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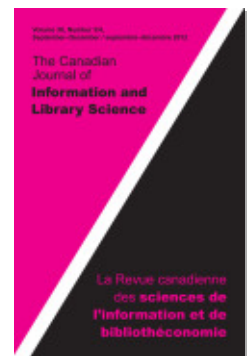
Online Article Searching on Publisher Platforms by STM
French Scholars: Findings and Analysis / La recherche
d'articles sur les plateformes d'éditeurs par les
chercheurs français dans les domaines STM : analyse et
résultats

Chérifa Boukacem-Zeghmouri

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**La recherche d'articles
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dans les domaines STM :
analyse et résultats**

Chérifa Boukacem-Zeghmouri
Université de Lyon ; Université Lyon 1
Laboratoire ELICO
URFIST de Lyon
cherifa.boukacem@univ-lyon1.fr

Abstract: This article seeks to understand the e-journal search patterns of STM (science, technology, and medicine) researchers from the French academic network by studying how researchers seek, read, and use articles on the ScienceDirect platform. The methodology combines two approaches. The first approach is quantitative and is based on statistical data concerning search activities on ScienceDirect between January 2008 and April 2009. The second approach is qualitative and is based on semi-directed interviews of researchers authorized to access ScienceDirect. The researchers' information-seeking activities on ScienceDirect follow two complementary usage logics. On the one hand, they follow search and discovery itineraries, and, on the other hand, they implement continuous and recurrent access mechanisms. In both cases, the researchers' searching behaviours on ScienceDirect are similar to their behaviours on the Web. This study concerns a previously unpublished large-scale analysis of STM searching behaviours. Furthermore, the mixed methodology used allows the results to be compared and, thus, the clearest and most objective interpretation to be obtained.

Keywords: usage, behaviour, navigation, ScienceDirect, electronic journals

Résumé : Cet article s'intéresse aux pratiques de consultation des périodiques électroniques des enseignants-chercheurs du réseau universitaire français, dans les domaines STM, sur une plateforme d'éditeur, ScienceDirect. Le premier volet méthodologique s'appuie sur une étude quantitative basée sur les statistiques des activités de consultations de la plateforme ScienceDirect, entre janvier 2008 et avril 2009. Le second volet, de type qualitatif, est basé sur des entretiens semi-directifs menés auprès d'un panel de ces mêmes enseignants-chercheurs. Les résultats montrent que deux logiques d'usages corollaires expliquent l'activité de consultation : l'emprunt d'itinéraires de recherche et de découvertes d'une part, la mise en œuvre de mécanismes d'accès pérennes et récurrents, d'autre part. Ces deux logiques

soulignent le caractère fondamental de la navigation chez les chercheurs qui transposent leurs pratiques du web sur la plateforme ScienceDirect.

Mots-clés : usages, navigation, ScienceDirect, périodiques électroniques

1. Introduction

The general consensus in the scientific and professional literature is that electronic resource searching is increasing (Nicholas et al. 2006; Jamali and Nicholas 2008; Research Information Network 2011), especially searching of electronic serials, and it does not seem to be slowing down. In France the same phenomenon is observed and all studies show a marked increase in the number of documents downloaded at public academic and research institutions (Boukacem-Zeghmouri and Kamga 2008; Colin and Lechaudel 2010). For example, between January 2008 and April 2009, 99.37% of all full-text searches logged on ScienceDirect¹ concerned journal articles. However, this figure should be considered in light of the fact that libraries purchase mainly online serials and that the share of electronic books remains quite small in terms of both files for use on personal computers and files for use on ebook readers.

We are now more aware of the behaviours behind those large volumes of downloads, such as how the users conduct their searches, how they navigate the interfaces of the platforms available to them, how they locate the documents they need, what formats they prefer, how much time is devoted to navigation, the average search length, the average frequency of searches, and the how the documents are used. The CIBER (Centre for Information Behaviour and the Evaluation of Research) research team identified these behaviours through its research, using many studies, such as those conducted by the Research Information Network (2011). The results of these studies all overlap and demonstrate that electronic resource viewing habits are similar to Web-navigation habits, therefore resulting in a general “Google-ization.” However, these studies were conducted in Britain and North America. One might wonder if it is possible to discover these same trends in France. Thus, this article is dedicated to identifying the electronic-resource viewing and consultation habits of French STM (science, technology, and medicine) researchers, and to seeing to what extent these new uses are similar to or different from those of the British and of North Americans.

First we studied the statistical analyses of electronic serials searching and the other methodological problems they raised, and tried to identify the volume of searches conducted in French academic institutions (Boukacem-Zeghmouri and Kamga 2008). Then we attempted to identify what searches were being done by researchers,² especially in STM academic institutions. Therefore, the purpose of this article is first to identify and examine the phenomenon of the extensive downloading of electronic serials by researchers, then to understand the behaviours linked to this phenomenon, and, finally, to place them in the context of their scientific activity. In this article we will focus on the trends common to the panel of researchers we interviewed, the members of which broadly belonged to STM disciplines.

