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# Information Retrieval System as a way of Accessing Information Resources in the Libraries: An Overview

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A library is a structured collection of sources of information and related resources, made available to a defined community for reference or borrowing purposes. Library provides physical or digital access to resources, and may be a physical structure or room, or a virtual space, or both. Information explosion has made it an issue of imperative for libraries to have at their disposal good information retrieval systems. This paper took a critical look at the types of information retrieval systems such as-speech information retrieval; cross language information retrieval; question-answering information retrieval; image information retrieval and music information retrieval. Also the paper discussed the kinds of information retrieval system such as offline Search and online Search, information retrieval tools; functions of information retrieval systems. Drawbacks of information retrieval system encountered by the users in the libraries were also discussed and appropriate recommendations were made.

**Keywords:** Information retrieval system; information; information resources

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## INTRODUCTION

The major objective of the organization of knowledge in the library is to permit the information resources or knowledge to be accessed later when it is needed. However, the poor organization makes it difficult to find the information later. A library is an organized collection of sources of information and similar resources, made accessible to a defined community for reference or borrowing purposes (Atanda & Adeyemi, 2018). It provides physical or digital access to materials, and may be a physical building or room, or a virtual space, or both. Libraries' collections can include books, periodicals, newspapers, manuscripts, films, maps, prints,

documents, microform, CDs, cassettes, videotapes, DVDs, Blu-ray Discs, e-books, audio books, databases, and other formats. Libraries range in size from a few shelves of books to several million items. According to Microsoft Encarta (2009), the central mission of a library is to collect, organize, preserve, and provide access to knowledge and information. In fulfilling this mission, libraries preserve a valuable record of culture that can be passed down to succeeding generations. Libraries are an essential link in the communication between the past, present, and future. Whether the cultural record is contained in books or in electronic formats, libraries ensure that the record is preserved and made available for later use. Libraries provide people with access to the

information they need to work, play, learn, and govern.

Information retrieval is fast becoming the dominant form of information access, overtaking traditional database style searching. The field of information retrieval also covers supporting users in browsing or filtering document collections or further processing a set of retrieved documents. Given a set of documents, clustering is the task of coming up with a good grouping of the documents based on their contents. Information retrieval is the activity of obtaining information resources relevant to an information need from a collection of information resources. The field of information retrieval also covers supporting users in browsing or filtering document collections or further processing a set of retrieved documents. Given a set of documents, clustering is the task of coming up with a good grouping of the documents based on their contents. It is similar to arranging books on a bookshelf according to their topic. Given a set of topics, standing information needs, or other categories (such as suitability of texts for different age groups), classification is the task of deciding which class (es), if any, each of a set of documents belongs to. It is often approached by first manually classifying some documents and then hoping to be able to classify new documents automatically. However, this notion of information retrieval has changed since the availability of full text documents in bibliographic databases. Modern information retrieval systems can either retrieve bibliographic items, or the exact text that matches a user's search criteria from a stored database of full texts of documents. Although information retrieval systems originally meant text retrieval systems, since they were dealing with textual documents, many modern information retrieval systems deal with multimedia information comprising text, audio, images and video. While many features of conventional text retrieval systems are equally applicable to multimedia information retrieval, the specific nature of audio, image and video information has called for the development of many new tools and techniques for information retrieval. Modern information retrieval deals with storage, organization and access to text, as well as multimedia information resources.

### **The Concept of Information Retrieval Systems**

According to Olson (2003) in Atanda & Adeyemi (2018), the term Information Retrieval was coined in 1952 and gain popularity in the research communities from 1961. At that time, Information Retrieval's organizing function was seen as a major advance in libraries that were no longer just storehouses of books, but as places where information was catalogued and indexed. The concept of Information Retrieval presupposes that there are some documents or records containing information

that have been organized in an order suited for easy retrieval. Information retrieval system is concerned with the exploitation and extraction of information and other contents of documents from different information sources (Akanwa & Udo-Anyanwu, 2017). According to Helmy (2019) he described an Information Retrieval System is a system that is capable of storage, retrieval, and maintenance of information. Information in this context can be composed of text (including numeric and date data), images, audio, video and other multi-media objects. He went further to opine that An Information Retrieval System consists of a software program that facilitates a user in finding the information the user needs. The system may use standard computer hardware or specialized hardware to support the search sub-function and to convert non-textual sources to a searchable media (e.g., transcription of audio to text). The gauge of success of an information system is how well it can minimize the overhead for a user to find the needed information.

