

## **Bridging the information gap with LinkOut: how this powerful feature could meet user's needs**

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**Summary.** - Outbound linking is a powerful Internet tool provided by modern technology which enhances the exchange of information and resource sharing in order to better serve user's needs for fast and easy access to knowledge. In fact, its "one-stop searching" facility allows website visitors to access data directly at its source. In this framework the US National Library of Medicine (NLM) has implemented a LinkOut service accessible through Entrez databases which provides users with links to a number of important web-accessible online resources, supplied by third parties. From a single PubMed citation, for example, clicking "LinkOut" from the links pull-down menu, the user is provided with links not only to the full text of the article at the editor's website, but also to library holdings, consumer health information, related commentaries, supplementary data, guidelines, biological databases and other related research tools. The aim of this paper is to show how important this service is to bridge the information gap which still exists in the dissemination of scientific information, and to meet user's needs by connecting different online bibliographic and non-bibliographic resources to improve, enlarge and clarify information, in a surprisingly easy and user-friendly way. Each letter in the word LinkOut is used by the authors as a reference point to help explaining the basic concepts of this service: Linking Information through the Network to share Knowledge, in an Open access way, for the benefits of Users, thanks to the enhancement of Technology. The recent activation of LinkOut for *Annali dell'Istituto Superiore di Sanità* is also briefly described.

Keywords: Information storage and retrieval, Internet, online systems.

### **Introduction**

PubMed users can experience more productive online sessions thanks to the LinkOut service implemented by the US National Library of Medicine for all its Entrez databases in order to extend searching to functional and high-quality external resources ([www.ncbi.nlm.nih.gov/entrez/linkout](http://www.ncbi.nlm.nih.gov/entrez/linkout)). A links pull-down menu takes the user from a single bibliographic record to a wide range of related information sources, including molecular biology databases, consumer health information, educational initiatives, research tools and lots more besides. Via LinkOut, users are also directed to the full-text articles at the editors' websites, where access, in most cases, depends on subscription or other fees. In addition, libraries submitting their electronic journal holdings to PubMed can provide direct links for their patrons to the articles belonging to their collection.

In April 2004 the Editorial Service of the Istituto Superiore di Sanità (ISS) received a warm "Welcome to the MEDLINE/PubMed family!" by the NLM. The reason is that the ISS science journal *Annali dell'Istituto Superiore di Sanità* was approved for electronic submission to NLM's MEDLINE/PubMed system and for participation in the LinkOut program which meant free access from the PubMed Database to the full text of its articles (Fig. 1). ISS became, therefore, a provider of the full text link to the journal, strengthening a collaboration with the NLM which dates back to the years of its foundation. The LinkOut service is therefore available for *Annali* starting with issue n 3 vol 39 (2003) (1).

### **The LinkOut service and its features**

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To help explaining the basic concepts of this service, each letter in the word LinkOut is used by the authors as a reference point, LinkOut meaning: Linking Information through the Network to share Knowledge, in an Open access way, for the benefits of Users, thanks to the enhancement of Technology.

Linking together disparate sources of information is a functionality provided by technological advancements which can help to better serve the Internet users community. Given the increasing amount of information available on the web, which can make of an online research a frustrating time-consuming experience, web users are becoming more and more demanding. They not only require easy access to the information they need, but they also want to be given access to all relevant data, possibly without the preclusion of any interesting material. In other words they want to download all useful information to their desktops in a “one-stop” search, with no intermediate steps, in order to save time and money spent in front of their PCs searching for information.

Information retrieval (IR) is rapidly evolving thanks to the opportunities offered by the development of powerful new technologies applied to database systems, but also thanks to the development of theoretical, behavioural and cognitive studies whose models of information seeking behaviour IR is using (2). IR is increasingly approaching and being modelled by the natural information seeking behaviour. We all live in an information environment. We need information for our mastery of life (Everyday Life Information Seeking behaviour, ELIS) (3) usually acquiring information through the so-called “Berry-Picking Model” (4). If to acquire information in every day life we follow a path which is not static, hierarchical, linear (like the command-language interfaces of old databases), but inherently interactive, flexible, associative, reticular, non-sequential, net-like, we are then prone to meet our information needs following the same patterns when searching the Internet.

Network users’ needs, therefore, can be better met if they proceed through an “explorative browsing behaviour”, which has been discovered to be typical of human thinking and better capable of reaching those multiple goals which are believed to be the true objective of information retrieval nowadays. If network users’ pathways to information (browsing, linking, expanding, relating, enhancing) are very similar to human thinking patterns (2), the LinkOut service is an important turning point in the redesigning of database systems, in this particular framework.