A few words on the electronic resources in France

Today, researchers can access a wide range of purchased or open-access electronic resources. Purchased resources (e.g., BiblioInserm, BiblioVie) are largely used through the gateways available in the library of a researcher's university or affiliated research institution. Researchers might be able to access several gateways through their affiliation to more than one institution. In this way, they might benefit from either broader access or the same access through two different access channels.

Electronic resources, and electronic serials in particular, are generally accessed through the "Electronic Resources," "Electronic Documents," or "Electronic Journals" tabs on these gateways' websites. Browsing can be done either through an "A to Z" menu of all available resources, a search menu, or other menus available on the platforms. Thus, researchers have at their disposal a variety of ways to access available resources, whose access terms were negotiated between the publishers and either the Couperin consortium or individual institutions.

As of July 2012, the Directory of Open Access Journals (DOAJ)³ lists nearly 8,000 open-access journals and the Registry of Open Access Repositories (ROAR)⁴ lists nearly 3,000 open-access thematic and institutional archives; among them is Hyper Article en Ligne (HAL), the French national repository.⁵ Such resources are increasingly integrated into or referenced by library gateways,⁶ and information and training seminars are available to researchers to increase their awareness of such resources and of the possibility of contributing to these resources.

We invited the researchers we met to express their views on the size and number of such resources. Their answers were unanimous. They wished to be able to access "more of these resources, at all time, and from anywhere." Nevertheless, the issue of how electronic subscriptions are related to the services and their associated accesses remains, because nowadays there exists not only the issue of researchers' desire for comprehensiveness but also the issue of the structure of the subscriptions and its evolution.

The French Association of the Electronic Information Industry (GFII) recently conducted a study on this topic (Vajou, Martinez, and Chaudiron 2009). Focusing on the economic challenges of STM publishing, it showed the difficulty and the complexity of fitting a free-publishing-and-access model into the broader business model of innovation. Despite the argument that it doesn't provide a sufficient return on investment and therefore requires government subsidies, support for this model remains. Similarly, the study clearly pointed out the importance of added-value services and functions developed by commercial publishing thanks to its profit margins. It also showed that open-access models would be hard pressed to compete. Furthermore, our analysis should in the future take into account research relating to the use of open archives—whether subject-oriented or institutional—likely to enter into the open-access business model (Schöpfel and Prost 2009).

2. Literature review

The first studies on patterns of electronic resource searches were published in 2005. The COUNTER (Counting Online Usage of NeTworked Electronic Resources) Code of Practice was gaining acceptance as a reliable tool to measure

electronic resource usage, and deep log analyses of daily transactions were undertaken (Nicholas et al. 2008). Such analyses will lead to an important corpus of quantitative and empirical studies based on large populations and will provide detailed discipline coverage (Jamali and Nicholas 2008).

It is interesting to note that a review of this literature shows that some of the studies see the patterns of online resource searches as a new phenomenon almost isolated from searches in a paper environment. The aim of these studies was to identify the new behaviour of researchers in the context of an entirely digital environment. Other studies sought to establish clearly a link with information-seeking behaviour in a paper environment. Authors looked at the search patterns of online resources and attempted to identify either a continuum or a break. Some of these studies are directly in line with the interest in information behaviour that arose in the 1970s (Tenopir et al. 2009).

To understand this phenomenon, especially on time scales of such length, the concept of “information literacy” must be brought forth. According to this concept, the user’s skills and the functions of the technical mediation devices within the disciplines in which the information-seeking behaviour occurs must be taken into account. The main interest of these studies for library professionals is the possibility of identifying the dynamics and logics that organize the various behaviours so that they can proactively address changes in their business (Nicholas and Rowlands 2008).

The innovative aspect of the most recent studies is the changing scale of the observations. With the advent of the so-called Big Deals, which make possible access to a greater number of journals, and the availability of search statistics for real populations rather than just samples, it is now possible to conduct studies of an unprecedented size. The critical mass of the data recorded enables the identification of more reliable trends of behaviours and empowers researchers to make comparisons.

More recently, an evolution in methodology has been observed. First based on a quantitative approach, the methodology has recently been integrating a qualitative dimension designed to make explicit the approaches identified by statistics (Rowlands et al. 2008). This quantitative-qualitative methodology makes it possible to conduct basic studies that lead to a characterization of the present and future behaviours of the “Google Generation” (Gunter, Rowlands, and Nicholas 2009).

Finally, another type of study, though less common and more theoretical, focuses on patterns of electronic resource searches to identify and investigate the new forms of knowledge acquisition implemented by users (Dyens 2002; Elisalde and Kosmopoulos 2007). We might expect to see another type of study in the future, that is, ethnological studies designed for the study of object-oriented behaviour. However, this type of approach is presently too cumbersome to use and is therefore of limited value.

3. Methodology

Our study is based on a methodology relying on two complementary approaches. The first approach is quantitative in nature. It consists of collecting,

processing, and analysing statistics on electronic serial searches in the 25 STM sections of libraries of the French academic network. Data were extracted from four series of statistical reports supplied by the publisher Elsevier through its ScienceDirect platform: *Journal Reports* (specific to serials), *Search Reports* (specific to searching activities), *Navigation Reports* (specific to navigation/browsing activities), and *Overview Reports* (of a more general nature). Out of the four reports, only *Journal Reports* and *Search Reports* are COUNTER compliant. Each of the four reports addresses different types of activities and therefore provides different statistical data. The activities we examined—and for which we took into account the publisher definition for a better understanding—were those that concerned the research questions of this study.

