EVALUATING THE USAGE AND IMPACT OF E-JOURNALS IN THE UK

INFORMATION USAGE AND SEEKING BEHAVIOUR SUBJECT AND INSTITUTIONAL PROFILES

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Table of Contents

List of Tables

1. INTRODUCTION

1.1 Aims

The main aim of the project was to establish what more than a decade of unprecedented digital access to journals for the UK research community has led to in the way of use and information seeking behaviour. Given the levels of diversity that have been established by previous deep log work (Nicholas et al, 2007a) this is clearly best conducted within subject groupings. The attractions of logs, of course, are that they can establish diversity on a very large scale and in minute detail. We believe that not only is this the first time that this has been undertaken for UK researchers, but it is also the largest study conducted ever conducted, anywhere in the world, and so represents something of a milestone in scholarly communication research.

This report essentially describes what occurs in e-journal scholarly environments and examines diversity in these environments. Possible explanations of this behaviour in terms of research performance, journal investment and other related factors can be found in the project's final report 'E-journals: their use, value and impact.'

1.2 Limitations

Of course, the analysis is based on just two journal databases – ScienceDirect and Oxford Journals. Therefore the logs we are dealing with will not furnish the whole record of the online activity connected with a particular research topic or problem as this would have entailed visits to a number of databases, in addition to the two covered in this report. However, in defence:

1) previous CIBER studies (Nicholas et al, 2008) show that journal use is a relatively restricted activity and that there is a marked preference for comprehensive, 'one-stop' shops, like ScienceDirect and PubMed;
2) these two databases are essential sources for researchers belonging to the case study subjects (thus the median impact factor for OUP journals was

2.8 in 2005 and the equivalent for Elsevier was 2.22 – figures only surpassed by Nature publishing);

3) we are comparing use and information seeking on a level playing field – a common publisher's platform;
4) a very large number of the world's top journals were covered (1395);
5) the intention is to follow up the log results with detailed questioning of the researchers whose digital footprints are the main feature of this report. Logs raise the questions that need to be asked and do not provide answers in themselves. Answers need to be obtained by interview and questionnaire.

1.3 Selecting the subject sample

It was not possible in the confines of the project to study all subjects, although the logs furnished by the publishers actually provided information for all subjects, and a few 'headline' analyses are in fact furnished for all-subjects (see Working Paper 3). In order to produce a systematic and realistic sample that would stand scrutiny a technique called `subject fingerprinting', which applies clustering techniques to large collections of scholarly behavioural and attitudinal data, was employed (for more details on the technique see Working Paper 1). A further consideration was that there was a need to select disciplines that mapped relatively easily on to existing research institutes and university departmental structures (for example, materials science may well be a coherent discipline in respect of the journal classifications but, in reality, work in this area can be found in chemistry, physics and engineering departments). Similarly, there was a need to select subjects that mapped well on to Thomson Scientific ISI subject classifications, which would enable comparisons with citation and publication outcomes.

Six subjects were selected as a result of the fingerprinting exercise: Life Sciences, Chemistry, Physics, Earth Sciences and Environmental sciences (shortened throughout the report to Earth Sciences), Economics and Econometrics (Economics), and History.

1.4 Defining 'subject' (user)

There are three main ways of extracting subject data from the logs:

1) asking the user what field or department they belonged to and then associating that with their log activity;

2) identifying a department or other organisational unit from log data and making an inferred subject classification;

3) by utilising the subject category of the journal used.

The first method is really only feasible where it is possible to identify a user with a log entry. This would require the user to access the service by means of a personal rather than institutional subscription, and also to access personal data. For these reasons this approach was not adopted. The second method is not reliable or stable below the level of a whole institution. The allocation of IP addresses at the institutional level is well documented and publicly available, but with regard to institutional sub-networks, unless the network topology and policies of the organisation are known, it is not possible identify either subjects or departments consistently and accurately from the logs. The IP address system was not intended for this purpose. Therefore the journal subject was used so what we were studying in essence was, for instance, the use of Physics journals by every department in the university. This was not only a much more straightforward solution; it also had the following additional attractions:

a) it took account of documentary scatter, whereby a good proportion of departmental publications appear in journals outside the subject of the researcher's home department because of widespread collaborative and problem-driven research;
b) it also takes account of the subject scatter of usage that has been observed in previous CIBER investigations. This scatter arises from the blurring of disciplines; partly for the reason stated above, that the nature of research is changing, partly as a result of the primacy of multi-disciplinary information platforms like ScienceDirect;
c) it provides additional value for the associated citation analysis. It was thus feasible, by using journal impact factor as the key metric, to profile and compare an institution's reading and publishing behaviour in a given subject.

Individual subject analyses are clearly influenced by the number of journals representing each subject and the box below shows relative journal populations. History is the only field which is represented by less than a 100 journals.

Table 1: Number of journals available for each subject on ScienceDirect and Oxford Journals

	Life sciences	Chemistry	Earth Sciences	Economics	Physics	History	Total
ScienceDirect	539	199	256	132	209	0	1334
Oxford Journals	31	0	0	19	0	11	61
Total	**570**	**199**	**256**	**151**	**209**	**11**	**1395**

1.5 Publisher platforms

Clearly ScienceDirect (SD) is a much, much bigger and more comprehensive resource than Oxford Journals and therefore to guarantee robust data most of the information seeking analyses has been conducted on the basis of ScienceDirect data only. Platform differences mean that making comparisons between the usage and information seeking might produce misleading and confusing data. Therefore we have used Oxford data carefully and sparingly, largely: a) to provide broad brush usage and information seeking comparisons with ScienceDirect data; b) provide coverage of History (a subject not covered by SD); c) to provide an analysis of usage over a full year in order to observe changes in usage and information seeking behaviour.

1.6 Types of analyses conducted

The subject usage and information seeking behaviour portraits furnished throughout this report have three main components to them:

1. *Usage or activity levels*
    i. As measured in terms of page views, full-text views (PDF, HTML), sessions conducted and time online;
    ii. Patterns of usage (use over time – time of day, day of the week, month of the year);

2. *Information seeking behaviour (session data)*
    i. Methods of access and navigational preferences
        - Gateways, referrer links, Google, Google scholar, PubMed;
        - Menu use (table of contents etc), advanced/basic search, citation downloading and linking (see Appendix 1 for definition of the latter)
    ii. Content viewed
        - Volume – page and article views in a session, number of different journals viewed in a session
        - Form - abstracts
        - Age of articles used and use of articles in press (i.e. accepted manuscripts, uncorrected proofs and corrected proofs);
        - Impact Factor of journals viewed. As determined by the ISI impact factor of the journals viewed in a session averaged over sessions.
        - Relative Impact Factor. Average impact factor of the journals viewed divided by the average impact factor of all journals in that category. Thus a value of 1 would mean they read average journals, less than 1 that they read low impact materials. This would normalise for otherwise big differences in practice between subjects.
3. *Journal titles used*
    i. name, number, rank, overlap and concentration of use (use accounted for by top 5, 25 and 50% of journals)

The definitions used in regard to the metrics and terms used above can be found in Appendix 1.

In all, each information profile contains about two dozen individual elements, the most detailed subject profiles ever produced for scholars and researchers and this is usually presented in 9 easy-to-view tables for each subject. The whole

purpose of the profiles is to throw light upon how people behave in their virtual scholarly environments. We need this information before we can start asking sensible questions about why they behave in the way they do, an important goal of the longer-term investigation.

We have not been able to relate the usage and information seeking behaviour to user demographics other than by subject (of journal used) because IP identification does not enable this in the case of our institutions; nor was it been possible to identify the numbers of researchers working in a case study field in a particular institution. Hopefully this data should be forthcoming from the second phase of the study and can then be factored into the analyses presented here.

1.7 Period covered

For ScienceDirect 4 months worth of data was analysed (January to April 2007). In the case Oxford Journals, because the number of journals (and transaction files) was much smaller it proved possible to undertake an analysis for the full year (January to December 2007) in order to study changes in usage and behaviour over time. This enabled us to investigate the research usage and information seeking rhythms of the year more comprehensively. In both cases the data capture was of an order that is almost hard to believe. Thus for ScienceDirect half a million sessions were analysed, and for Oxford Journals the figure was a quarter of a million. Three quarters of a million sessions or visits provides a very large and powerful evidence base.

The results of this analysis are structured first by the database studied (ScienceDirect, Oxford Journals); then within each database a cross-subject comparison is presented, although fewer analyses are provided for Oxford Journals as previously mentioned. This in turn is followed by an examination of institutional diversity within individual case study subject, in the case of Oxford just for History.

1.8 Case study institutions

The following ten institutions were selected for investigation: 1) Centre for Ecology and Hydrology - CEH; 2) Rothamsted Research (Agricultural Research Centre); 3) University College London; 4) University of Aberdeen; 5) University of Bangor; 6) University of Cambridge; 7) University of Edinburgh; 8) University of Manchester; 9) University of Strathclyde; 10) University of Swansea.

2. SCIENCEDIRECT

The logs of ScienceDirect for 10 institutions and 5 subjects over a four month period, January to April 2007 were analysed. During that period half a million (507,924) sessions were conducted across the institutions and subjects, a million and a half (1,507,864) pages viewed and not far off a million (892,359) full-text articles downloaded. These impressive figures conclusively demonstrate the enormous value of the journal resource to researchers and scholars. After all they have a choice and they have exercised that choice in favour of e-journals and ScienceDirect. One thousand, three hundred and thirty-five ScienceDirect journal titles fell within the confines of our investigation. The figures for the individual subjects were as follows: Life sciences (539), Earth and environmental sciences (256), Physics (209), Chemistry (199) and Economics (132). History was not represented on ScienceDirect and is therefore not featured in this analysis, but is for Oxford Journals (see Section 3.0).

2.1 Subject comparisons

For the sake of brevity and to reduce duplication in what is a substantial report anyway a full explanation of the value and significance of each metric and information seeking characteristic is provided in this section only. The sections that follow just provide the key findings.

2.1.1 Usage profiles

There is no single 'right' or 'accurate' measure of use and a variety of metrics are utilised to provide a comprehensive and robust picture: 1) page views, which is basically a general and crude activity indicator covering searching, browsing,

navigating and viewing/reading; 2) full-text views, which is a consumption indicator and one that points more closely to satisfaction and positive outcome; 3) PDF views, a metric which, possibly, points more accurately to relevance and satisfaction, as people often view first in HTML and only if they like what the see then view or download in PDF; 4) sessions or visits conducted, the vehicle for all information seeking behaviour analyses; 5) page views per session (site penetration), which can be viewed as a 'busyness' metric; 6) time spent online, either viewing a page or on a session, which serves as a possible interest metric.

