training. Training of Industrial Information specialists including liaison officers, has always been a priority within FID/II programme. Many institutions represented at the Committee give training courses for Industrial Information Officers, which could be attended by people coming from less developed countries. It will also be possible to organize such courses in developing areas, either at regional or national levels.

To sum up: within FID/II there is enough experience to provide an efficient technical assistance to developing countries. The problem is that we have the expertise but not the funds, and so it is necessary to coordinate our action with international organizations which could provide financial resources. To that aim, FID/II has created a special working group to analyze in detail our possibilites of action towards developing countries. A draft document was prepared and discussed, in order to be presented as a catalogue of the possibilites of technical assistance which the Committee can offer.

I have devoted the last part of my presentation to the problems of international aid and cooperation, with special reference to FID/II, a Committee which has closely cooperated

with UNIDO in the past, and will continue to cooperate in future. On the other hand, international cooperation is a relevant factor in the whole subject. In fact, the final option to be chosen for the creation of an Industrial Information System, in a given country, has to be selected by national authorities, of course, taking into account the particular circumstances prevailing in each case. I have tried to present the various alternatives. But for any of the options selected, it would be good to have in mind the possibilities offered by international assistance and, in this context, FID/II could provide an important cooperation, based on the experience of its members.

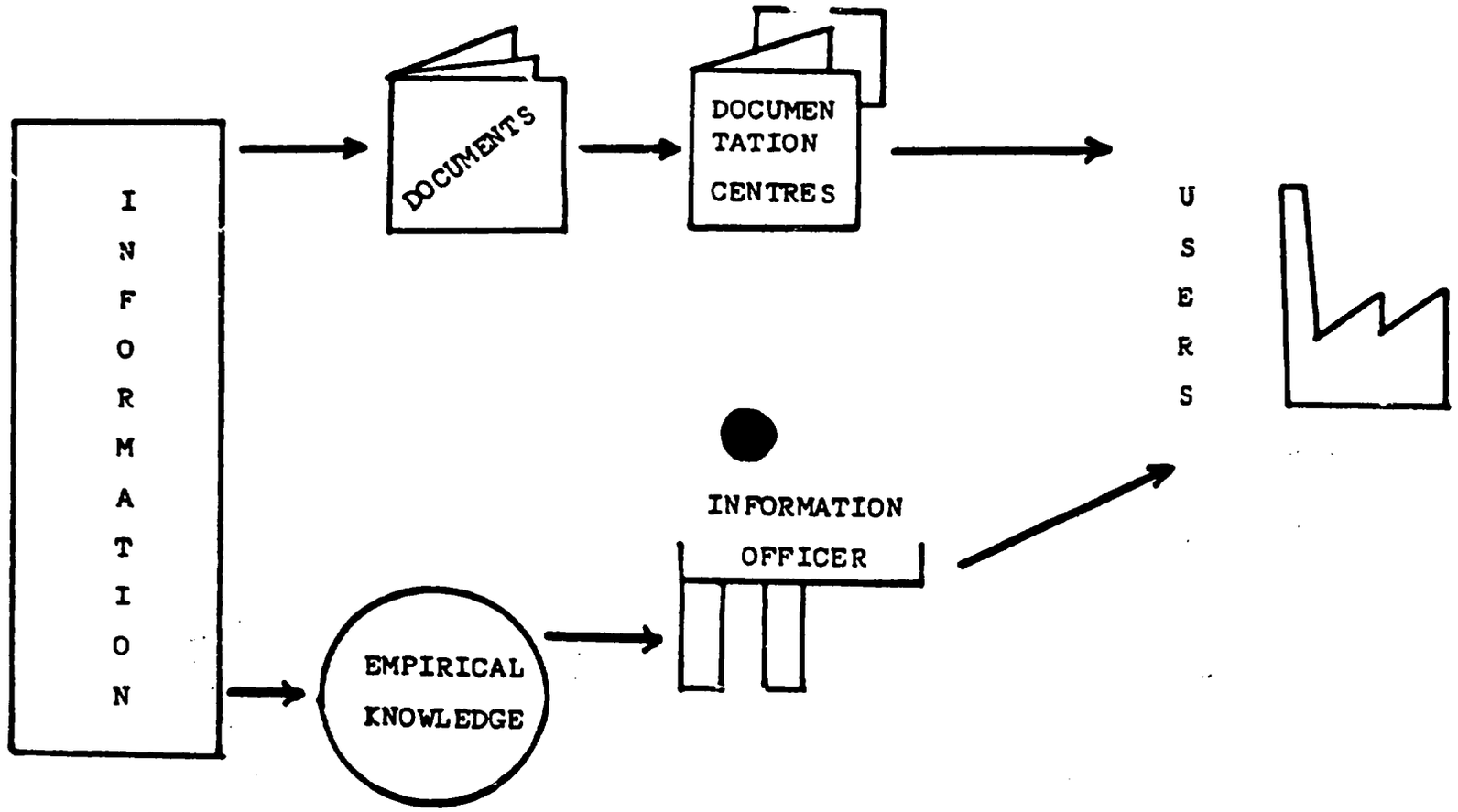

FIG. 1. Contact between the Industrial User and the Information Officer.