The second methodological approach, of a qualitative nature, was based on 23 semi-directed interviews with university researchers who were patrons of the STM sections of their libraries. These interviews gave us an opportunity to question the ScienceDirect users on the “paths” they followed to seek and find documents, the time they spent searching, the reasons why they undertook their searches, how they searched, and what their preferences are.

These interviews lasted between 1 hour and 15 minutes and 1 hour and 40 minutes. They took place between September 2008 and February 2009 in the offices of the researchers, in the very context in which their information behaviours occurred. We were able to acquaint ourselves with the physical layout of the offices and the documents contained within them as well as see the tools that were used, identify their purposes, and theorize how they could be used by the researchers. The ethnological observation was therefore an important part of the protocol for these interviews.

Most importantly, through these interviews we could acquaint ourselves with the logic behind the choices and actions of the researchers during their information-seeking activities. When they explained the paths they followed and their ways “to do things,” the researchers we interviewed revealed the reasoning, choices, strategies, and objectives underlying their utilization of the platforms they used. This dimension was quite valuable for making sense of the results of the quantitative part of our study.

4. Results

To account in an understandable manner for the meaning of the multiple practices and usages that were recorded and explained, we relied on the concept of usage logic developed by Jacques Perriault (2008). According to this concept, a model can be conceived that accounts for the wealth and diversity of usages observed in our study. Thus, two logics seemed to emerge on their own. We will call the first one “search and discovery itineraries” and the second “continuous and recurrent access mechanisms.” Search and discovery itineraries refers to the route followed to access documents, for example, via a database, a search engine, or an external or internal link. Continuous and recurrent access mechanisms refers to aspects of user behaviour once the document has been accessed, such as bouncing to other links, file backup, on-screen reading, and session length.

4.1 Search and Discovery Itineraries

4.1.1 Access routes to documents

Searching on Elsevier’s ScienceDirect platform involves two separate activities. The first is logging directly onto the platform, where users will utilize various traditional or advanced functionalities offered by the interface. The second is navigating or browsing, whereby users access the platform on the go. In their browsing activities, users can first identify documents of interest by a search engine, CrossRef,⁷ an open archive, or the personal home page of a researcher. Then users will log onto ScienceDirect to retrieve the full text of the document. In such cases, the Elsevier platform is used to refine, complete, and confirm their bibliographies, or to obtain documents they spotted on the Web, search for articles by an author spotted on the Web, check whether a preprint has been published and therefore validated, or test a keyword to assess if it has been appropriated by colleagues. The platform can also be searched to identify the works, research fields, projects, and specificities of a research team.

The *Navigation Reports* specifies how users choose between searching and browsing activities in a real context. Figure 1 below shows the respective instances of these activities. Browsing is more than seven times more popular than searching. It is obvious that users prefer finding for articles while browsing. This figure clearly shows the importance of browsing for users. A recent study also underlined the importance of browsing for users of electronic journal platforms (Nicholas et al. 2008).

Researchers used Google more than Google Scholar as their browsing tool. A researcher, questioned on this point, answered that she preferred Google over Google Scholar since with Google she could handle a lot more information on the Web. Interviews confirmed the popularity of this practice, which can provide

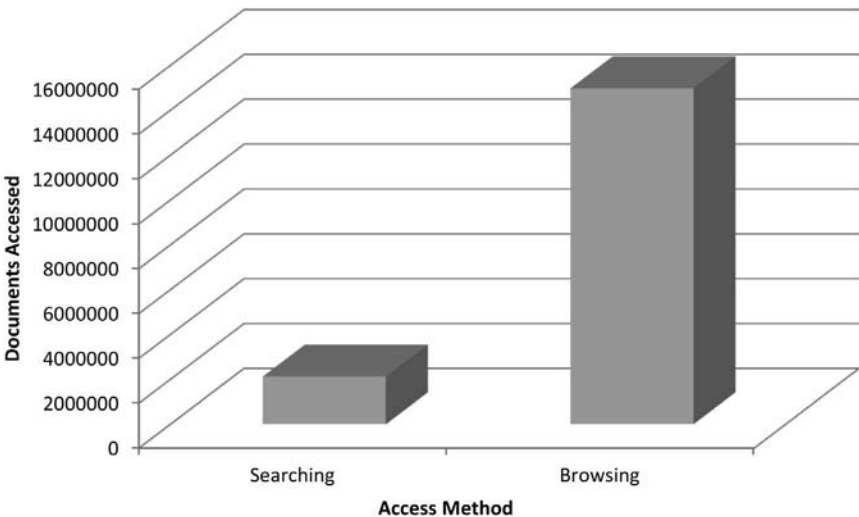


Figure 1: Distribution of documents accessed through searching versus browsing in 2008.

access to a broader selection of resources and contexts for reading and enables researchers to cross subject and discipline borders in order to see what can be found on the fringe. Hypertext links, multiple menus, and cursory reading, which are characteristics specific to browsing, are the cornerstones of a new way to seek information that is essential to researchers faced with hitherto unheard of possibilities. The STM researchers we interviewed felt that the availability of large corpora such as the publishers' Big Deals were quite relevant. The larger the corpus, the more they felt proficient in their information seeking.