Table 2 provides an overview of the key usage metrics. The key findings are:

- Life Sciences has a huge literature and it is a very big user of it;
- While levels of use are generally related to the number of journals available, even allowing for this, both Life Sciences and Physics punch above their weight. This might constitute an argument, on the face of it, for greater library provision and / or open access for Life Sciences and Physics titles;
- Life Sciences accounted for half of the full-text views recorded by the five case study subjects. It has a big literature so no real surprises here;
- Life Sciences sessions are about half the duration of every other subject field. This can partly be put down to the large number of gateway accesses (via PubMed for instance). However Physics has almost as many accesses, and its sessions are almost twice as long;
- In Life Sciences articles tend to be viewed in HTML, while in Earth sciences and Economics the very opposite was true
- The biggest users were generally the fastest searchers – a very significant finding;
- The importance of using more than one measure to evaluate use is well demonstrated by the case of Life Sciences, which accounted for 46% of page views, 50% of full-text views, 41% of PDFs and 53% of sessions.

Table 2: Summary of key subject usage metrics

Subject	Total page views[1]		Total full-text views[2]		Total HTML views		Total PDF views		Sessions			Journal sample	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*Ave. in secs*	*N*	*%*	*N*	*%*
Life sciences	602340	44	372900	46	205751	56	167149	38	68	229986	50	539	40
Chemistry	208706	15	115314	14	43849	12	71465	16	105	65988	14	199	15
Earth Sci	276684	20	155406	19	56799	16	98607	22	192	72566	16	256	19
Economics	120167	9	50858	6	10888	3	39970	9	149	29626	6	132	10
Physics	170473	12	108458	14	46990	13	61468	14	126	57861	13	209	16
All case study subjects	1378370	100	372900	46	364277	100	438659	100	95	456027	100	1330	100

Usage over time

- There was little variation in use from month to month for the case study subjects, which suggests that student use was not a significant factor here, which confirms what Elsevier told us at the beginning of the study. Table 3 refers. Oxford Journal data in fact tells us later on that the period January to April is less volatile than the rest of the year.

[1] All page view counts include views to abstracts, an article or a menu (e.g. table of contents).

[2] Because of duplicate PDF and HTML views totals will add up to more than total article views.

- In terms of day of the week, use was very even from Mondays to Thursdays; it fell a little on Friday and then dropped to around a third of weekday use over the weekends. Nevertheless weekends accounted for about 15% of ScienceDirect use. Table 4 refers.
- Economists were the most active over a weekend with about 17% of their use occurring then. This compares to just 10% of use for Chemists
- The most popular period of the day to use ScienceDirect was between 12 and 2pm, when 28% of all use occurred (Table 5). Nearly a quarter (24%) of use occurred outside the traditional 9-5 working day, and it is Economists who were most likely to use the service 'out of hours', with 30% of their use being recorded then. Economists can work independently of laboratories and thus are probably able to work more easily away from the office.

Table 3: Use over time (monthly percentage of page views)

		January	February	March	April

Life Sciences	%	25	25	27	22
Chemistry	%	25	25	27	23
Earth sciences	%	24	27	27	22
Economics	%	22	25	27	26
Physics	%	24	24	27	25
All case study subjects	%	24	25	27	23

Table 4: Use over time: (average day of the week percentage page views)

		Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Life Sciences	%	19	18	18	17	15	5	7
Chemistry	%	19	18	19	18	16	4	6
Earth sciences	%	19	18	17	18	15	6	8
Economics	%	17	17	18	16	14	8	9
Physics	%	18	19	18	18	16	5	7
All case study subjects	%	19	18	18	17	15	6	7

Table 5: Use over time (average hourly page views)

		12-5am[3]	**6-8am**	**9-11am**	**12-2pm**	**3-5pm**	**6-8pm**	**9-11 pm**
Life	*N*	15737	20240	139245	170665	157843	63295	35315

[3] This includes times up to 5.59 and this rule is the same for each time band

Sciences	%	2.6	3.4	23.1	28.3	26.2	10.5	5.9
Chemistry	*N*	5990	7965	49464	59409	55852	19661	10365
	%	2.9	3.8	23.7	28.5	26.8	9.4	5
Earth Sciences	*N*	8864	9520	62878	77122	71259	29733	17308
	%	3.2	3.4	22.7	27.9	25.8	10.7	6.3
Economics	*N*	7587	4024	21693	29503	29470	15891	11999
	%	6.3	3.3	18.1	24.6	24.5	13.2	10
Physics	*N*	6428	8207	39182	47187	44137	16875	8457
	%	3.8	4.8	23	27.7	25.9	9.9	5
All case study subjects	*N*	44606	49956	312462	383886	358561	145455	83444
	%	3.2	3.6	22.7	27.9	26.0	10.6	6.1

2.1.2 Information seeking behaviour (session data)

Logs provide a comprehensive and detailed view of how researchers access a site and, once there, how they navigate around it. In this regard they provide us with three types of information: a) where they were and what they might have been doing prior to arriving at ScienceDirect, something which enhances our knowledge of the broader Web session of which the ScienceDirect search might have been a part; b) where they actually arrived in the site and what kind of view of the ScienceDirect content they obtained as a consequence, something which might influence what they use; c) on searching and navigating styles (browsing v searching).

2.1.2.1 Method of access

Users arrive at ScienceDirect via a wide variety of routes (see Table 6). They may come by way of a 'gateway' site[4] and, if so, access ScienceDirect articles (occasionally abstracts) directly by activating a link, bypassing homepages, menus and (sometimes) abstracts. Thus anyone accessing the ScienceDirect via a gateway site will have done some of their searching and navigating in the gateway site and arrive at ScienceDirect largely to pick-up content. Therefore, for a high percentage of 'users' – 56% in the case of ScienceDirect - we shall only capture a proportion of the Web search session connected with a particular research query. Page views, site penetration and session time are going to be the metrics most affected. Because of this the information profile for each subject and institution includes levels of gateway use.

PubMed is perhaps the best known example of a gateway site and we have highlighted its use in the subject descriptions. Users may also have come in via a citation link within an e-journal, for example, Scirus[5], CASChemPort[6], Web of Science and Cell Press[7] provide such links. Further, people may have linked via ExLibrisSFX and CrossRef, which are electronic service linking online library resources together by providing hyperlinks to articles from references and abstracts. Indeed, Google, too, can be thought of as a gateway and because of its enormous popularity and the fact that ScienceDirect opened up its site to Google indexing in 2007 it has been featured in the subject descriptions.

Researchers may also arrive via a referrer link and in these cases they are taken to the site, rather than a document; meaning they are one or two links away from content, as would be people using a bookmark or Googling for ScienceDirect. In the main these links are from library or university pages and there are hundreds

[4] See Appendix 1 for a definition

[5] www.scirus.com

[6] www.chemport.org

[7] www.cellpress.com

of them. 22% of sessions arose from such a referral. A minority of users, less than one in five only used menus (tables of contents, title and subject lists) to navigate towards content; however we cannot be sure from the logs how this group accessed the site.

Table 6: Method of access and navigation (sessions)

		Method of access					Form of navigation			
Subject		**All gateway access[8]**	**Google access[9]**	**Google scholar**	**PubMed access**	**Athens access**	**Menu use**	**Advanced search**	**Basic search**	**Citation function[10]**
Life Sciences	*N*	149021	1378	123	52183	8807	77581	350	3472	6860
	%[11]	64.80	0.80	0.10	30.70	5.20	33.70	0.20	1.50	3.00
Chemistry	*N*	31963	4060	380	1919	2477	35032	183	2800	2084
	%	48.40	9.40	0.90	4.50	5.70	53.10	0.30	4.20	3.20

[8]Gateway access here (and in similar tables following) included Google and Google Scholar access, PubMed access and other forms of gateway use.

[9] Note that low levels of Google access are due to the fact that Elsevier only started opening the site to Google indexing during the period of investigation.

[10] Citation here includes citation exports and linking (see Appendix 1 for a full definition.

[11] Percentages are based on all sessions featuring this form of access and navigation for the subject

Earth Sciences	*N*	29924	5353	948	1302	3597	41833	172	3032	2670
	%	41.20	11.60	2.10	2.80	7.80	57.60	0.20	4.20	3.70
Economics	*N*	5579	369	30	46	2320	19353	60	915	733
	%	18.80	1.80	0.10	0.20	11.00	65.30	0.20	3.10	2.50
Physics	*N*	33487	14655	1424	264	2184	24988	125	2714	1955
	%	57.90	35.60	3.50	0.60	5.30	43.20	0.20	4.70	3.40
All case study subjects	*N*	249974	25815	2905	55714	19385	198787	890	12933	14302
	%	55.70	8.10	0.90	18.10	5.80	41.80	0.20	2.30	3.00

Gateway access (all gateways)

Gateway is a broad term used by Elsevier to denote everyone who jumped straight into content, rather than coming to a homepage, table of contents etc. The term is more generally used to denote third-party sites like PubMed. Hence we have separated out PubMed for analysis. For most fields gateway access accounts for around half of all accesses, but there are huge differences between subjects here, as one might probably expect. In the case of Life Sciences nearly two thirds of the traffic to ScienceDirect came via gateways, and this compares to just 19% for Economics, where there are clearly not as many or simply not used.

As mentioned previously this will inevitably mean we will not have captured all of the information seeking behaviour that was associated with the query that prompted the visit. This shows up in shorter session times, lower use of menus and smaller number of pages viewed for subjects that make extensive use of gateways, although, interestingly, it does not impact too much on abstract viewing. We had thought of just looking at non-gateway traffic to see how differently this was from non-gateway traffic but in the end thought this would not be a good idea at this stage in the project as it is possible that people who opt to search purely within ScienceDirect might be a different type of user altogether

and only the follow-up qualitative study would tell us whether this was true or not.

Google and Google Scholar

- Google access was artificially low because ScienceDirect only opened its contents to Google during 2007. For the period surveyed 324 journals were opened up to Google indexing. Of these journals 107 belonged to case study subjects: 58 in Physics, 22 in Life sciences, 16 in Earth sciences and 11 in Chemistry. This has clearly impacted upon the number of Google searches for each subject. Thus 36% of sessions arose from a Google search in Physics, whereas the equivalent figure for Economics was less than 2%. The Google traffic is not necessarily new traffic, probably just people finding the Google search a better method of location.
- GoogleScholar sends little traffic ScienceDirect's way, except in Physics, where 3% of sessions originate from GoogleScholar, however even this is a relatively low figure.

PubMed

- As might be expected it is in the Life sciences that PubMed has a real impact, with around one-third of traffic coming into the site via this route.

Athens

- Athens is not a gateway but an authentication system that allows users off-site to obtain the same kind of access to services as they obtain on site, courtesy of IP identification. Athens use is thus a pointer to off-site use and there is also a sense that Athens users are advanced users because they have to try a bit harder to access the service. Around 8% of all users came in via an Athens account, but this figure was half that again in the case of Economics (12%). This might be explained by Economists preference to search from home, which we shall discover later in this section.

