

proaches to realization of information search: document search with collection partitioning and document search with document ranking. Publications on document search deal mostly with these two approaches. Let us look at them in more detail.

Document search with collection partitioning is a process that results from dividing the search collection into two subcollections: (1) documents to be given to the user as an answer to the user's search request and (2) the rest of the documents in the collection. In this case, the output resulting from such a search is formally generated using a well-defined and explicit output criterion; that is, it is generated (automatically) without the user or anybody else browsing through the collection of documents. Generally, a large majority of systems do this kind of document search in practice, most of them being Boolean systems (discussed in previous chapters).

The other approach is a document search with document ranking. This search involves ranking search collected documents according to a decreasing degree of a certain formally calculated correspondence of documents to the search request and then generating output during browsing (usually by the user) of the ranked search collection. In other words, the document search with document ranking involves two stages: (1) ranking the collection of documents and (2) having the user browse through these documents (naturally, this is done after document ranking). It is understood that the user usually looks at only a negligible part of the collection, that is, those documents that have the highest correspondence values, and these documents form the output. This document search method has not been widely adapted in practice. Still, a great number of experiments associated with this approach have been conducted for more than 30 years. The most prominent system in this approach worth mentioning here is the well-known experimental system SMART, which was the first system capable of realizing this type of search (Salton & McGill, 1983).

To generate output (using the document ranking method) an "implicit" output criterion is used. "Implicitness" of the criterion means that it is the user who decides whether to include a document into the output (the user decides at his or her own discretion whether to browse through that particular document in the ranked collection); the output criterion, therefore, is not defined explicitly (and hence, not formally) in this situation.

As we have emphasized, we are seeking to create a fully automatic IR system. Naturally, use of the "implicit" output criterion makes this impossible, because the "central" subsystem of the IR system, which is the search subsystem, cannot operate automatically in this case, at least not fully. Therefore, only the first method of document search is of interest to us, and in discussing the problem of evaluation we will assume the type of search where the collection is divided into two subcollections: documents to be given to the user as an answer to his or her search request and documents not to be given to the user. In particular, as stated previously, we will use the Boolean output criterion.

As for document search evaluation, it is possible to consider both partial and complex search parameters. Partial parameters include parameters such as search time, recall level, and output form, among others. Complex parameters concern the economic efficiency and functional efficiency of the search. Usually economic efficiency is defined as a measure of expended money (or, in some instances, the time) needed for the system to perform its function (Salton, 1975). (In some cases, economic efficiency is evaluated by the profit from operating the system.)

Functional efficiency, it should be stressed, characterizes the quality of fulfillment of a function by the IR system. However, how should we understand the quality of function fulfillment? There are various opinions on this point. In some cases, consistency of fulfillment, which is usually called "performance," is considered to be the most important. However, of special interest for the researchers is *how* the goal of creating the system has been achieved by fulfilling its function. In other words, the functional efficiency of the search is usually defined as the extent to which it achieved the goal for which the search is carried out.

As stated earlier, the goal of a document search is to find information that will satisfy POIN. The higher the ability of the search output to satisfy POIN, the higher the search quality. Quite naturally, from the point of view of a particular user, an output will be of highest quality if it contains all those and only those documents from the search collection that satisfy his or her POIN. In this case, the system can be considered as having the highest value of functional efficiency. This is the goal that all developers, theoretically, are striving to reach. However, when discussing IR system operation, we pointed out that this value is very difficult to achieve (at least, at present). This is why function definitions do not contain such a quality requirement. However, because the closest approximation to the ideal means the highest functional efficiency of search, an evaluation of functional efficiency not only permits us to judge how far the created system is from the ideal, but it also makes it possible for us to compare it with other systems. Furthermore, such an evaluation permits us to make a judgment on how successful the technical solutions found during development of the system are.

All of the evaluations mentioned are important to the creation and development of IR systems. However, as stated earlier, it is impossible to consider the whole spectrum within the limits of this book. This is one of the reasons why we chose not to include the economic aspects of information search and related search parameters and to focus our attention on problems of evaluating the functional efficiency of a document search and those partial search parameters that are aspects of functional efficiency, such as the recall level of search.

Now that we have determined what aspects of information search evaluation will be discussed subsequently, we would like to point out that, in addition to document search and systems realizing it, there are a number of other objects