4.1.2 Sessions and searches

We looked at the volume of searches conducted by researchers within the sessions they opened. Figure 2 below shows the number of searches and sessions logged in 2007 and 2008.⁸ These data come from the *Search Reports* and are COUNTER compliant.

We can see that in 2007 the number of searches is higher than the number of sessions, that is, that users conducted more than one search during each session. Nevertheless, the search-to-session ratio is rather low (1.05), close to one search per session. In 2008 searches underwent a 15% increase while sessions underwent a 19.93% increase. The search-to-session ratio remained roughly the same (1.007) as that of 2007.

These figures show that users tended to formulate a lesser number of searches during their sessions even though the number of sessions underwent a marked increase. We must point out that interviewed researchers indicated that they felt quite proficient in their information seeking. This makes sense if we take into account that, during a session, researchers might browse the platform without formulating a single query. We must also take into account the phenomenon of articles accessed through external links as stated in part 4.1.1 above.

Interviews conducted with researchers in the STM fields also supported this phenomenon. Users did not seem to dedicate time to information seeking

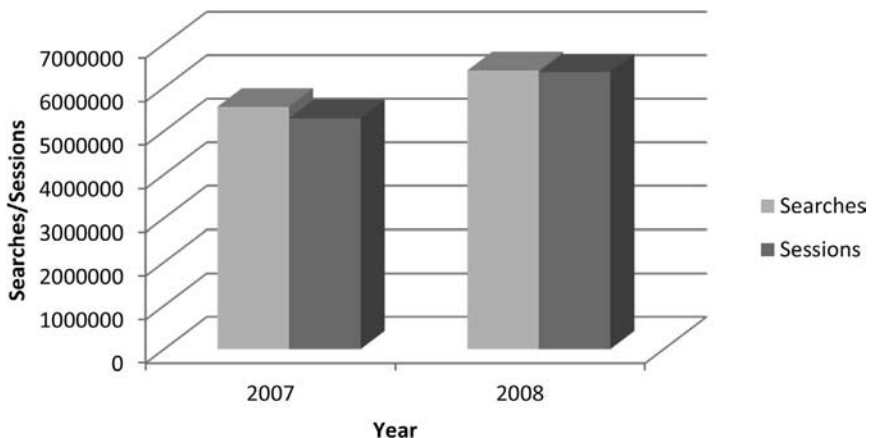


Figure 2: Searches and sessions conducted on the ScienceDirect platform.

but, rather, they included it in the time dedicated to and integrated in other activities (writing, assessment, teaching), and information seeking was done more on an *ad hoc* basis. With continuous and remote access to a corpus of documents, researchers can download the same article several times to print it, show it to a colleague, check a figure or a reference while writing a document, and so on. Researchers do not really see any difference between on-the-spot, in-context downloading and referring to a paper document on a shelf as the need arises. Thus, as we have already mentioned previously (Boukacem-Zeghmouri 2009), users might also open a session to print an article, check a cited reference in an article to be assessed, or copy a figure while writing an article. This is just a case of carrying a print-environment behaviour over to an electronic environment.

4.1.3 Types of searches conducted on the platform

Now, we would like to look into the searches conducted by users on the ScienceDirect platform. Figure 3, derived from the Search Reports data, shows the distribution of searches logged in 2008. We can see that users overwhelmingly favour the simple search, or Quick Search, mode (82.89%) over other more advanced search modes. As previously mentioned, users prefer the simple search mode because—despite the “noise” it produces—the results it provides are more general than the precise results that the advanced searches provide.

The interviews showed us that targeted searches are generally used by STM researchers to retrieve specific already-known references. For example, users will combine an author name and a publication year. By contrast, researchers use the simple search mode as they would a search engine, like Google, and what they expect to find is not only specific information but also marginal information that could throw some light on the issue in question from a different viewpoint.

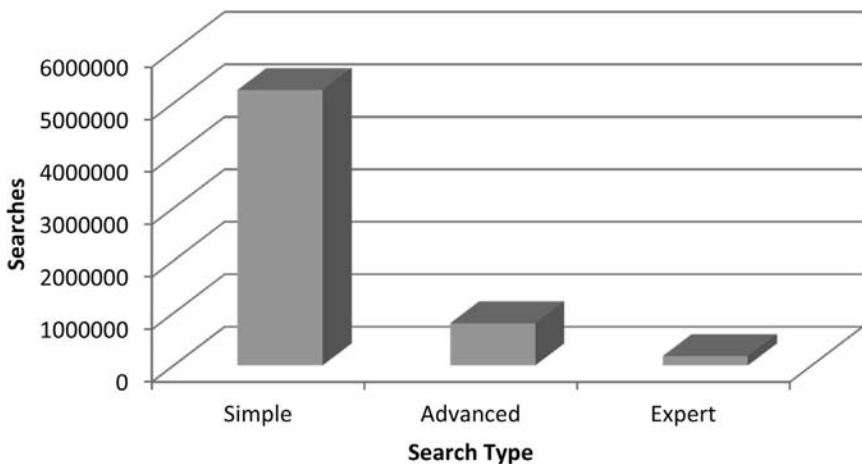


Figure 3: Types of searches conducted on the ScienceDirect platform (2008).