An Information Retrieval system is designed to retrieve the documents or information required by the user community. It should make the right information available to the right and targeted users. Thus, an Information Retrieval system aims at collecting and organizing information in one or more subject areas in order to provide it to users as soon as it is requested for Craven (2000), opined that an Information Retrieval system does not inform in change of knowledge of the users on the subject of his enquiry; it merely informs him/her of existence or non-existence and where about of documents relating to his request. The Information Retrieval system serves as a bridge between the world of creators or generation of information and the users of that particular information.

Hence, the objective of an information retrieval system is to enable users to find relevant information from an organized collection of documents. In fact, most information retrieval systems are, truly speaking, document retrieval systems, since they are designed to retrieve information about the existence (or non-existence) of documents relevant to a user query. Lancaster comments that an information retrieval system does not inform (change the knowledge of) the user on the subject of their enquiry; it merely informs them of the existence (or non-existence) and whereabouts of documents relating to their request.

### **Types of Information Retrieval Systems**

**Speech information retrieval:** Speech is an information-rich element of multimedia. Now there exist several techniques where information can be extracted from a speech signal in a number of different ways. Thus there are several well-established speech signal analysis

research fields. These fields include speech recognition, speaker identification, voice detection, sentiment analysis and fingerprinting. The information that can be extracted from tools and methods developed in these fields can greatly enhance multimedia systems and help mankind in various aspects.

**Cross language information retrieval:** It is an application area of information retrieval, which deals with fetching information written in a particular language different from the language of the user's query. E.g., Using Yoruba queries to retrieve English documents. It is one of the challenging fields and a lot of research is going on in this area.

**Question-answering information retrieval:** It is a computer science discipline within the domains of information retrieval and natural language processing (NLP), which is involved with building systems that automatically answer questions posed by humans in a natural language. A QA implementation, usually a computer program, may construct its answers by querying a structured database of knowledge or information, usually a knowledge base. More commonly, QA systems can pull answers from an unstructured collection of natural language documents.

**Image information retrieval:** this is part of sub-field of information retrieval. This helps the retrieval system for browsing, searching and retrieving images from a large database. The database may contain only digital images, images along with text or may contain other types of resources like graphics, videos, audios along with the image, etc. Most popular and common techniques of image retrieval utilize some method of adding metadata such as use of captioning, keywords, or descriptions to the images so that retrieval can be performed over the annotation words. The manual process of image annotation is not only time-consuming but is also a laborious and expensive affair; to address this, there has been a large amount of research done on automatic image annotation and image detection. Moreover, with the increase in usage of social networks and a shift in paradigm from web to data web warrants new technology framework have inspired the evolution of several web-based image annotation tools.

**Music information retrieval:** Music information retrieval (MIR) is the interdisciplinary field of retrieving useful information from music. MIR, although small yet it is a growing field of research with many real world applications. Several researchers working in MIR may come from different backgrounds which include computer science, instrumentation, musicology, psychology, academic music study, signal processing, machine learning or some combination of these.

Also to the above mentioned retrieval systems, IR also deals with any type of entity or object: work of art, software, courses offered at a university, people, products of any kind, etc. Text, speech or images, printed or digital, carry information, hence information retrieval.

#### **Kinds of information retrieval system:**

1. **Offline Search:** this is where users can get the required information needed with or without the help of computer and internet, here the users browse through the isle of the shelves stored with information materials for example: libraries, CD-ROM etc.

2. **Online Search:** this means that the search of a remotely located database through interactive communications with the help of computer and communication channel. This can be accessed through online databases with the help of the vendor/aggregator directly. For example: OPAC, Databases, Internet etc.

#### **Information Retrieval Tools**

These are the simple mechanisms or apparatus that aid the library users to locate, retrieve, and use the needed documents from the library of information from a book or document (Osaniyi, 2019). The effectiveness of a library as an instrument of learning is determined by the success with which it is able to provide the users with the necessary tools capable of accessing and retrieving the information they seek. Aina (2003) asserted that a list showing records of all information carriers in a collection through the access points of author, title and subject and how such materials can be located must be provided. Such lists are called retrieval tools. Thus, information retrieval tools contain surrogates of information carriers stored in a collection that is the substitutes of the actual documents.

Some of the information retrieval tools to include: index, Library Catalogue, Bibliography, Classification, Finding aide, Registers, Abstract, Search engine, Online Databases, OPAC, shelf guides, etc.