2.1.2.2 Navigation

- The use of the advanced search was universally low, being utilised in less than 0.4 sessions conducted. In fact the bare numbers tell a more potent story: in the case of Physics the advanced search was called upon only 135 times by thousands of researchers in 11 institutions over a period of four months. This is probably due to a combination of factors - speed of searching, gateway use (where much of searching is conducted off-site) and the fact that researchers knew what they were looking for. However, if the researchers are not using the facility can we really make the assumption that teaching colleagues and students are? Table 6 refers.
- While the basic search facility was used more, it was still relatively lightly used. Even in the case of the subject that used it the most (Physics) it was used in less than one in twenty sessions. Furthermore, we cannot put this wholly down to gateway use as Economics, a subject with low gateway use, demonstrates even lower levels of basic searching – just one in thirty sessions saw the facility being used. Low levels of use of internal search engines have been found elsewhere by CIBER; it appears that while researchers use web search engines with alacrity, this does not translate into the use of their less effective (or well known) internal cousins.
- In regard to browsing and searching the data shows that viewing menus (tables of content, lists of journals etc) were by far the most popular means of navigating toward content, between one third (Life Sciences) and two-thirds (Economics) of sessions recorded a view to a menu.
- The citation function was employed the most in the Earth Sciences, nearly one in twenty sessions saw the facility being used.

2.1.2.3 Content viewed

- There were clear differences between subjects in regard to 'busyness' or amount of activity associated with a session. Thus, in terms of the number of pages viewed, Life Sciences recorded just two a session (probably the gateway influence at work again) and Economics recorded twice that

(nearly 4). Life Sciences also viewed the fewest articles and journals in a session (respectively 1.4 and 1.1), with Earth sciences recording the most (1.8 and 1.4).

- There were considerable differences in abstract viewing, with nearly one in three Economics' sessions recording an abstract view as compared to a figure of one in five for Life Sciences (again, the latter figure is probably explained by the influence of gateway searching).
- Life Sciences viewed the most recent articles, with an average age of 862 days (about 2.4 years old) and Economists the oldest, 1648 days or 4.5 years.
- Use of email alerts was at a very low level (0.1% of sessions saw them used) but the viewing of articles in press (AIPs), a possibly currency indicator, proved more popular, especially with Physicists – 9.5% of their sessions saw AIPs viewed. True to form Economics, the sole social science, which also viewed the oldest articles, used AIPs the least (in 5.9% of sessions).
- In terms of rank of journals viewed (as measured by ISI impact factor), on average Life scientists viewed higher ranked ones (average impact factor 4.92), but this might well be a reflection of the higher scores of journals that is prevalent in this field. Earth sciences saw the lowest ranked journals viewed (1.18). It can be dangerous comparing across subject and therefore the data have been normalized the data for better comparison. Thus according to relative impact factor Physics viewed the lowest ranked journals and Earth sciences the highest.

Table 7: Content viewed (sessions)

Subject	Volume			Form	Age/currency			Impact	
	Ave. no. of pages viewed	*Ave. no. of articles viewed*	*Ave. no. of journals viewed*	*% viewing an abstract*	*Ave. age of article viewed (days)*	*Alerts %*	*% viewing an AIP*	*Ave. impact factor of journal viewed*	*Relative impact factor*
Life Sciences	2.1	1.5	1.2	19.30	859	0.1	7.1	4.4	1.15
Chemistry	3.6	1.9	1.5	23.30	1176	0.1	8.2	2.5	1.15

Earth Sciences	3.8	2.0	1.5	22.50	1078	0.1	9.3	2.1	1.17
Economics	3.9	1.5	1.2	30.20	1552	0.1	5.9	1.4	1.24
Physics	2.6	1.7	1.4	20.10	1157	0.1	7.4	1.6	0.97
All case study subjects	2.4	1.5	1.2	20.30	1022	0.1	6.7	2.9	

2.1.3 Journals used

- The highest concentration of article use was found in Economics, the sole social science subject, where nearly 47% of use was accounted for by just 5% of the journals. By marked contrast the equivalent figure for Physics was nearly 27%.
- The highest number of unique journal titles was viewed in Life Sciences, which of course had the most journals in the first place (539).
- Almost every journal in a subject field was used, 97% in the case of Earth Sciences and 100% in the case of Economics. This supports the OhioLINK data which also showed that even in the case of the biggest of the big deals all journals end up being used.

Table 8: Journal title use and scatter

Subject	**Scatter[12]**			**Unique journals viewed**	**As a proportion of all case study journals available**
	Top 5% of journals viewed account for % use	Top 25% of journals viewed account for % use	Top 50% of journals viewed account for % use	*N*	%
Life Sciences	41.1	78.6	94.7	531	99
Chemistry	41.5	79.7	95.6	196	98

[12] Based on unique session views; thus multiple views to the same journal not counted

Earth Sciences	31.6	75.2	94.2	248	97
Economics	49.6	85.3	96.8	132	100
Physics	28.6	75.6	95.4	204	98

Table 9 lists the top ranked journals, by page views for all five fields.

Table 9: Top twenty journals

Rank	Life Sciences	Chemistry	Earth Sciences	Economics	Physics
1	Cell	Tetrahedron Letters	Earth & Planetary Science Letters	World Development	Materials Science & Engineering: A
2	current biology	Tetrahedron	Quaternary Science Reviews	Jrnl of Financial Economics	Thin Solid Films
3	Jrnl of Molecular Biology	Biomaterials	Biological Conservation	Research Policy	Surface & Coatings Technology
4	Biochemical & Biophysical Research Communications	Polymer	Ecological Economics	Jrnl of Econometrics	Jrnl of Materials Processing Technology
5	Trends in Ecology & Evolution	Chemical Physics Letters	Geochimica et Cosmochimica Acta	Jrnl of Banking & Finance	Acta Materialia
6	Developmental Biology	Jrnl of Chromatography A	Energy Policy	Jrnl of Development Economics	Jrnl of Sound & Vibration
7	Animal Behaviour	Jrnl of Organometallic Chemistry	Science of The Total Environment	Management Accounting Research	Physica D: Nonlinear Phenomena
8	FEBS Letters	Chemical Engineering Science	Jrnl of Hydrology	Jrnl of Monetary Economics	Jrnl of Magnetism & Magnetic Materials
9	Forensic Science Int.	Surface Science	Jrnl of Volcanology & Geothermal Research	Jrnl of Public Economics	Jrnl of Computational Physics
10	molecular cell	Jrnl of Colloid & Interface Science	Palaeogeography Palaeoclimatology Palaeoecology	European Economic Review	Physica B+C
11	Trends in Genetics	Tetrahedron: Asymmetry	Forest Ecology & Management	Critical Perspectives on Accounting	International Jrnl of Radiation Oncology*Biology*Physics
12	Analytical Biochemistry	Trends in Biotechnology	Atmospheric Environment	Jrnl of Accounting & Economics	Scripta Materialia
13	Current Opinion in Cell Biology	International Jrnl of Heat & Mass Transfer	Environmental Pollution	Jrnl of Economic Theory	Physica A: Statistical Mechanics & its Applications
14	Trends in Biochemical Sciences	Inorganica Chimica Acta	Marine Geology	Jrnl of Environmental Economics &	Jrnl of NonCrystalline Solids

				Management	
15	development cell	Analytica Chimica Acta	Renewable Energy	Jrnl of Int. Economics	Nuclear Instruments & Methods in Physics Research Section A: Acce
16	Jrnl of Allergy & Clinical Immunology	Jrnl of Catalysis	Estuarine Coastal & Shelf Science	Economics Letters	Applied Surface Science
17	Vaccine	Electrochimica Acta	Chemosphere	Jrnl of Health Economics	Carbon
18	Trends in Cell Biology	Jrnl of Membrane Science	Jrnl of Rural Studies	Jrnl of Economic Behavior & Organization	Jrnl of Crystal Growth
19	Bioorganic & Medicinal Chemistry Letters	Combustion & Flame	Marine Pollution Bulletin	Int. Jrnl of Production Economics	Physics Letters B
20	Current Opinion in Genetics & Development	Polyhedron	Geomorphology	Explorations in Economic History	Corrosion Science

Subject profile differences

Life Sciences and Economics have the most distinctive profiles, the former probably because of the influence of PubMed and the latter because it is a social science

2.2 Institutional differences

In making comparisons between institutions a number of factors need to be borne in mind: institutional type, size, status and type of journal user – defined by modified COUNTER data (Table 10); subject research performance (Table 11); and access arrangements to ScienceDirect.

General institutional background

To help with comparisons institutions have been categorized according to status, size, usage and world ranking (Table 10).

Table 10: Case study institutional backgrounds

Institution	Status (SCONUL classification)	Size (Academic FTEs) Small 1-1500 Medium 1501-3000 Large 3001+	Usage (CIBER/COUNTER classification)	THE world university ranking
Aberdeen	Old university (excl. Russell Group)	Small	High user	153
Bangor	Old university (excl. Russell Group)	Small	Moderate user	n/a
Cambridge	Russell Group university	Large	Super user	3
CEH (Centre for Ecology & Hydrology)	Government research laboratory	Small	n/a	n/a
Edinburgh	Russell Group university	Medium	Super user	23
Manchester	Russell Group university	Large	Super user	29
Rothamsted Research	Government research laboratory	Small	n/a	n/a

Strathclyde	Old university (excl. Russell Group)	Small	High user	n/a
Swansea	Old university (excl. Russell Group)	Small	Moderate user	n/a
UCL	Russell Group university	Large	Super user	7

Research performance

The format for the data in this table (reading from right to left) is as follows:

- the 2001 grading (e.g. 5*, 3a)
- the proportion of staff selected
- the total number of Category A and A* research active staff (FTEs in brackets)

Table 11: Performance of case study institutions in the 2001 RAE

	Biological Sciences (UoA 14)	**Chemistry (UoA 18)**	**Physics (UoA 19)**	**Earth Sciences (UoA 20)**	**Environmental Sciences (UoA 21)**	**Economics and Econometrics (UoA 38)**	**History (UoA 59)**
Aberdeen	5 C (19.0)	3a C (13.2)	-	4 C (14.2)	-	3a A (16.0)	4 B (21.0)
Bangor	4 A (29.3)	3a A (12.3)	-	-	4 A (34.0)	-	4 B (13.0)
Cambridge	Biochemistry 5* A (41.0); Genetics 5 B (30.3); Plant sciences 5 B (19.5); Zoology 5* A (58.4); Biotechnology 5 A (5.0)	5* A (68.0)	5* A (138.9)	5* A (56.7)	-	5 B (44.9)	5* A (81.2)
Edinburgh	5 A (153.2)	5 A (43.0)	5 B (64.8)	5 A (52.7)	-	4 B (13.0)	5 B (42.8)
Manchester	5* B	5 B (32.2)	5 A (59.0)	5 B (26.6)	-	4 B (34.0)	5 B (40.5)4
Strathclyde	-	4 A (43.0)	4 A (45.7)	-	-	4 C (18.0)	4 B (16.0)
Swansea	3a A (36.0)	4 A (12.0)	5 A (11.6)	-	-	4 A (16.0)	4 A (20.0)
UCL	Biochemistry 5 B (47.4) Life Sciences 5 B (39.0)	5* B (31.8)	5 B (84.4)	5 B (33.3)	-	5* A (30.5)	5 A (32.0)
CEH	-n/a	-	-	-	-	-	-
Rothamsted	-n/a	-	-	-	-	-	-

Type of Big Deal

There are a number of deals available by which Libraries can access ScienceDirect titles and these deals largely determine what researchers can view and use for free. All of the institutions subscribed to the Freedom deal by which they were provided with access to 2055 journals. Some had extra access arrangements, but not significant enough to impact on the data.