They clearly stated that through this method they expect to find “gold nuggets” that could bring an unexpected and novel transdisciplinary element to their work.

4.1.4 Access to ScienceDirect through current awareness services (alerts)

Users of the ScienceDirect platform can subscribe to current awareness services that will keep them informed by email of the availability of documents corresponding to predefined profiles. Figure 4 below is derived from the *Navigation Reports* data and shows that in 2008 the majority of current awareness services leading to the platform and documents are those services that send to users the table of contents of new journal issues (69.16%). The interviews we conducted with researchers confirmed the popularity of this type of service since all of them subscribed to the new-issue current awareness services. They cited lack of time and the need to avoid “being drowned in information” as reasons to subscribe to such services. For them, following a list of 20 journal titles is too time consuming and, given their time schedules, it is quite “impossible” for them to delve into details. Interviews also showed that researchers prefer such current awareness services because they are linked to their email inboxes. Email inboxes are used to centralize, organize, and store information. In fact, by being constantly connected to their email, researchers are constantly in touch with their corpus.

By contrast, few researchers subscribed to other current awareness services, including RSS feeds, which they do not understand. They stick to table of contents services, which are rather reminiscent of the Current Contents service. For them, such services are more relevant for regular scanning of the latest publications, even if looking at an alert does not necessarily mean perusing the documents themselves. Interviews also showed that current awareness services are also

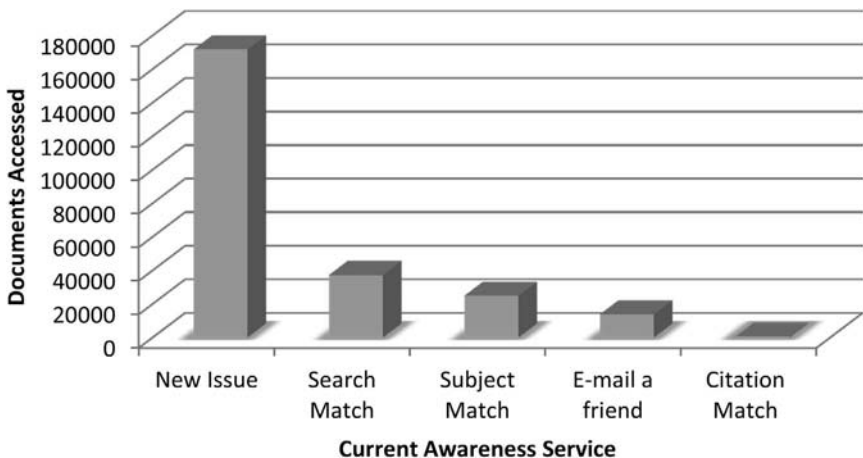


Figure 4: Modes of access to ScienceDirect via current awareness services (2008).

a way for researchers to obtain a clear and precise “mapping” of researchers working in their field. They also rely on the “cited by” links offered by databases such as the Web of Science,⁹ Scopus,¹⁰ and Google Scholar to keep abreast of what is happening in their field.

4.1.5 Searching and browsing times

Figure 5 breaks down the 2008 access flow related to searching and browsing activity of the documents on ScienceDirect. More precisely, the graph allows us to observe the beats that punctuate this flow. It clearly indicates that browsing activity decreases as the summer months approach. A browsing jolt is noticeable during the month of March, which can be linked to the arrival of student interns in laboratories. There is a drop of activity between the months of June and September, and a more dramatic drop in August 2008, at the height of the summer holiday period. This rhythm is similar to the academic calendar which is divided in two periods. The month of May, with its end-of-week national holidays, is also a time when browsing and search activities decreases. With this evidence, we can therefore recognize the two major beats in the French researcher’s calendar.

But when looking at this figure, we must remember that browsing and searching activity never fully stops, even at the height of summer, when French universities are officially closed. Online access allows researchers to keep working actively throughout the year.

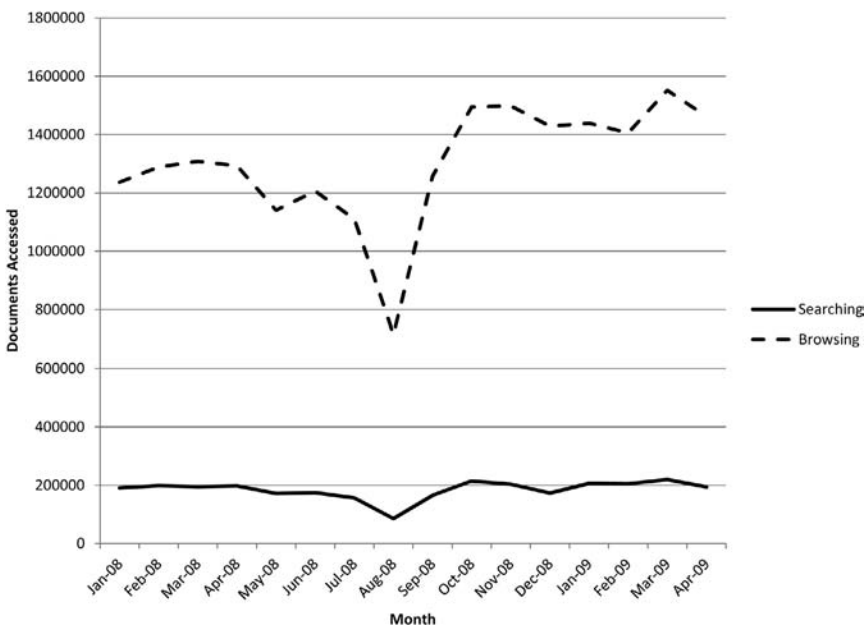


Figure 5: Search and browsing activity on ScienceDirect (January 2008–April 2009).