**Index:** this serves as a guide to intellectual contents of a document, e.g. books, journal articles, edited works, etc. by indicating where an item in the collection could be located. The list is generally arranged in alphabetical order by subject or name. Having indexes allows researchers to more quickly find records for specific individuals; without them, researchers might have to look through hundreds or thousands of records to locate an individual record (Atanda & Adeyemi 2018). The word "Index" denotes one of three distinct species of bibliographic guides, namely: "(i) a guide to the content of

a particular publication. (ii) A guide to the content of a particular library. (iii) A guide to what literature exists, say in a given area, or in a given time or period". It is on the above premise that the library catalogue is sometimes described as an index to the content of the library and a bibliography as an index to the existence/ availability or otherwise of a publication. There is no doubt that indexes have been employed in several ways to help trace information and without indexes, information cannot be found and retrieved quickly. Most books have indexes at the end of the pages. There are also indexes on particular subjects which also make retrieval easier. In fact, it is possible to trace an article by an author or by subject through the use of indexes. Furthermore, there are periodical and newspaper indexes on particular subject. It is these indexes that are often referred to wherever librarians talk about indexes.

**Catalogue:** this is the most important tools for organizing a library collection. It is the list of materials such as books, microforms, audio recordings, etc. in a collection. It records and describes and locates each item presents in the collection. The collection may be that of library museums, internet resources or a database. The catalogue is more or less like an index to a collection. In fact, for the proper, efficient and effective use of the library, a reader cannot bypass or totally ignore the catalogue. Going straight to the shelves without consulting the catalogue to pick books may have its own little advantages, but it does not however give the user or the readers the opportunity to know very well the library's complete and comprehensive holdings. In essence, the catalogue indicates where the books are on the library shelves. Apart from indicating the where about or location of every books in the library, it will also indicate whether or not the library has a particular book on a particular discipline.

There are basically two types of catalogues. The first one is the single library catalogue which provides an index to all materials being held in by a particular library. The other type of a library catalogue is union catalogue, which is a joint catalogue of more than one library collection. It is a combine list of materials present in the participating libraries. A joint catalogue may include up to 10 or more libraries. Nevertheless, the precise purposes of the library catalogue vary, and they can be broadly summarized thus:

#### To help a library user to find a book which:

- The author is known.
- The title is known.
- The subject is known.

#### To show the library holdings:

- By a given author.
- On a given subject and related subject.
- In a given form of literature.

#### To help in the choice of books:

- As to its edition.
- As to its other characteristics.

**Bibliography:** these are basically lists of information materials by subject, form, author or geographical location. There are situations in which such of the items listed in a bibliography may be provided with a short summary of the content. In such a case, the bibliography is called an annotated bibliography.

It is true that without the aid of Bibliographies, additional works by a certain author or works on a certain subjects cannot be found. There are hundreds of different kinds of bibliographies compiled for different purposes, and it is with the aid of bibliographies that your reference librarian can let you know which one might be useful in the topic area of your research. However, it is a bibliography that will tell (the clientele) a work exist, but it may not be held by that particular library. After writing a journal article or a book, the writers usually refer to the sources he had used. The source could be book or articles that he had used or added to his own information, thus list is referred to as reference or bibliographies.

**Classification:** this is an orderly arrangement of terms or classes, resulting in the arrangement of documents based on subject contents into groups or classes. Thus documents with the same subject contents could be grouped together into one class and these documents in the class are arranged in a useful order with respect to one another. Thus, the systematic arrangement of library collections on the shelves is called classification (Aina, 2003). In the words of Nnadozie (2007), he defined classification scheme as a system created for the division into categories of the universe of human knowledge into broad subjects and narrow topics. Hence, without the grouping of collections of books in the library to their subject matter, books on the same subject would not have been found together on the shelf. Also, without the classification schemes, class numbers that are seen in indexes cannot be obtained (Atanda & Adeyemi 2018).

**Finding aide:** these are the retrieval tool used mainly in archives. There are called inventories, in which items in the archives are listed based on the personal or corporate sources rather than the author of the individual items.

**Registers:** these are used in museums, also referred to as an accession log. These contain the identity and the donor of each object in the museum. Registers function like catalogs although, they have additional kinds of access points, such as the identification of the object, the donor, a history of association (i.e. where or with whom previously owned the item), any insurance related information. An identification number (accession number) is assigned. The accession record becomes one or more files that help to provide organization to a museum's collection.