Knowledge is but the true keyword in IR. It is the fulfillment of all user’s information needs which however can only be reached when the information sought after is obtained using a query which is not only logical and relevant, but also “useful”, both to the user him/herself at intellectual level and to the whole community (from theory to practice). Therefore knowledge, according to many, should be freely and equally accessible from all with no boundaries of any sort. The NLM is rapidly moving towards this goal and the free LinkOut service is also a way to achieve it.

Open access, the well known initiative (Budapest, 2001), is rapidly spreading. Its main commitment is a free and unrestricted availability of scientific information through the Internet. It’s statement reads: “By open access to this literature, we mean its free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to internet itself” ([www.soros.org/openaccess/read.shtml](http://www.soros.org/openaccess/read.shtml)). LinkOut is an important step towards this goal (5). Even if not all full texts are free (according to each publisher’s policy), all PubMed Central papers (the open access repository of the NLM) are freely accessible through the LinkOut service.

Users’ expectations can be matched by information providers through locally created links to other sites where persistent, relevant and valuable data reside. Forging appropriate links at the right time, at the right level of detail, enables website visitors to directly access a cluster of information tailored to their needs, without sifting through mountains of information. On the one

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hand, linkage operations allow website owners to enrich and supplement their content and, on the other, useful links provide users a means to have what they need at their fingertips, as they can easily and quickly locate additional information to extend their research.

Technology is changing the Internet both in terms of the network itself and in terms of the services and functionalities it can provide. Organizing and linking resources together offers navigation focused on audience needs, through the creation of integrated information spaces, capable to put the right data into the right hands in a few moments. Undoubtedly, outbound linking is one of the best uses of the Internet that the information industry can make. In fact, it gives resource providers benefits like broader coverage, increased visibility and higher search engine ranking and, at the same time, it plays a role of the utmost importance for the dissemination of communication to wide audiences through the sharing and exchange of information even beyond traditional disciplinary boundaries (6).

## **Conclusions**

Linking technology has radically changed the process of online searching for information which by now moves by associations, rather than from search to search, enabling users to avoid time-consuming sessions surfing from one website to another. The pool of linking options provided by LinkOut has, in fact, transformed each PubMed reference into a unique point of access to a universe of web resources provided by third parties.

The aim of the service is helping users to go deeper into a research topic, allowing them comprehensiveness of retrieval in a minimum time, by means of the integration of related concepts which are scattered in a variety of sources available on the Internet. It perfectly matches the needs of today's scientific community and the high-speed demands of the digital age by bridging the information gap which still exists in the dissemination of scientific information.

## **References**

1. Napolitani F, Guderzo S, Mariani R. L'attivazione del LinkOut per gli Annali dell'Istituto Superiore di Sanità. *Not Ist Super Sanità* 2004;17(12):15-7.
2. Savage-Knepshield PA, Belkin NJ. Interaction in information retrieval: trends over time. *J Am Soc Inform Science* 1999;50(12):1067-82.
3. Spink A, Cole C. Introduction to the special issue: Everyday life information-seeking research. *Libr Inf Sci Res* 2001;23:301-4.
4. Bates, MJ. The berry-picking search: User interface design. In: Dillon, M (Ed.). *Interfaces for information retrieval and online systems: state of the art*. New York: Greenwood Press; 1991. p. 55-61.
5. Lacroix E-M, Menhert R. The US National Library of Medicine in the 21st century: expanding collections, nontraditional formats, new audiences. *Health Information and Libraries Journal* 2002;19:126-32.
6. McEntyre J, Lipman D. PubMed: bridging the information gap. *Can Med Assoc J* 2001 May 1; 164(9):1317-9

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Fig. 1. – Example of a LinkOut record from PubMed

The screenshot shows the PubMed interface for a LinkOut record. At the top, there are logos for NCBI, PubMed, and the National Library of Medicine (NLM). A navigation bar includes links for All Databases, PubMed, Nucleotide, Protein, Genome, Structure, CMA, PMC, Journals, and Books. A search bar is present with a 'Go' button and a 'Clear' button. Below the search bar, there are tabs for Limits, Preview/Index, History, Clipboard, and Details. A 'Display' dropdown menu is set to 'LinkOut', and a 'Show' dropdown is set to '20'. A 'Sort by' dropdown and a 'Send to' dropdown are also visible. The main content area displays the following text: 'The following LinkOut resources are supplied by external providers. These providers are responsible for maintaining the links. What does the icon mean?'. Below this, there is a list of resources for the article '1: Ferri M. [Primary prevention for alcohol... [PMID: 15269452]'. The resources are categorized as follows: Full Text Sources (Istituto Superiore di Sanita), Libraries (New England Research Institutes Inc.), Education (MEDLINEplus Health Information), and Medical (Alcohol and Youth, Alcoholism). A left sidebar contains various navigation options such as About Entrez, Text Version, Entrez PubMed Overview, Help, Tutorial, and PubMed Services.