4.2 Continuous and recurrent access mechanisms

4.2.1 PDF, the researchers' format of choice

Studies of Anglo-Saxon populations have shown that PDF is the format that researchers prefer. The same can be said of STM researchers in the French academic network. *Journal Reports* data show that, on average, PDF versions of articles are downloaded 2.3 times more often than HTML versions. Our interviews confirmed this trend and found that the PDF format was systematically used for viewing, saving, printing, and storing. Further questioning revealed that researchers favoured the PDF format because it resembles the print format. A PDF is generated from the typeset version of an article, whose layout is familiar to the researchers and makes them more likely to read and print the document. When it comes to printing, PDF is clearly the format of choice. The tottering piles of printed articles observed on the researchers' desks are all the result of PDF printing.

The advantage of the PDF format is that it is more compact than other formats and therefore saves storage space and allows researchers to build article collections on their hard disks and USB flash drives. Researchers keep them for years and take them along when they travel.

We will add that when searching on ScienceDirect, several items are available for download: a PDF version of the article, an HTML version with links, the abstract, and the "Summary Plus," which contains the abstract and an overall presentation of the article, along with images, tables, and bibliographic references. However, the interface emphasizes the PDF icon, which might influence the user's choice while browsing. This fact, which has been mentioned previously (Ke et al. 2002), is worthy of further investigation through analyses of interface ergonomics, especially in a French context. The issue to explore is whether the behaviours we observed were induced by interfaces and ergonomics or if they were determined more by disciplinary contexts and the evolution of researchers' scientific communication and publishing traditions.

4.2.2 Average session length

We wanted to determine the average length of a session. Using the *Overview Reports* data, we were able to display the evolution of the average length of a session over 16 months between January 2008 and April 2009, as shown in [Figure 6](#) below.

It is interesting to note that this evolution is rather stable. Over the 16 months observed, the progression is rather minimal: Less than a minute was added to the average session length (from 7 minutes and 23 seconds in January 2008 to 8 minutes and 14 seconds in February 2009). One cannot really speak of an increase in session length especially since the figures for the last months in [Figure 6](#), which correspond to the researchers' most active months in the year, are relatively stable. In fact, the increase levelled off between the end of 2008 and the beginning of 2009.

One must take into account the definition of a session when looking at this progression. When does a session start and when does it end? What about

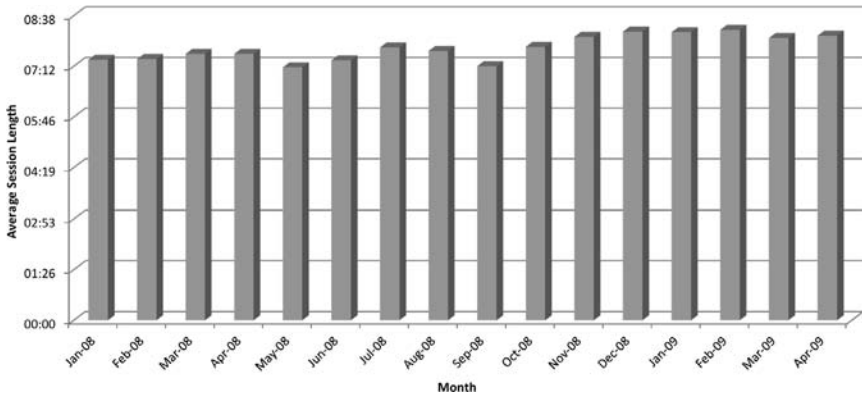


Figure 6: Average session lengths recorded on ScienceDirect (January 2008–April 2009).

inactive sessions that end by a “time out”? In light of these questions, the average length of a session should not be considered in isolation but as part of a trend. Additionally, the short length of the average session brings us back to what we covered in 4.1.1 and 4.1.2 above (access routes and sessions). With continuous and remote access to electronic resources, researchers can log on, and briefly and repetitively search for and display documents, which explains for the most part the short nature of these sessions. However, sessions increased regularly (see 4.1.2), as did searches; therefore, as a previous study showed (Nicholas, Clark, Rowlands, and Jamali 2009), short session length does not necessarily mean lesser search activity.

Nevertheless, such short sessions do not allow for many tasks. Our interviews revealed that, in fact, researchers used the printed version of the article for actual reading. The researchers often talked of on-screen reading but that most often meant skimming through the PDF—reading the abstract or a specific section of the article, most often the results section.