**Abstract:** this is similar to an index. This is generally performs the same functions except that in addition to listing the bibliographic records of each item, it also gives a summary of each item listed. The two common examples of abstracts according to Aina, (2003) in the field of library and information studies are:

*Library and information science Abstracts.*

London: Library Association. 1969-

*Information science and technology Abstracts.*

Medford. NJ: Information Today Inc. 1966- (formally *Information Science Abstracts*)

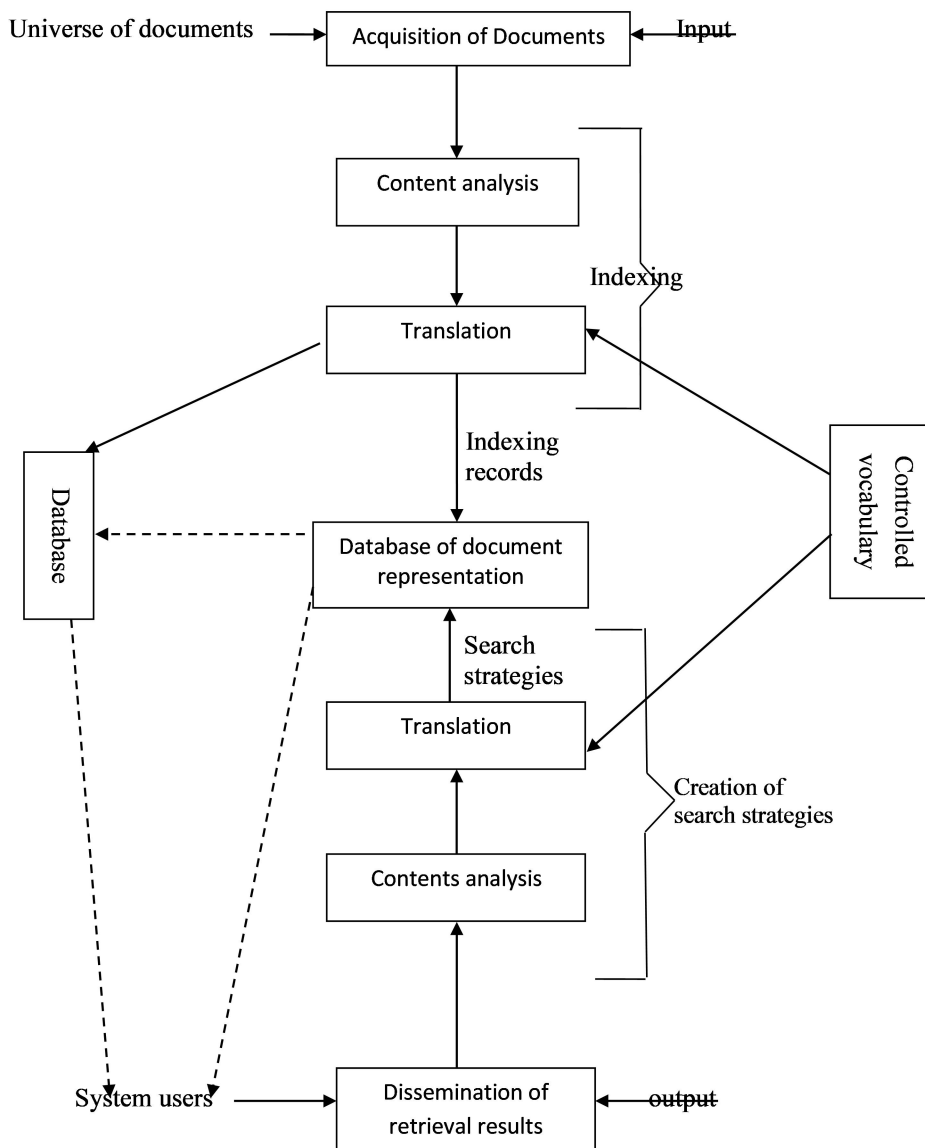
*Library and information science Abstracts* is published monthly and then cumulated annually.

*Information science and technology Abstracts* is published nine time a year.

**Search engine:** A search engine is software, usually accessed on the Internet. This searches a database of information according to the user's query. It can also be described as a software program that searches the Internet (bunch of websites) based on the words that you designate as search terms (query words). Search engines look through their own databases of information in order to find what it is that you are looking for. Web Search Engines are a good example for massively sized Information Retrieval Systems. The engine provides a list of results that best match what the user is trying to find. Today, there are many different search engines available on the Internet, each with their own abilities and features. E.g. Google, Yahoo, Bing Ask.com, AOL search engine, etc.

**Online Databases:** This is electronic catalogs, where records are encoded for computer display and are stored in computer memory or on CD-ROM disks. Online databases are built on the technical logic supported by relational database theories. Databases that have records that is all stored within the same file. Records are link by a unique identifier and are linked to related databases that share this unique identifier. An online database conserves storage space, allows for faster searching, and allows for easier modification of records.