University v Government laboratory

The work of Government laboratories have largely been overlooked in regard to their information usage and seeking and hence their inclusion in this study. They are quite different in that they are generally smaller in overall user size (although they might boast significant number of researchers in specific fields) and also they are much narrower in their subject focus. Access arrangements to facilities might also be different and this needs further investigation.

2.2 Life Sciences

2.2.1 Usage profiles

- The high volume institutions in the field were Cambridge, Manchester (both boasting 5* departments) and UCL. Cambridge ranked first in the case of all the usage metrics - 20% of page viewed, 21% of PDF articles viewed and nearly 20% of sessions conducted. These data will be related to research status, as measured by Hirsch, in the final report.
- The heaviest users were however not the fastest users, in fact the very opposite was true, with Cambridge recording the shortest sessions (74 seconds) and Bangor the longest (293 seconds). As was the case with the Ohio study research-intensive institutions were characterised by short session times (Nicholas et al, 2007b), probably because their users know precisely what they want and use gateway sites where their searching is undertaken. As we shall discover later Cambridge researchers employed gateways most and Bangor the least.

Table 12: Summary of key Life Sciences usage metrics

Institution	Total page views		Total full-text views		Total HTML views		Total PDF views		Session numbers		Session time
	N	*%*	*N*	*%*	*n*	*%*	*N*	*%*	*N*	*%*	*Ave. in seconds*
Aberdeen	47030	7	28947	7	14748	6	14199	6	15322	5.7	154
Bangor	25118	4	13533	3	5188	2	8345	3	7255	2.7	293
Cambridge	140243	20	92565	21	55340	23	37225	21	56271	20.9	74
Edinburgh	100134	14	57867	13	31212	13	26655	13	37483	13.9	81
Manchester	124225	18	82560	19	45098	19	37462	19	48817	18.2	84
Strathclyde	23907	3	15453	3	6958	3	8495	3	7834	2.9	272
Swansea	13427	2	8427	2	3764	2	4663	2	4371	1.6	281
UCL	114998	16	67628	15	40474	17	27154	15	46622	17.3	61
CEH	4424	1	1795	0	595	0	1200	0	1306	.5	122
Rothamsted	8834	1	4125	1	2457	1	1751	1	3032	1.1	89

Usage over time

- While there was little monthly variation in use at the broad subject level there was more variation at the institutional level. Manchester showed the greatest variation in monthly use, with a low of 22% in April and high of 31% in March (a 9% variation), the Easter vacation partly explaining this no doubt. In contrast, there was only a 3% difference between the highest and lowest months in the case of Aberdeen. (Table 13)
- However, where the real big differences emerged were in weekly patterns of use. Users in universities and government laboratories behaved very differently, especially in regard to weekend searching. Typically, 14-15% of ScienceDirect use took place on a weekend in the case of universities, but in

the case of the laboratories, it was less than half of that. Indeed, for CEH, it was only 1%. (Table 14).

- When it came to time of day when use occurred, CEH again stood out with virtually no use occurring in the night or early morning. By contrast 13% of Strathclyde searching was undertaken then. Indeed, it appears that Scottish researchers generally search well into the night. (Table 15).

Table 13: Use over time (monthly percentage of page views)

		Jan	Feb	Mar	Apr
Aberdeen	%	23	26	26	25
Bangor	%	23	24	29	25
Cambridge	%	28	26	26	21
Edinburgh	%	25	28	25	22
Manchester	%	23	24	31	22
Strathclyde	%	23	28	29	20
Swansea	%	21	25	30	23
UCL	%	27	24	27	22
CEH	%	27	26	27	20
Rothamsted	%	27	26	25	22

Table 14: Use over time: (average day of the week percentage page views)

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

Aberdeen	%	19	17	18	16	15	7	8
Bangor	%	17	16	18	19	15	6	8
Cambridge	%	19	18	17	17	16	6	7
Edinburgh	%	19	18	18	17	15	6	8
Manchester	%	18	19	18	18	15	5	7
Strathclyde	%	18	17	19	17	15	6	8
Swansea	%	19	17	16	19	16	6	8
UCL	%	19	19	18	18	15	5	6
CEH	%	22	20	22	18	17	0	1
Rothamsted	%	20	21	19	17	17	3	3

Table 15: Use over time (average hourly page views)

		12-5am	6-8am	9-11am	12-2pm	3-5pm	6-8pm	9-11 pm
Aberdeen	*N*	914	1525	10836	13850	12282	5230	2393
	%	1.9	3.2	23.0	29.4	26.1	11.1	5.1
Bangor	*N*	960	770	5174	6972	6446	3142	1654
	%	3.8	3.1	20.6	27.8	25.7	12.5	6.6
Cambridge	*N*	2930	4446	32072	37430	38721	16025	8619
	%	2.1	3.2	22.9	26.7	27.6	11.4	6.1
Edinburgh	*N*	2052	3007	24078	29772	25912	10011	5302
	%	2.0	3.0	24.0	29.7	25.9	10.0	5.3
Manchester	*N*	4427	4730	29225	36062	29930	11873	7978
	%	3.6	3.8	23.5	29.0	24.1	9.6	6.4
Strathclyde	*N*	994	876	5376	6280	5607	2790	1984
	%	4.2	3.7	22.5	26.3	23.5	11.7	8.3
Swansea	*N*	173	446	3281	4108	3223	341	855
	%	1.3	3.3	24.4	30.6	24.0	10.0	6.4
UCL	*N*	2889	3653	25110	32596	31942	12383	6425

	%	2.5	3.2	21.8	28.3	27.8	10.8	5.6
CEH	*N*	0	354	1507	1390	1052	115	5
	%	0	8.0	34.1	31.4	23.8	2.6	0.1
Rothamsted	*N*	398	433	2586	2205	2728	384	100
	%	4.5	4.9	29.3	25.0	30.9	4.3	1.1

2.2.2 Information seeking behaviour (session data)

2.2.2.1 Method of access

- Cambridge researchers made most use of gateways, with nearly three-quarters accessing ScienceDirect by this route, and Bangor researchers the least with less than half of them using gateways.
- Only a small percentage (4%) of Life Sciences titles was available to Google searchers during the survey period, so traffic levels are bound to be low, and they were. Swansea researchers used Google and GoogleScholar the most to access ScienceDirect Life Sciences content. Nearly 4% of their sessions originated from a Google search and 3% from a GoogleScholar search.
- UCL and Cambridge users showed a strong preference for PubMed searching, with more than one third of users entering via ScienceDirect. Cambridge and UCL have medical schools and that will predispose them to using PubMed. PubMed would not have the same attraction for marine biologists or people studying fungi. The lesson for a Phase II of the investigation is to recognise that the Life sciences are a very, very broad church and focus in on more narrowly focused and balanced subject groups. The differences between a plant taxonomist at Kew and someone researching gene splicing / stem cells must be profound. Bangor recorded the lowest level of use; just 6.4% of sessions came by way of PubMed.
- One in five Strathclyde researchers accessed ScienceDirect via an Athens. By marked contrast the figure was less than 1% in the case of Edinburgh.

This possibly has something to do with the fact that their library systems might be set up differently.

Table 16: Method of access and navigation (sessions)

		Gateway access	Google access	Google scholar	PubMed access	Athens access	Menu use	Advanced search	Basic search	Citation function
Aberdeen	*N*	10105	63	2	2396	111	5706	35	356	516
	%[13]	65.8	0.6	0	21.6	1.0	37.2	0.2	2.3	3.4
Bangor	*N*	3230	31	3	322	486	4068	14	289	229
	%	44.4	0.6	0.1	6.4	9.6	56.0	0.2	4.0	3.1
Cambridge	*N*	41370	437	8	15703	2193	15069	112	373	1135
	%	72.9	1.0	0	35.0	4.9	26.5	0.2	0.7	2.0
Edinburgh	*N*	23507	207	5	9094	58	13638	34	559	1062
	%	62.3	0.8	0	34.8	0.2	36.1	0.1	1.5	2.8
Manchester	*N*	31856	252	6	9530	4711	15405	75	990	2532
	%	64.8	0.7	0	27.1	13.4	31.3	0.2	2.0	5.1
Strathclyde	*N*	3630	53	1	1205	1146	4248	24	306	158
	%	46.2	0.9	0	21.4	20.4	54.1	0.3	3.9	2.0
Swansea	*N*	1774	115	76	376	57	2569	28	228	117
	%	40.5	3.9	2.6	12.7	1.9	58.7	0.6	5.2	2.7
UCL	*N*	31333	182	22	13189	45	14678	28	325	911
	%	66.6	0.5	0.1	36.3	0.1	31.2	0.1	0.7	1.9
CEH	*N*	399	18	0	150	0	894	0	22	86
	%	30.5	2.0	0	17.0	0	68.4	0	1.7	6.6
Rothamsted	*N*	1817	20	0	218	0	1306	0	24	114
	%	59.3	1.4	0	15.2	0	42.6	0	0.8	3.7

[13] percentage of all session for that subject

2.2.2.2 Navigation

- CEH researchers exhibited the strongest preference for browsing - over two thirds of their sessions recorded a view to a menu. By contrast, Cambridge researchers viewed a menu in a one in four sessions.
- Advanced searching was generally very unpopular throughout Life Sciences, and researchers from the laboratories never used the facility during the four months. Proportionally speaking Swansea researchers used the facility the most, in 0.6% of sessions, but this still only constituted 28 uses in four months. The use of advanced facilities appears not to be related to research performance. There are some big policy issues here. Systems might be too complex and users shun them, despite the investment. It might be because they are designed by librarians and lack the common touch (not in tune with the digital consumer) or it could be that researchers don't have very advanced information literacy skills or training?
- Basic searching was most popular at Swansea where over 5% of sessions saw the facility used and least popular at Cambridge and UCL, where just 0.7% of sessions saw it used.
- Clearly navigational data were affected by gateway searching where much of the searching and browsing might have been undertaken off-site. Surely this has big implications for publishers and librarians. Are they, for instance, taking this into account when designing and evaluating their information services?
- CEH recorded the highest percentage use of the citation facility (in nearly 7% of sessions); by contrast UCL researchers hardly used the facility (in less than 2% of sessions). This is another case where the use of an 'advanced' facility appears not to be associated with research performance.

2.2.2.3 Content viewed

- Bangor recorded the most 'active' sessions with, on average, 4.2 pages and 2 articles viewed; in contrast the figures for Cambridge were, respectively, 2 and 1.5. The least active institutions were the ones with the biggest

researchers. Bangor also viewed the most journals in a session (1.6), although it was UCL this time which viewed the least (1.1).

