

just so far as to be able to physically realize the system. In our case, when we speak about relaxation we mean relaxation in the requirements in the quality of different properties of POIN. This approach requires constant analysis of the possibility of realizing the formulated function; otherwise (i.e., in the case when its realization does not appear possible), one must reformulate the function by further removing it from the desired ideal.

A rather well-known example of a function "at minimum" formulated for a documentary IR system is the following: "the function of any IR system (even if this is only the librarian in a village library) consists in determination of the location of information and extraction of it from the place of storage" (Meadow, 1973). We will analyze this function, as it is of definite interest. First, we will turn our attention to the remark included in parentheses, "the function of any IR system (even if this is only a librarian)." It is not difficult to note that in this definition an IR system is a class of objects carrying out a search, and an object such as a librarian is called an IR system only because a search is carried out by him or her. It is clear as well that in this connection the librarian is not considered a system (i.e., none of the investigators who call the librarian an IR system created the librarian with the use of the systems approach). However, if we omit the remark concerning the librarian, the function is completely admissible for the object called a documentary IR system.

What is required from a system realizing this function? Obviously the system must determine the location of information (the system's storage) and extract it from the place of storage. And that is all. If the system performs this, then the function is being fulfilled. In other words, whatever information the system extracts, it is fulfilling its function. This in fact is the minimum quality, if by this we mean the correspondence of the information found to the user's POIN. Moreover, this minimum can be significantly worse than the usual level achieved by the user, such as when all extracted information is not actual information for the user (it is obvious that even then the system fulfills the formulated function). However, and this is important, in the formulated function, what is taken into account is not the correspondence of the found information to the POIN, but another parameter extremely important in light of the modern information crisis. This is the parameter taking into account the possibility of determining the location of information and extracting it from any storage accessible to the system. Thus, a system satisfying the formulated function must "find" and "extract" information from some collection(s) of documents. Of course, when this collection consists of a thousand documents (not to mention hundreds of thousands and even millions), then a system fulfilling the formulated function would clearly outperform a person, because traditional methods assuming the participation of a person in a search would be practically useless. That is why we speak about a crisis of forms, and in fact an IR system satisfying the function just described permits us to deal successfully with the crisis.

Note that for realization of such a function on a computer, the retrieval

scheme illustrated in Figure 3.1 was completely suitable. In fact, that is the general structure of practically all systems that appeared during the first decade in the development of IR systems.

Thus, the initial stage when a function was realized "at minimum" was compensated by the possibility of carrying out the process of retrieval directly on a computer. However, in due time the creators of IR systems began to stress the correspondence between the found (extracted) information and the POIN. The highest priority was given to the parameters characterizing satisfaction of the user's POIN. Now the attention of investigators was concentrated in the direction of creating a structure that would permit improvement of the values of these parameters, including all those elements of the IR system that were sufficient for realization of the indicated function. Clearly this gave positive results. However, some of the properties of POIN were not considered. For example, a feedback mechanism (which takes into account attributes 2 and 4 of POIN) was lacking. It is interesting to note that authors who first attempted (in the 1960s) to realize the user's feedback pointed out that feedback "may prove useful" or "may improve results of a search," but until the 1970s no one said that it was necessary.

Hence, a new function that took into account important properties of POIN was being formulated, a function that would "at maximum" lead to the better satisfaction of POIN. But what does a "maximum" applied to information retrieval mean? What is the best for which we can really aim and which can we really achieve? If by this we mean being absolutely successful in all respects, then executing an absolutely successful information retrieval is obviously not possible, because not all the parameters characterizing the search are known, and it is also unknown whether we have the best values and whether it is possible in general to obtain simultaneously the best values of all these parameters. Thus, ideal information retrieval is not possible. Therefore we will take a step down from the ideal, and instead of ideal retrieval we will consider an *optimal retrieval*—the secret goal of any retrieval (and apparently of the majority of known processes in general) toward which all developers are striving. An optimal retrieval is the maximum that will not raise objections of any user.

We recall that by definition the concept "optimal" assumes the best of what is possible within the framework of the considered system. To find this "best" we need to choose among the "available" (possible) alternatives. In speaking about the optimal retrieval of information, we assume that for an IR system, the best possible state—among the set of its possible states—is the one in which the result of a search will be best from the point of view of the user. But is it really possible to create an IR system realizing optimal retrieval? To answer this question, we will consider what in fact is necessary for creating such a system. It is first necessary to have a choice of various methods or algorithms for at least one of the processes participating in information retrieval (see Figure 3.1) and influencing the results of the search. This is not a problem because