### The Diagram and Functions of Information Retrieval System



**Figure 1.** Functions of Information Retrieval Systems

#### Functions of Information Retrieval Systems are as follows:

- ▶ To identify the information (sources) relevant to the areas of interest of the target users' community; this is a challenging job especially in the web environment where virtually everybody in the world can be the potential user of a web-based information retrieval system.
- ▶ To analyze the contents of the sources (documents); this is becoming increasingly challenging as the size, volume and variety of information sources (documents)

is increasing rapidly; web information retrieval is carried out automatically using specially designed programs called spiders.

- ▶ To represent the contents of analyzed sources in a way that matches users' queries; this is done by automatically creating one or more index files, and is becoming an increasingly complex task due to the volume and variety of content and increasing user demands.
- ▶ To analyze users' queries and represent them in a form that will be suitable for matching the database; this is done in a number of ways, through the design of

sophisticated search interfaces including those that can provide some help to users for selection of appropriate search terms by using dictionary and thesauri, automatic spell checkers, a predefined set of search statements and so forth.

- ▶ To match the search statement with the stored database; a number of complex information retrieval models have been developed over the years that are used to determine the similarity of the query and stored documents.
- ▶ To retrieve relevant information; a variety of tools and techniques are used to determine the relevance of retrieved items and their ranking.
- ▶ To make continuous changes in all aspects of the system, keeping in mind the rapid developments in information and communication technologies (ICTs) relating to changing patterns of society, users and their information needs and expectations. (Chowdhury, 2010)

### **Drawbacks of Information Retrieval System Encounter by the Users in the Libraries**

#### ***Insufficient Funds for Acquiring ICT Facilities***

Libraries need adequate funds to attain contemporary ICT facilities such as computers, servers, scanners, photocopiers, software as well as compensating for electronic and traditional library services such as electronic journals, eBooks and digital libraries. This reflects on the conduct of the programmes that should be conducted to train registered users on how to make use of IR system with ICT so as to meet their information needs. Largely, these ICT facilities and services are extremely costly and can be acquired from industrialised countries. Hence, according to Mutula (2004) and Amuchie (2015) they asserted that the little funds received fall far below the standard costs of ICT facilities

#### ***Lack of Information Literacy Skills***

Information literacy is all the happenings engaged in by librarians in training clientele how to make the noblest use of the library resources, services and facilities, incorporating both the prescribed and unauthorized instruction provided by a librarian or other staff member on a one-on-one basis or in a group (Reitz, 2004). One of the challenges that the students have is to be information literate so that they can realize when information is required and be competent in finding, assessing and successfully utilizing the required information. The concept also includes the skills required to critically evaluate information contents and employ it effectively, as well as understanding of the technological

infrastructure on which information transmission is based, including its social, political, and cultural context and impact.

#### ***Lack of Information Retrieval Skills***

There is also a need to improve the information search strategy skills so as to acquire information to enhance their studies. The keywords such as, Boolean Operators and the keywords index phrase search strategies can be used by users to search and retrieve relevant information. Also on the other hand, the shortage of library staff poses another challenge to libraries because of the number of new students entering into higher institutions of learning is growing in such a way that it is difficult for the librarians to ensure that all the students attained the accurate information retrieval skills. While on the other hand some of the students are not aware of the availability of the information retrieval system. There is also the problem of the relevancy of the document retrieved for meeting the information needs of the students (Fordjour et al. 2010).

#### ***Lack of Relevant Knowledge of ICT***

The usages of Information Technology in the library system requires that the users should be exposed to and have knowledge in Information and Communication Technology so as to be able to effectively use the ICT facilities to retrieve information required. Without ICT skills the users may not retrieve information effectively. As a result the influence of ICT resources introduced in library undertakings, increased the need for the students (library users) to be trained on how to manipulate them to effectively access their information needs to enable them to pursue their studies (Aliyu 2011).

### **CONCLUSION**

The quality of an institution of higher learning is judged based on its functioning library. Information retrieval systems aid the library users to have access to the needed information material in various formats. These information retrieval tools are bibliography, index and abstract, shelve lists, Online Public Access Catalogue (OPAC) and library card catalogue. Institutions can simply achieve valuable use of their libraries and their resources if it makes the entire environment well-organized and attractive for meaningful study.

### **RECOMMENDATIONS**

- Users of information retrieval tools in the library should

improve the information search strategy skills so as to acquire information to enhance their studies.

- Users should be exposed to and have knowledge in Information and Communication Technology so as to be able to effectively use the ICT facilities to retrieve required information.
- Librarians should train clientele/users on how to make the noblest use of the library resources, services and facilities, incorporating both the prescribed and unauthorized instructions about the basic information retrieval systems in the library both in manual and technology.
- The management of the academic libraries should programme that will train registered users on how to make use of IR system with ICT so as to meet their information needs.

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