- Swansea showed the highest levels of abstract viewing – over one in four sessions viewed an abstract; for Cambridge the equivalent figure was more like one in six sessions. The biggest research universities (and the greatest users of gateways) used abstracts the least.
- There were huge differences in terms of the age of the articles viewed. Bangor viewed the oldest articles (1007 days old) and CEH the most recent (309). Part of the explanation might lie in the fact that non-academic researchers are plainly more focused on currency than their academic colleagues. There appears also to be a difference between the bigger research universities and their smaller colleagues. Thus UCL and Cambridge viewed the newest material and Bangor and Strathclyde the oldest. However, Swansea was an exception to that rule. The huge differences could arise from the fact that within Life Sciences there are very different styles of research, from interdisciplinary to basic, from big teams to individuals. Example: taxonomists go back in the literature like historians – they always cite the first description of a new species, even if that was a medieval herbalist. UCL and Cambridge are at the cutting edge of very highly competitive Big Science, and this might be the reason.
- Alerts were rarely used; although they were a little more popular at Strathclyde and Swansea (0.2% of sessions featured their use). It might be that these researchers are not so well connected as their colleagues in Manchester or Cambridge.
- CEH, clearly an institution where currency is everything, made most use of articles in press: 11% of sessions saw an AIP viewed. Interestingly this is another area of behaviour where the big research and user universities were the lowest users of the facility.
- The higher the institutions research ranking the higher the ISI rank of the journal viewed. Thus Cambridge's average Impact Factor was 5 (relative factor 2.0), whereas that for Bangor was 2.3 (0.9). The difference may be due to a Big Science effect where the top researchers are conducting more basic science, whereas Bangor research is more applied.

Table 17: Content viewed (sessions)

Subject	Volume			Form	Age/currency			Impact	
	Ave. no. of pages viewed	*Ave. no. of articles viewed*	*Ave. no. of journals viewed*	*% viewing an abstract*	*Ave. age of article viewed (days)*	*Alerts %*	*% viewing an AIP*[14]	*Ave. impact factor of journal viewed*	*Relative impact factor*
Aberdeen	3.1	1.9	1.4	25.4	579	0.1	6.5	3.0	1.2
Bangor	4.2	2.0	1.6	27.4	1007	0.1	7.6	2.3	0.9
Cambridge	2.0	1.5	1.2	17.2	722	0.1	6.5	5.0	2.0
Edinburgh	2.1	1.4	1.2	18.1	788	0.1	6.9	3.7	1.5
Manchester	2.1	1.5	1.3	20.1	828	0.1	6.9	3.9	1.6
Strathclyde	3.6	1.9	1.5	22.9	900	0.2	10.4	2.7	1.1
Swansea	3.8	1.9	1.5	26.9	737	0.2	10.2	2.5	1.0
UCL	2.0	1.3	1.1	17.3	507	0	7.3	4.1	1.7
CEH	3.4	1.3	1.3	17.4	309	0	11.1	2.6	1.0

articles in press – accepted manuscripts, uncorrected proofs and corrected proofs;

Rothamsted	2.3	1.2	1.3	18.7	477	0.1	8.4	2.6	1.0

2.2.3 Journals used

- In the case of three institutions (Bangor, Cambridge and CEH) just 5% of the available journals accounted for more than 50% of all use, high-levels of concentration indeed. At Aberdeen and UCL use was spread more widely, 5% of journals accounted for one-third of use.
- Manchester viewed the highest number of unique journals (517) and CEH the least (209). Generally the more research active the university the greater the number of titles viewed.
- Cell and Current Biology proved to be the most used journal, both within the top five ranking at 7 of the 11 institutions (Table 19). In fact, at Cambridge Cell accounted for 13% of all use.

Table 18: Journal title use and scatter

	Scatter[15]			**Unique journals viewed**	**As a proportion of subject journals available (539)**
	Top 5% of journals viewed account for % use	Top 25% of journals viewed account for % use	Top 50% of journals viewed account for % use	*N*	%
Aberdeen	36	75	92	482	89
Bangor	53	84	95	430	80
Cambridge	52	86	97	483	90
Edinburgh	41	82	96	483	90
Manchester	39	78	94	517	96
Strathclyde	45	82	95	416	77
Swansea	43	78	93	349	65

[15] Based on unique session views; thus multiple views to the same journals were not counted

UCL	36	78	95	465	86
CEH	51	84	95	209	39
Rothamsted	47	88	96	265	49

Table 19: Life Sciences top twenty journals

Rank	**Aberdeen**	**Bangor**	**Cambridge**	**Edinburgh**	**Manchester**
1	Cell	J. of Experimental Marine Biology & Ecology	Cell	Cell	Cell
2	Current Biology	Aquaculture	Current Biology	Current Biology	Current Biology
3	Trends in Ecology & Evolution	Continental Shelf Research	J. of Molecular Biology	Applied Animal Behaviour Science	Biochemical & Biophysical Research Communications
4	Animal Behaviour	Animal Behaviour	Developmental Biology	Biochemical & Biophysical Research Communications	J. of Molecular Biology
5	ICES J. of Marine Science	Trends in Ecology & Evolution	Molecular Cell	Molecular Cell	FEBS Letters
6	Fisheries Research	Soil Biology & Biochemistry	Development Cell	Developmental Biology	Molecular Cell
7	Biochemical & Biophysical Research Communications	Current Biology	Biochemical & Biophysical Research Communications	Trends in Ecology & Evolution	J. of Allergy & Clinical Immunology
8	Soil Biology & Biochemistry	Fisheries Research	Trends in Ecology & Evolution	Animal Behaviour	Developmental Biology
9	J. of Experimental Marine Biology & Ecology	J. of Sea Research	FEBS Letters	J. of Molecular Biology	Current Opinion in Cell Biology
10	FEBS Letters	Forensic Science Int.	Trends in Biochemical Sciences	Development Cell	Methods in Enzymology
11	J. of Allergy & Clinical Immunology	ICES J. of Marine Science	Current Opinion in Cell Biology	Trends in Parasitology	Analytical Biochemistry
12	J. of Molecular Biology	Molecular Phylogenetics & Evolution	Trends in Genetics	FEBS Letters	Experimental Cell Research
13	Developmental Biology	Agricultural Systems	Current Opinion in Genetics & Development	Immunity	Development Cell
14	Fish & Shellfish Immunology	Phytochemistry	Trends in Cell Biology	Trends in Genetics	Gene
15	Applied Animal Behaviour Science	Aquatic Botany	Animal Behaviour	Vaccine	Bioorganic & Medicinal Chemistry Letters
16	Current Opinion in Immunology	Applied Animal Behaviour Science	Immunity	Int. J. for Parasitology	Trends in Biochemical Sciences
17	Aquaculture	J. of Theoretical Biology	J. of Human Evolution	Veterinary Parasitology	Current Opinion in Immunology
18	Int. J. for Parasitology	Medical Hypotheses	Current Opinion in Structural Biology	J. of Allergy & Clinical Immunology	Advanced Drug Delivery Reviews
19	Molecular Immunology	Biochemical & Biophysical Research Communications	Current Opinion in Immunology	Current Opinion in Cell Biology	Vaccine
20	Immunity	Carbohydrate Polymers	Gene	Molecular & Cellular Endocrinology	Trends in Cell Biology

Rank	**Strathclyde**	**UCL**	**CEH**	**Rothamsted**	**Swansea**

1	Forensic Science Int.	Cell	Soil Biology & Biochemistry	Current Biology	Aquaculture
2	Advanced Drug Delivery Reviews	Current Biology	Trends in Ecology & Evolution	Trends in Plant Science	J. of Hospital Infection
3	European J. of Pharmaceutics & Biopharmaceutics	Developmental Biology	Applied Soil Ecology	Soil Biology & Biochemistry	J. of Experimental Marine Biology & Ecology
4	Biochemical & Biophysical Research Communications	Biochemical & Biophysical Research Communications	Virology	Current Opinion in Plant Biology	Appetite
5	Bioorganic & Medicinal Chemistry Letters	FEBS Letters	European J. of Soil Biology	Cell	Current Biology
6	Bioorganic & Medicinal Chemistry	J. of Molecular Biology	Pedobiologia	Phytochemistry	American J. of Infection Control
7	Vaccine	Molecular Cell	J. of Microbiological Methods	Soil & Tillage Research	Trends in Ecology & Evolution
8	FEBS Letters	Development Cell	Applied Animal Behaviour Science	Plant Science	ICES J. of Marine Science
9	Analytical Biochemistry	Immunity	FEBS Letters	J. of Cereal Science	Mutation Research/Genetic Toxicology & Environmental Mutagenesis
10	Carbohydrate Polymers	Experimental Cell Research	Animal Behaviour	Fungal Genetics & Biology	J. of the American Dietetic Association
11	Drug Discovery Today	Current Opinion in Cell Biology	J. of Invertebrate Pathology	FEBS Letters	Parasitology Today
12	Phytochemistry	Trends in Cell Biology	Aquatic Toxicology	Crop Protection	J. of Allergy & Clinical Immunology
13	Biosensors & Bioelectronics	cancer cell	Current Biology	Field Crops Research	Animal Behaviour
14	Cancer Letters	Trends in Ecology & Evolution	J. of Molecular Biology	Applied Soil Ecology	Fisheries Research
15	Trends in Parasitology	Vaccine	J. for Nature Conservation	European J. of Agronomy	Cell
16	Food Control	Trends in Genetics	Aquatic Botany	Plant Physiology & Biochemistry	Mutation Research/Fundamental & Molecular Mechanisms of Mutagenes
17	Int. J. for Parasitology	Mechanisms of Development	Comparative Biochemistry & Physiology Part C: Toxicology & Pharma	Trends in Genetics	European J. of Cancer
18	J. of Allergy & Clinical Immunology	J. of Allergy & Clinical Immunology	Biochemical & Biophysical Research Communications	Insect Biochemistry & Molecular Biology	Biochemical & Biophysical Research Communications
19	European J. of Cancer	Molecular & Cellular Neuroscience	General & Comparative Endocrinology	Trends in Ecology & Evolution	J. of Invertebrate Pathology
20	J. of Chromatography B: Biomedical Sciences & Applications	Current Opinion in Genetics & Development	Molecular Phylogenetics & Evolution	Physiological & Molecular Plant Pathology	Process Biochemistry

Table 20: Journals featuring in the top five ranked lists of two or more institutions

Life sciences titles	Number of Universities
Cell	7
Current Biology	7
Biochemical & Biophysical Research Communications	5
Trends in Ecology & Evolution	3
Animal Behaviour	3
J. of Molecular Biology	2
Developmental Biology	3
Molecular Cell	2
FEBS Letters	2
Aquaculture	2
J. of Experimental Marine Biology & Ecology	2

2.3 Chemistry

2.3.1 Usage profiles

- Again, all the usage metrics told the same story. Manchester was the biggest user in every respect accounting for 29% of page views, 31% of PDF downloads and 30% of all sessions conducted; Cambridge, the biggest user of Life Sciences journals, came second for all usage metrics. Interestingly, in regard to PDF viewing, a possible 'satisfaction' metric, Manchester's score was 6% higher than Cambridge's. UCL was a long third, which is perhaps surprising given it was awarded a 5* in the last RAE.
- The laboratories were very small users, not surprisingly given their subject strengths are elsewhere.
- There were enormous differences between institutions regarding session time. Edinburgh (not Manchester) recorded the shortest sessions (114 seconds) and Bangor (again) the longest ones (435 seconds); interestingly, the two heaviest users, Manchester and Cambridge, had very similar session times, respectively 178 and 160 seconds. The clear relationship found between research performance and session time was not so strong in the case of Chemistry.