4.2.3 Bouncing to other links

Our interviews also revealed that researchers from all the disciplines covered would couple their ScienceDirect searches with searches on the Web of Science or Scopus depending on what they were authorized to access. They used the bibliometric functionalities of these databases to see how the identified, downloaded, and displayed article had been appropriated by the scientific community (e.g., the number of times, when, and by whom it had been cited). This approach was also used by researchers on the articles they themselves had written, though few of them would openly admit it. This information was used as additional criteria to determine an article’s relevance and therefore justify the time spent reading it. The article relevance varies according to the researcher’s intentions. One will either go along with the consensus and cite what the community has already cited or go against the consensus by citing what has never been or seldom been cited.

This “selection” step occurs before printing or saving on a disk. When explaining this step, researchers indicated that it was important in the context of their limited reading time. The tables, desks, and shelves chock-full of articles to be read helps explain that this approach is designed to limit the corpus to be read or browsed.

5. Discussion

This study gives an initial overview of the searching behaviour exhibited on ScienceDirect by scholars of academic STM libraries. The quantitative approach of the methodology enabled the identification and characterization of search volumes and broad searching trends while the qualitative approach made it possible to clarify the intention and nature of the search behaviours. A discussion of the results follows.

5.1 Methodological biases to be taken into account

First, it is important to point out some methodological biases and limitations of our study. Our study analysed a single platform, namely, Elsevier ScienceDirect. We could not obtain similar data (whether COUNTER compliant or not) from other publishers such as Springer or Wiley. Even though our study would be somewhat biased, we decided to use the data available to us while keeping in mind that we would compare them to data from other platforms as soon as they were available to us.

The data available to us did not allow for in-depth and complex analyses (e.g., deep log analysis) such as those performed by the CIBER team.¹¹ For example, we did not have precise data on the users' statuses. For technical reasons, these data are almost inexistent at this time. Even if we assume that the majority of users are researchers, some lesser proportion might nevertheless be another type of user, such as graduate students. Similarly, we could not obtain precise data on the nature of the displayed documents (e.g., whether they are research or review articles). This was overcome by the semi-directed interviews of the researchers that specified the behaviour related to each type of publication.

Our study targeted STM researchers; however, we were aware that, undoubtedly, the search activities of undergraduate and graduate students were included in the search statistics. Even though we thought that such activities were low, we were unable at the time to determine their proportion of the results.¹² This constituted a bias since the access to publisher platforms is open to any public at an institution. When browsing, undergraduate and graduate students might also download an online article.

Another bias was that our data covered a calendar year (2008) and not an academic year. As a result, the user population was not exactly the same for the period under examination. Whenever possible, data for the first four months of 2009 were also analysed to reduce the bias and lengthen the analysed period.

There was a time variance between the periods when the quantitative and qualitative data were collected in our study. The interviews took place between September 2008 and February 2009, while the collected data covered 2008 and

early 2009. Nevertheless, given the scale of the available electronic resources and the behaviour observations, this interval could not significantly bias the analysis.

5.2 Browsing versus searching

One of the most significant elements of our study is the browsing behaviour observed in researchers. Already mentioned in a similar study (Nicholas *et al.* 2008), this dimension was clearly confirmed by our study of the French academic environment. This behaviour can be explained either by the multiplicity of document access routes or by the important and growing use of search engines and publisher databases. When searching for information, researchers follow a path that takes them in turn from general search engines (Google) and collaborative encyclopedias (Wikipedia) to specialized search engines (Google Scholar), publisher databases (ScienceDirect in our case), or gateways and, finally, to bibliometric databases such as Web of Science or Scopus. Several of these steps can be combined. ScienceDirect becomes a leg of the information-seeking journey where the Web-browsing behaviour is replicated. Since researchers begin their searches by browsing Google, the platform indexed by Google becomes, through the links, a browsing space on the Web.

In the literature, this phenomenon is called “bouncing” and is the result of the combination of short session times, the great power of the search engines, and the multiple searching possibilities (Nicholas 2010). This concept is more specific than the concept of browsing. It is a clear example of new user behaviours designed to handle large volumes of information in an online environment where users try to find everything they need, including the elusive “gold nuggets.”

Bouncing also includes the concepts of reasoning and choice in the way the information is sought, namely, going from one source to another, one point to another according to well defined criteria and strategies. The issue of superficiality has also been raised, for example, in relation to users relying on superficiality to implement new knowledge acquisition structures. Superficiality in this sense means a specific kind of intelligence required to deal with “the speed at which we must absorb and react to information” (Dyens 2002, 213). It relies on synthetic rather than analytical approaches, and the hyperlink is its cornerstone.

There is an increase in the diversification of behaviours that enable identification and access to articles that are deemed to be relevant. When using the simple search mode, current awareness and alerting services, or citations, users develop a browsing behaviour acquired on the Web through the use of search engines.

5.3 Researchers' assessment of a corpus

This point, which is directly linked to the previous point, is an opportunity to go back over how users behave when faced with a complex scenario. Their reading time is limited, they have teaching and research workloads, they take on administrative and pedagogical responsibilities and, furthermore, they must regularly publish in publications accepted by their scholarly communities. The

larger the volumes of available scholarly literature, the less time there is for reading each piece of literature.