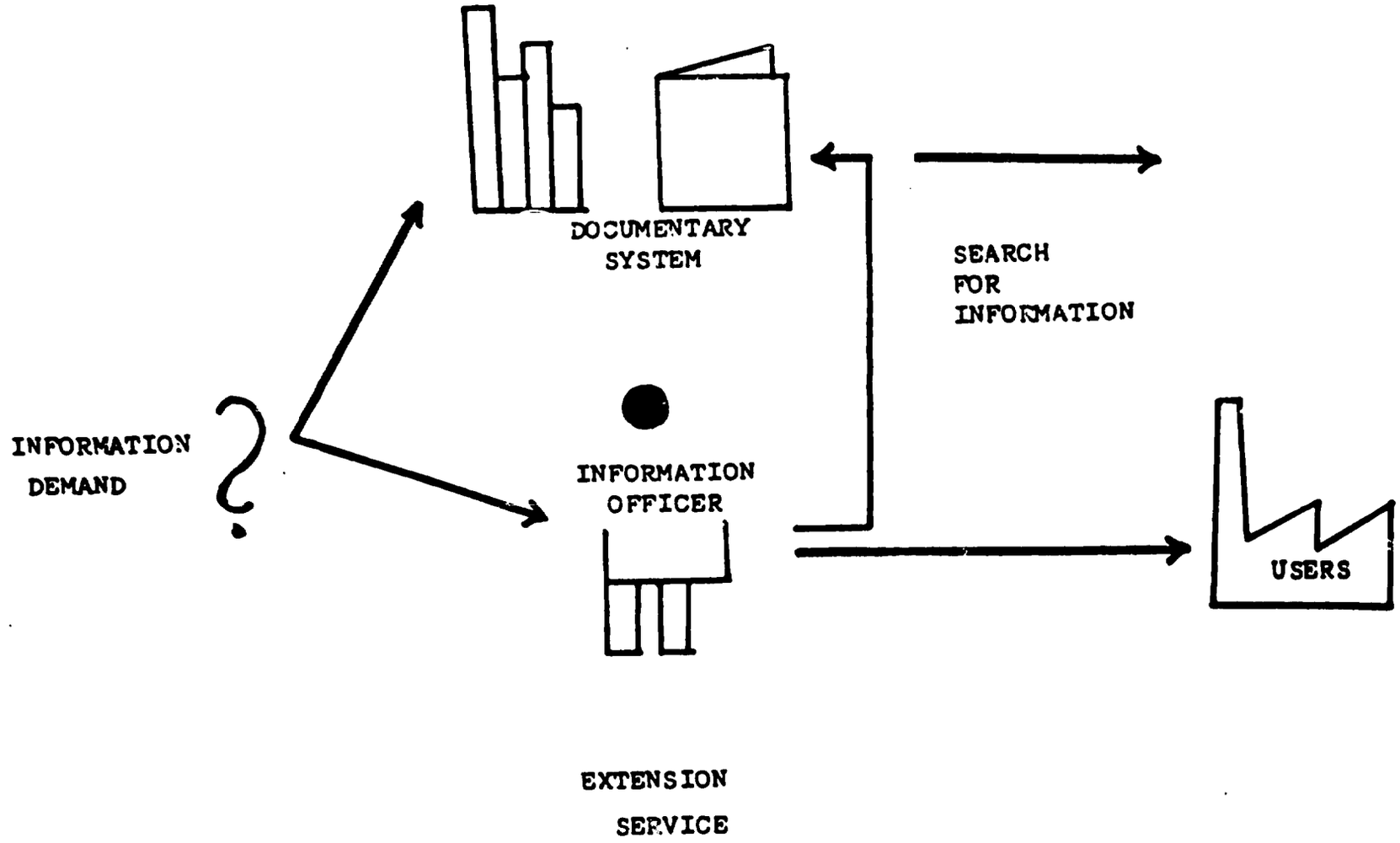

Fig. 2 Extension Service