Table 21: Summary of key Chemistry usage metrics

Institution	Total page views		Total full-text views		Total HTML views		Total PDF views		Session numbers		Session time
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*Ave. in seconds*[16]
Aberdeen	8292	4	4705	4	2123	5	2582	3	2439	3.5	298
Bangor	5122	2	3066	3	1222	3	1844	3	1574	2.3	434
Cambridge	55538	26	30179	25	10863	23	19316	26	16549	24.0	178
Edinburgh	23923	11	11740	10	4512	10	7228	10	8047	11.7	114
Manchester	62486	29	36240	30	13618	29	22622	31	20940	30.4	160
Strathclyde	20350	9	12623	10	4702	10	7921	9	5908	8.6	292

[16] Huber's M-Estimator

Swansea	6640	3	4326	4	1779	4	2547	3	1985	2.9	441
UCL	25274	12	11818	10	4691	10	7127	10	7900	11.5	154
CEH	271	0.1	146	0	37	0	109	0	87	.1	314
Rothamsted	810	0.4	471	0	302	1	169	0	309	.4	170

Use over time

- Government laboratories run to a very different monthly rhythm and there was a great deal of variation between months, which is possibly unexpected given that they do not have academic terms. Thus, in the case of Rothamsted, March accounted for 17% of use, whereas the figure for April was 43%. This could, possibly, be attributed to the fact that use levels were low and consequently rises and falls in use are magnified.
- In respect to universities use was most even at Manchester (just 2% variation between months) and most variable at Strathclyde (10% variation). There was less variation at the big research universities, Manchester, Cambridge and Edinburgh.
- Adding weight to the view that Government laboratories operate differently (or have different constraints) is the fact that they did not use ScienceDirect on weekends. In contrast Aberdeen recorded 18% of their page views over the weekend, meaning that staff there were achieving another weekday's worth of work at the weekend.
- Mondays and Wednesdays were the busiest days of the week for Chemists, and there was no obvious relationship between weekend working and research size or performance, with Aberdeen showing the highest levels (18%) and Manchester the lowest (11%) of use. The laboratories do not search on a weekend.
- Lunch was the most popular time to use ScienceDirect. Interestingly, that is also the busiest time for the E-shopper (Nicholas and Rowlands, 2008). With the exception of the laboratories a good deal of use occurred outside

conventional office hours (9-6). Interestingly those institutions working most at the weekend where not the ones that worked into the night and early morning. Thus, at Strathclyde, nearly a quarter of all use took place out of hours.

Table 22: Use over time (monthly percentage of page views)

		Jan	Feb	Mar	Apr
Aberdeen	%	23	25	24	29
Bangor	%	28	23	26	22
Cambridge	%	26	25	27	23
Edinburgh	%	25	24	25	26
Manchester	%	24	26	26	24
Strathclyde	%	29	22	30	20
Swansea	%	25	26	28	22
UCL	%	26	26	28	21
CEH	%	23	35	30	13
Rothamsted	%	18	22	17	43

Table 23: Use over time: (average day of the week percentage page views)

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Aberdeen	%	19	17	18	14	15	8	10
Bangor	%	19	17	20	17	16	5	6
Cambridge	%	19	18	20	18	16	4	5
Edinburgh	%	19	18	18	18	16	4	8
Manchester	%	19	19	18	18	16	5	6

Strathclyde	%	19	17	20	18	16	4	6
Swansea	%	19	16	21	24	13	3	5
UCL	%	20	17	18	19	16	5	5
CEH	%	10	28	29	9	24	0	0
Rothamsted	%	27	13	20	19	19	2	0

Table 24: Use over time (average hourly page views)

		12-5am	6-8am	9-11am	12-2pm	3-5pm	6-8pm	9-11 pm
Aberdeen	*N*	914	1525	10836	13850	12282	5230	2393
	%	1.9	3.2	23.0	29.4	26.1	11.1	5.1
Bangor	*N*	960	770	5174	6972	6446	3142	1654
	%	3.8	3.1	20.6	27.8	25.7	12.5	6.6
Cambridge	*N*	2930	4446	32072	37430	38721	16025	8619
	%	2.1	3.2	22.9	26.7	27.6	11.4	6.1
Edinburgh	*N*	2052	3007	24078	29772	25912	10011	5302
	%	2.0	3.0	24.0	29.7	25.9	10.0	5.3
Manchester	*N*	4427	4730	29225	36062	29930	11873	7978
	%	3.6	3.8	23.5	29.0	24.1	9.6	6.4
Strathclyde	*N*	994	876	5376	6280	5607	2790	1984
	%	4.2	3.7	22.5	26.3	23.5	11.7	8.3
UCL	*N*	2889	3653	25110	32596	31942	12383	6425
	%	2.5	3.2	21.8	28.3	27.8	10.8	5.6
CEH	*N*	0	354	1507	1390	1052	115	5
	%	0	8.0	34.1	31.4	23.8	2.6	0.1
Rothamsted	*N*	398	433	2586	2205	2728	384	100
	%	4.5	4.9	29.3	25.0	30.9	4.3	1.1

2.3.2 Information seeking behaviour (session data)

2.3.2.1 Method of access

- Even with the influence of PubMed diminished considerably high levels of gateway use was still recorded for Chemistry. Thus for Rothamsted, Manchester and Aberdeen more than half of all traffic arrived via a gateway site.
- Just 11 Chemistry titles were indexed by Google during this period and so it is not surprising that recorded levels of use were low with nearly 13% recorded at Strathclyde and Swansea.

Table 25: Chemistry method of access and navigation (sessions)

		Gateway access	Google access	Google scholar	PubMed access	Athens access	Menu use	Advanced search	Basic search	Citation function
Aberdeen	*N*	1263	95	5	96	44	1288	7	96	61
	%[17]	51.7	6.1	0.3	6.0	2.8	52.7	0.3	3.9	2.5
Bangor	*N*	686	44	8	12	90	927	6	81	71
	%	43.4	4.9	0.9	1.3	10.1	58.6	0.4	5.1	4.5
Cambridge	*N*	8005	1138	85	509	515	8949	27	486	470
	%	48.2	10.3	0.8	4.6	4.6	53.9	0.2	2.9	2.8
Edinburgh	*N*	4259	429	36	246	16	3971	9	293	180
	%	52.8	8.3	0.7	4.8	0.3	49.2	0.1	3.6	2.2
Manchester	*N*	11225	1309	157	443	1152	9938	60	1061	923
	%	53.8	9.2	1.1	3.1	8.1	47.2	0.3	5.0	4.4
Strathclyde	*N*	2294	482	23	133	626	3779	31	279	78
	%	38.8	12.7	0.6	3.5	16.5	63.8	0.5	4.7	1.3
Swansea		588	155	30	28	32	1469	24	231	100
		29.5	12.9	2.5	2.3	2.7	73.6	1.2	11.6	5.0
UCL	*N*	3419	394	36	441	2	4519	18	249	182
	%	43.1	7.8	0.7	8.7	0	57.0	0.2	3.1	2.3
CEH	*N*	19	6	0o	4	0	66	1	15	11
	%	21.8	9.8	0	6.6	0	75.9	1.1	17.2	12.6
Rothamsted	*N*	205	8	0	10	0	126	0	9	8
	%	65.3	5.8	0	7.3	0	40.1	0	2.9	2.5

[17] percentage of all session for that subject

2.3.2.2 Navigation

- Browsing levels were high everywhere, and very high in the case of CEH and Swansea where around three-quarters of sessions saw menus being viewed. They were lowest at Rothamsted, where only 40% of sessions saw views to menus.
- Advanced searching was rarely undertaken and Swansea topped the list of users, where the facility was used in 1.2 sessions. Swansea also proved to be the biggest users of the basic search, 11.6% of their sessions employed the facility (CEH's figures were really too small to read anything into them).

2.3.2.3 Content viewed

- CEH, Swansea and Bangor conducted the most active sessions with average sessions viewing more than 5 pages – 6 in the case of CEH. Swansea also viewed the most articles in a session – nearly 3 and Manchester the least (1.5).
- There were large variations in the number of journals viewed in a session with Rothamsted viewing the most (2.4) and UCL the least (1.4).
- One in four sessions undertaken by researchers at Aberdeen, Edinburgh and Rothamsted saw abstracts viewed. UCL viewed the least, just in one in five sessions recorded an abstract view.
- CEH researchers employed the alert facility around 10 times more than the other institutions. CEH also used AIPs the most, in 18.4% sessions. Swansea was a close second, with 18.2%. By contrast, researchers at Edinburgh viewed AIPs in 7% of sessions – real differences here, which might point to currency requirements.
- Manchester viewed the oldest articles, average age 1213 days, and Aberdeen the most recent ones (423 days).

- Rothamsted researchers viewed the highest ranked journals; the average ranking was 3.0 or higher. Swansea researchers viewed the lowest ranked titles (Impact Factor 2.2; relative factor 1.0).

Table 26: Content viewed (sessions)

Subject	Volume			Form	Age/currency			Impact	
	Ave. no. of pages viewed	*Ave. no. of articles viewed*	*Ave. no. of journals viewed*	*% viewing an abstract*	*Ave. age of article viewed (days)*	*Alerts %*	*% viewing an AIP*[18]	*Ave. impact factor of journal viewed*	*Relative impact factor*
Aberdeen	4.6	2.5	1.8	25.9	423	0.1	9.0	2.7	1.3
Bangor	5.4	2.9	2.2	22.9	871	0.1	12.1	2.6	1.2
Cambridge	3.7	1.9	1.5	22.5	967	0.1	7.4	2.5	1.2
Edinburgh	3.3	1.5	1.5	25.4	1167	0	7.0	2.5	1.2
Manchester	3.4	1.9	1.5	25.1	1213	0.1	7.2	2.5	1.2

articles in press – accepted manuscripts, uncorrected proofs and corrected proofs;

Strathclyde	4.7	2.3	1.7	21.3	733	0.2	11.3	2.5	1.2
Swansea	5.8	2.7	2.0	21.7	693	0.2	18.2	2.2	1.0
UCL	3.4	1.6	1.4	19.2	561	0	7.5	2.5	1.2
CEH	6.0	2.4	1.9	23.0	833	1.1	18.4	2.9	1.4
Rothamsted	3.4	1.8	2.4	25.2	541	0	8.6	3.0	1.4

2.3.3 Journals used

- The highest concentration of journal use was found at Cambridge, where the top five percent of journals accounted for exactly half of all page views. Use was least concentrated at Swansea where the top 5% of journals accounted for 36% of use. (Table 27)
- Tetrahedron Letters and Tetrahedron were the journals that appeared most frequently at the top of institutional lists (Table 28).