Faced with this information glut, users must make an efficient and relevant selection of the articles to be read. To do so, they will follow a reading strategy that takes advantage of bibliometric tools such as the Web of Science and Scopus. The content of the article then undergoes a second assessment. Namely, researchers will “position” the identified article in the corpus and find out how it “behaves” before deciding whether to read it. The decision to read the article will often depend on whether it is a review article, a research article, or something else.

The data we collected during interviews clearly show that this behaviour most often occurs among senior researchers who have scientific and administrative responsibilities and who concurrently play the roles of reader, author, and referee (Boukacem-Zeghmouri and Kamga 2008).

The main criteria for this assessment centre on the citations: by whom, how often, when, and where the article was cited. The objectives of this assessment are varied (teaching, research, assessment). We could say that this selection strategy is influenced by whether the visibility and originality of the articles is important to the researcher. In this approach, researchers might choose not to seek journals with the highest impact factor and instead search and read articles with few or no citations.

5.4 Reading to browse, browsing to assess

Examining the issue of information seeking and searching on a publisher platform such as ScienceDirect inevitably leads to the issue of the reading activity involved in the information seeking and browsing of the researchers we met. Our observations in the field, as well as the observations in recent research, showed that the reading issue is closely linked to information-seeking behaviours and, even more so, to the browsing behaviours which we identified. D. Nicholas noted that “it is thus impossible to isolate reading from navigating, people are reading as part of searching, not searching for reading” (Nicholas et al. 2008, 197).

Online reading in the context of a browsing activity does not have the same meaning as ordinary reading, which usually takes place at another time, that is, when the results retrieved through browsing are exploited. This “visualization” is an instrumental and utilitarian reading, however broken up, partial, rapid, skimmed through and—one might say—“surfed” it might be. It is subordinated to and put to the service of the more global and broader browsing behaviour. It is less a matter of absorbing knowledge than trying to decide on a selection. Nevertheless, the researchers we met explained that they felt they had better knowledge of the corpus related to their research topic and that they read “more” than before. The fact that this “reading”—which could more accurately be described as “viewing”—was associated with an important and regular browsing activity and that it acted as a “proxy” for reading certainly contributed to how the users felt.

6. Conclusion

This study, despite its biases and limitations, shows the new characteristics of the researchers' information behaviour. We are dealing with new ways of doing things born of a new context where a huge number of electronic resources can be accessed through different channels and multiple search possibilities.

These characteristics are not specific to French researchers. They have been identified in British and North American case studies, as we have previously mentioned. We can therefore say that French researchers' behaviours identified in this study are similar to the habits of their foreign colleagues. This also means that we are all faced with new generalized trends that extend beyond individual countries. They are induced by the Web, and users apply their Web-browsing activities to information search tools in general and to publisher platforms in particular. Publishers encourage this phenomenon through the functionalities they offer. Browsing becomes a structuring search mode since it constitutes a basic background against which more specific behaviours (related to various intentions and objectives) will take place. Related to this new form of usage, navigation and browsing will apply more specific behaviours that are done for a whole range of different objectives (reading, printing, saving, on-screen display, clicks on links, etc.).

Users judge the efficiency of this new strategy by the volume of information they handle during browsing, by the multiple spaces they visit (academic, professional, commercial, associative, etc.), and by the simultaneous performance of tasks. This gives them a feeling of proficiency and performance in their information seeking. However, the reading and analysis grids we had did not take into account these two logics, which constitute truly novel ways of doing things, and we were unable to account for them. Therefore, we had to analyse a truly new phenomenon with tools from a previous context that is starting to disappear.

Now, the issue is to verify whether this new way of appropriating scientific information leads to greater scientific output (in terms of produced items) or better scientific output (in terms of quality of publication places) or both—in other words, whether it makes for more productive users and has a greater impact on their respective scientific communities. A recent study conducted by the CIBER team in several British institutions seems to confirm that this new method does have a positive effect on research quantity and quality (Rowlands 2009). This type of study needs to be conducted in other disciplines to ascertain whether this hypothesis is true elsewhere. This will be the topic of an upcoming study.

Notes

1. ScienceDirect is an access platform of Elsevier, the largest commercial scientific publisher. This platform gives access to more than 2,500 full-text journal titles in all fields but with an emphasis on STM fields. ScienceDirect also offers access to 10,000 full-text books, book chapters, and reports. Today, the database offers approximately 10 million documents.
2. The term "researcher" includes pre-docs, PhDs and post-docs.
3. <http://www.doaj.org>.
4. <http://roar.eprints.org>.

5. <http://hal.archives-ouvertes.fr>.
6. See for example the Inter-University Medical Library (BIUM) of the Paris Descartes University: <http://www.bium.univ-paris5.fr>.
7. <http://www.crossref.org/>.
8. Data were available for 2007 so we were able to associate them with 2008 data to understand the evolution.
9. http://wokinfo.com/products_tools/multidisciplinary/webofscience/.
10. <http://www.info.sciverse.com/scopus/>.
11. <http://www.ucl.ac.uk/infostudies/research/> and <http://ciber-research.eu/>.
12. Some of the researchers we interviewed require that graduate students read some scientific articles.

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