Table 27: Journal title use and scatter

	Scatter[19]			**Unique journals viewed**	**As a proportion of subject journals available (199)**
	Top 5% of journals viewed account for % use	Top 25% of journals viewed account for % use	Top 50% of journals viewed account for % use	*N*	%
Aberdeen	38	76	92	169	85
Bangor	41	80	94	37	19
Cambridge	50	85	97	184	92
Edinburgh	44	82	96	177	89
Manchester	39	79	95	179	90

[19] Based on unique session views; thus multiple views to the same journal not counted

Strathclyde	37	78	95	166	83
Swansea	36	75	93	138	69
UCL	42	79	95	163	82
CEH	41	83	92	37	19
Rothamsted	45	85	95	62	31

Table 28: Chemistry top twenty journals

Rank	**Aberdeen**	**Bangor**	**Cambridge**	**Edinburgh**	**Manchester**
1	Biomaterials	Tetrahedron	Tetrahedron Letters	Tetrahedron Letters	Tetrahedron Letters
2	Fuel	Sensors & Actuators B: Chemical	Tetrahedron	Tetrahedron	Tetrahedron
3	Tetrahedron Letters	Tetrahedron Letters	Surface Science	J. of Organometallic Chemistry	Polymer
4	Analytica Chimica Acta	J. of Chromatography A	Chemical Physics Letters	Trends in Biotechnology	Biomaterials
5	Tetrahedron	J. of Organometallic Chemistry	Polymer	Inorganica Chimica Acta	International J. of Heat & Mass Transfer
6	J. of Chromatography A	Electrochimica Acta	Chemical Engineering Science	Chemical Engineering Science	Chemical Engineering Science
7	Talanta	Analytica Chimica Acta	Biomaterials	Biomaterials	J. of Chromatography A
8	J. of Pharmaceutical & Biomedical Analysis	Polymer	Combustion & Flame	Polymer	Chemical Physics Letters
9	TrAC Trends in Analytical Chemistry	J. of Electroanalytical Chemistry	J. of Organometallic Chemistry	Coordination Chemistry Reviews	Electrochimica Acta
10	J. of Chromatography B	Talanta	J. of Molecular Structure	International J. of Heat & Mass Transfer	J. of Colloid & Interface Science
11	J. of Catalysis	Polymer Degradation & Stability	J. of Colloid & Interface Science	Polyhedron	J. of Organometallic Chemistry
12	Microporous & Mesoporous Materials	J. of Photochemistry & Photobiology A: Chemistry	chemistry&biology	Tetrahedron: Asymmetry	Colloids & Surfaces A: Physicochemical & Engineering Aspects
13	Applied Catalysis B: Environmental	J. of Colloid & Interface Science	Tetrahedron: Asymmetry	Powder Technology	Analytica Chimica Acta
14	Applied Catalysis A: General	Chemical Physics	Sensors & Actuators B: Chemical	Chemical Physics Letters	J. of Membrane Science
15	Catalysis Today	Colloids & Surfaces A: Physicochemical & Engineering Aspects	Inorganica Chimica Acta	J. of Colloid & Interface Science	Tetrahedron: Asymmetry
16	J. of Food Engineering	Trends in Biotechnology	Powder Technology	Analytica Chimica Acta	European Polymer J.

17	International J. of Heat & Mass Transfer	Catalysis Today	International J. of Hydrogen Energy	J. of Chromatography A	Trends in Biotechnology
18	J. of Molecular Catalysis A: Chemical	Tetrahedron: Asymmetry	Trends in Biotechnology	J. of Solid State Chemistry	Inorganica Chimica Acta
19	Trends in Biotechnology	Electrochemistry Communications	International J. of Heat & Mass Transfer	Applied Catalysis A: General	Computers & Chemical Engineering
20	J. of Loss Prevention in the Process Industries	Dyes & Pigments	Proceedings of the Combustion Institute	J. of Chromatography B	Polyhedron

Rank	**Strathclyde**	**Swansea**	**UCL**	**CEH**	**Rothamsted**
1	J. of Chromatography A	J. of Non-Newtonian Fluid Mechanics	Biomaterials	J. of Chromatography A	J. of Chromatography A
2	Tetrahedron Letters	Tetrahedron Letters	Tetrahedron Letters	Int. J. of Mass Spectrometry	Tetrahedron Letters
3	J. of Pharmaceutical & Biomedical Analysis	J. of Membrane Science	Tetrahedron	TrAC Trends in Analytical Chemistry	Trends in Biotechnology
4	Polymer	Fuel	Surface Science	J. of Chromatography B	Tetrahedron
5	Tetrahedron	Separation & Purification Technology	Chemical Physics Letters	J. of Membrane Science	Tetrahedron: Asymmetry
6	Analytica Chimica Acta	Polymer	Chemical Engineering Science	Trends in Biotechnology	Talanta
7	International J. of Hydrogen Energy	Tetrahedron	J. of Chromatography A	Colloids & Surfaces B: Biointerfaces	Analytica Chimica Acta
8	J. of Photochemistry & Photobiology A: Chemistry	Colloids & Surfaces A: Physicochemical & Engineering Aspects	Trends in Biotechnology	Analytica Chimica Acta	Fuel
9	Biomaterials	J. of Colloid & Interface Science	Polymer	J. of Colloid & Interface Science	TrAC Trends in Analytical Chemistry
10	J. of Colloid & Interface Science	International J. of Heat & Mass Transfer	J. of Membrane Science	Tetrahedron	J. of Pharmaceutical & Biomedical Analysis
11	Applied Catalysis B: Environmental	J. of Loss Prevention in the Process Industries	Computers & Chemical Engineering	J. of Pharmaceutical & Biomedical Analysis	J. of Molecular Catalysis A: Chemical
12	European Polymer J.	Chemical Engineering Science	J. of Chromatography B	Tribology Int.	J. of the American Society for Mass Spectrometry
13	J. of Chromatography B	Tribology Int.	J. of Colloid & Interface Science	Spectrochimica Acta Part A: Molecular & Biomolecular Spectroscopy	J. of Chromatography B
14	Talanta	Analytica Chimica Acta	Microporous & Mesoporous Materials	Accident Analysis & Prevention	Int. J. of Heat & Fluid Flow
15	Catalysis Today	Sensors & Actuators B: Chemical	Catalysis Today	Biochemical Engineering J.	Microchemical J.
16	Inorganica Chimica Acta	Biochemical Engineering J.	Int. J. of Multiphase Flow	J. of Molecular Structure	J. of Molecular Graphics & Modelling
17	J. of Organometallic Chemistry	Polymer Degradation & Stability	Applied Catalysis A: General	Microporous & Mesoporous Materials	J. of Colloid & Interface Science
18	Reactive &	Microporous	J. of	Progress in	Int. J. of Mass

	Functional Polymers	& Mesoporous Materials	Organometallic Chemistry	Energy & Combustion Science	Spectrometry
19	J. of Catalysis	Chemical Engineering J.	chemistry&biology	Talanta	Applied Catalysis A: General
20	Applied Catalysis A: General	J. of Photochemistry & Photobiology A: Chemistry	J. of Catalysis	Colloids & Surfaces A: Physicochemical & Engineering Aspects	J. of Organometallic Chemistry

Table 29: Journals featuring in the top five ranked lists of two or more institutions

Chemistry titles	Number of Universities
Tetrahedron Letters	9
Tetrahedron	8
J. of Chromatography A	5
Biomaterials	4
Trends in Biotechnology	3
Polymer	3
Fuel	2
J. of Organometallic Chemistry	2
Surface Science	2
J. of Chromatography B	2
J. of Membrane Science	2

2.4 Earth Science

2.4.1 Usage profiles

- There was generally a more even spread of use across institutions than in other case study fields. Manchester proved to be the biggest user according to all the metrics with the exception of PDF views were they were beaten by Cambridge, which had a 5* in the subject. In terms of session time the laboratories were clearly the quickest searchers by some margin, recording times of around 140 seconds, as compared, for instance, to Bangor's 410 seconds.

Table 30: Summary of key Earth Science usage metrics

Institution	Total page	Total full-text	Total HTML	Total PDF	Session	Session

	views		views		views		views		numbers		time
	N	*%*	*N*	*%*	*n*	*%*	*N*	*%*	*N*	*%*	*Ave. in seconds*[20]
Aberdeen	31360	11	18879	12	8494	14	10385	10	8259	10.8	269
Bangor	28324	10	17154	11	5456	9	11698	11	6242	8.2	410
Cambridge	49757	17	27224	17	7438	12	19786	19	11657	15.3	211
Edinburgh	41400	14	20177	12	7097	12	13080	13	10319	13.6	201
Manchester	50460	18	31305	19	12234	21	19071	18	15025	19.7	209
Strathclyde	15768	6	10892	7	4668	8	6224	6	4846	6.4	312
Swansea	10925	4	7234	4	3289	5	3945	4	3152	4.1	343
UCL	37902	13	18173	11	6701	11	11472	11	10098	13.3	166
CEH	7658	3	2676	2	660	1	2016	2	1690	2.2	140
Rothamsted	3130	1	1692	1	762	1	930	1	927	1.2	145

Usage over time

- There was quite a variation in monthly use at most institutions and this was greatest at the two laboratories, Rothamsted (19% variation between March and April) and CEH (13% between the same months, but the busiest months were reversed). Use was remarkably even at Manchester where it never varied by more than 3%. (Table 31).
- Use was very even throughout the working week at Cambridge, where it varied by less than 2%. Very little searching took place at the laboratories over the weekend; by contrast 16% of searching at Aberdeen took place then. (Table 32).

[20] Huber's M-Estimator

- Considerable amounts of searching occurred at the universities during the evenings and nights; for instance, nearly a fifth of searching at Aberdeen was conducted during these times. (Table 33)

Table 31: Use over time (percentage of page views)

		Jan	Feb	Mar	Apr
Aberdeen	%	20	28	26	26
Bangor	%	25	28	29	19
Cambridge	%	22	30	28	21
Edinburgh	%	26	29	24	20
Manchester	%	24	25	27	26
Strathclyde	%	24	27	26	23
Swansea	%	20	21	30	29
UCL	%	25	28	27	21
CEH	%	26	26	30	17
Rothamsted	%	28	23	15	34

Table 32: Use over time: (average day of the week percentage page views)

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Aberdeen	%	20	19	16	16	14	7	9
Bangor	%	19	18	18	16	14	7	8
Cambridge	%	19	18	16	17	17	6	8
Edinburgh	%	18	17	17	18	15	7	8
Manchester	%	18	18	16	19	15	6	7

Strathclyde	%	19	18	20	19	13	5	7
Swansea	%	19	19	16	18	16	5	8
UCL	%	18	18	18	18	15	6	8
CEH	%	22	19	23	18	17	1	1
Rothamsted	%	16	18	21	19	20	3	2

Table 33: Use over time (average hourly page views)

		12-5am	**6-8am**	**9-11am**	**12-2pm**	**3-5pm**	**6-8pm**	**9-11 pm**
Aberdeen	*N*	716	962	7171	9092	8053	3351	2015
	%	2.3	3.1	22.9	29.0	25.7	10.7	6.4
Bangor	*N*	964	982	6832	7206	6707	3629	2004
	%	3.4	3.5	24.1	25.4	23.7	12.8	7.1
Cambridge	*N*	1636	1747	10841	13345	14290	4896	3012
	%	3.3	3.5	21.8	26.8	28.7	9.8	6.1
Edinburgh	*N*	1122	1177	8926	11838	10646	4796	2895
	%	2.7	2.8	21.6	28.6	25.7	11.6	7.0

Manchester	*N*	2406	1661	10758	14589	12300	5443	3303
	%	4.8	3.3	21.3	28.9	24.4	10.8	6.5
Strathclyde	*N*	515	565	3832	4775	3816	1601	664
	%	3.3	3.6	24.3	30.3	24.2	10.2	4.2
Swansea	*N*	249	229	2695	3185	2540	1261	766
	%	2.3	2.1	24.7	29.2	23.2	11.5	7.0
UCL	*N*	1147	1540	7767	10112	10238	4462	2636
	%	3.0	4.1	20.5	26.7	27.0	11.8	7.0
CEH	*N*	0	361	2975	2213	1987	121	1
	%	0	4.7	38.8	28.9	25.9	1.6	0
Rothamsted	*N*	109	296	1081	787	692	179	12
	%	3.5	9.5	34.5	24.5	22.1	5.5	0.4
All institutions	*N*	9573	9957	64819	80300	74324	31602	18321
	%	3.3	3.4	22.4	27.8	25.7	10.9	6.3

2.4.2 Information seeking behaviour (session data)

2.4.2.1 Method of access

- Gateway access was very high at Aberdeen and Rothamsted where it accounted for over half of all sessions conducted.
- Google access was greatest at Swansea where it accounted for around a third of all sessions. GoogleScholar use was also highest at Swansea.

2.4.2.2 Navigation

- Menu use was greatest at Swansea where nearly 70% of sessions saw a menu viewed. It was less than 50% in the case of Aberdeen.
- Again, Swansea led the way in levels of advanced searching, although even there the facility was utilised in less than 1% of sessions.

- Strathclyde and Swansea were the only institutions where the basic search facility was used in 20 or more sessions.
- Manchester saw the greatest use of the citation facility, about 1 in 15 sessions recording its use

Table 34: Method of access and navigation (sessions)

		Gateway access	Google access	Google scholar	PubMed access	Athens access	Menu use	Advanced search	Basic search	Citation function
Aberdeen	*N*	4809	278	52	127	60	3954	15	340	208
	%[21]	58.1	5.2	1.0	2.4	1.1	47.8	0.2	4.1	2.5
Bangor	*N*	2337	140	40	36	450	3818	21	267	165
	%	37.3	3.2	0.9	0.8	10.4	61.0	0.3	4.3	2.6
Cambridge	*N*	4386	935	127	233	660	6491	21	372	349
	%	37.5	11.2	1.5	2.8	7.9	55.4	0.2	3.2	3.0
Edinburgh	*N*	3842	847	179	242	15	6541	20	473	273
	%	37.1	14.7	3.1	4.2	0.3	63.1	0.2	4.6	2.6
Manchester	*N*	6814	1316	258	300	1805	8009	34	757	1095
	%	45.1	13.9	2.7	3.2	19.1	53.0	0.2	5.0	7.2
Strathclyde	*N*	2198	984	94	64	510	2741	18	254	89
	%	45.0	30.2	2.9	2.0	15.7	56.2	0.4	5.2	1.8

[21] percentage of all session for that subject

Swansea		989	236	77	20	74	2201	28	198	126
		31.3	12.9	4.2	1.1	4.1	69.7	0.8	6.3	4.0
UCL	*N*	3728	558	111	256	23	6261	17	327	202
	%	36.6	8.8	1.8	4.0	0.4	61.4	0.2	3.2	2.0
CEH	*N*	313	28	3	15	0	1374	0	32	124
	%	18.5	2.3	0.2	1.2	0	81.2	0	1.9	7.3
Rothamsted	*N*	508	31	7	9	0	443	0	12	39
	%	54.3	9.6	2.3	2.8	0	47.4	0	1.3	4.2

2.4.2.3 Content viewed

- Swansea recorded the highest number of pages viewed. However, in terms of the number of articles and journals viewed Bangor scored the most highly.
- There was not a lot of difference between the average and relative impacts factors of the journals viewed, although the scores for smaller research universities (Bangor, Swansea and Strathclyde) were the lowest.
- On average nearly two journals were viewed in a session, although it was closer to 1 at CEH.
- Most abstract viewing was undertaken at Aberdeen and the least at CEH.
- The government laboratories viewed the most recent material and Bangor and Cambridge the oldest.
- Swansea made the most of email alerts and AIPs.

Table 35: Content viewed (sessions)

Subject	Volume			Form	Age/currency			Impact	
	Ave. no. of pages viewed	*Ave. no. of articles viewed*	*Ave. no. of journals viewed*	*% viewing an abstract*	*Ave. age of article viewed (days)*	*Alerts %*	*% viewing an AIP*[22]	*Ave. impact factor of journal viewed*	*Relative impact Factor*
Aberdeen	3.9	2.3	1.7	27.8	732	0.1	7.4	2.2	1.4
Bangor	4.9	2.6	1.8	25.0	1175	0.1	7.7	1.9	1.2
Cambridge	3.8	2.1	1.5	26.0	1167	0.1	8.2	2.2	1.4
Edinburgh	4.2	1.8	1.5	20.6	942	0.1	9.4	2.0	1.3
Manchester	3.6	2.1	1.6	22.3	988	0.1	9.7	2.0	1.3
Strathclyde	4.3	2.3	1.7	20.4	812	0.1	12.7	1.7	1.1
Swansea	4.6	2.4	1.8	22.5	748	0.3	13.6	1.9	1.2
UCL	3.5	1.6	1.4	17.8	739	0	8.8	2.1	1.3
CEH	4.1	1.4	1.2	13.5	355	0.2	10.2	2.3	1.4
Rothamsted	3.2	1.6	1.7	16.4	525	0.1	12.7	2.2	1.4

2.4.3 Journals used

- Use was most concentrated at the two government laboratories where 5% of journals accounted for more than half of all use; by contrast the equivalent figure for Manchester was around a quarter.
- Manchester viewed the largest and the laboratories the least number of journals.

articles in press – accepted manuscripts, uncorrected proofs and corrected proofs;

Table 36: Journal title use and scatter

	Scatter[23]			Unique journals viewed	As a proportion of subject journals available (256)
	Top 5% of journals viewed account for % use	Top 25% of journals viewed account for % use	Top 50% of journals viewed account for % use	*N*	*%*
Aberdeen	33	78	94	227	89
Bangor	45	84	96	215	84
Cambridge	46	82	96	231	90
Edinburgh	31	76	94	217	85
Manchester	27	75	94	246	96
Strathclyde	32	83	96	193	75
Swansea	30	76	93	189	74
UCL	33	75	94	212	83
CEH	51	90	98	114	45
Rothamsted	55	89	96	126	49

- There was a great degree of diversity in regard to the titles viewed at the 11 institutions. Biological Conservation, Energy Policy, and Quaternary Science Reviews were the journals that cropped up most at the top of institutional lists.

Table 37: Earth sciences top twenty journals

Rank	**Aberdeen**	**Bangor**	**Cambridge**	**Edinburgh**	**Manchester**
1	Biological Conservation	Ecological Economics	Earth & Planetary Science Letters	Energy Policy	Energy Policy
2	Science of The Total Environment	Marine Pollution Bulletin	J. of Volcanology & Geothermal	Earth & Planetary Science Letters	Geochimica et Cosmochimica

[23] Based on unique session views; thus multiple views to the same journal not counted

			Research		Acta
3	Forest Ecology & Management	Forest Ecology & Management	Energy Policy	Ecological Economics	Atmospheric Environment
4	Quaternary Science Reviews	Estuarine Coastal & Shelf Science	Quaternary Science Reviews	Renewable Energy	Remote Sensing of Environment
5	Chemosphere	Biological Conservation	Geochimica et Cosmochimica Acta	Geomorphology	Science of The Total Environment
6	Estuarine Coastal & Shelf Science	Marine Geology	Chemical Geology	Science of The Total Environment	J. of Power Sources
7	Ecological Modelling	Agriculture Ecosystems & Environment	Biological Conservation	Geochimica et Cosmochimica Acta	Renewable Energy
8	Environmental Pollution	Geochimica et Cosmochimica Acta	Palaeogeography Palaeoclimatology Palaeoecology	Forest Ecology & Management	Earth & Planetary Science Letters
9	Marine Pollution Bulletin	Science of The Total Environment	Tectonophysics	Biological Conservation	Applied Thermal Engineering
10	Agriculture Ecosystems & Environment	Netherl&s J. of Sea Research	Ecological Economics	Quaternary Science Reviews	Bioresource Technology
11	Ecological Economics	Marine Chemistry	Marine Geology	Renewable & Sustainable Energy Reviews	Global Environmental Change
12	J. of Hydrology	Environmental Pollution	Atmospheric Environment	Energy	Nuclear Engineering & Design
13	Landscape & Urban Planning	Ocean & Coastal Management	Energy Conversion & Management	J. of Environmental Management	Quaternary Science Reviews
14	Progress in Oceanography	Chemosphere	Renewable Energy	Remote Sensing of Environment	Ecological Economics
15	J. of Rural Studies	Marine Environmental Research	J. of Power Sources	Atmospheric Environment	J. of Hydrology
16	Deep Sea Research Part I: Oceanographic Research Papers	Deep Sea Research Part II: Topical Studies in Oceanography	Review of Palaeobotany & Palynology	Water Research	J. of Cleaner Production
17	Earth & Planetary Science Letters	J. of Marine Systems	Energy	J. of Rural Studies	Water Research
18	J. of Environmental Management	J. of Hydrology	Bioresource Technology	Biomass & Bioenergy	Environmental Impact Assessment Review
19	Remote Sensing of Environment	Desalination	Solar Energy	Energy Conversion & Management	Palaeogeography Palaeoclimatolog y Palaeoecology
20	Marine & Petroleum Geology	Ecological Modelling	Quaternary Int.	Chemosphere	Environmental Pollution

Rank	**Strathclyde**	**UCL**	**CEH**	**Rothamsted**	**Swansea**
1	Bioresource Technology	Quaternary Science Reviews	J. of Hydrology	Geoderma	Bioresource Technology
2	Energy Policy	Earth & Planetary Science Letters	Environmental Pollution	Agriculture Ecosystems & Environment	Quaternary Science Reviews
3	Renewable Energy	Palaeogeography Palaeoclimatology Palaeoecology	Atmospheric Environment	Chemosphere	Resources Conservation & Recycling
4	J. of Hazardous Materials	J. of Hydrology	Science of The Total Environment	Ecological Modelling	Desalination
5	Energy Conversion & Management	Building & Environment	Biological Conservation	Environmental Pollution	Water Research
6	Energy	Energy Policy	Forest Ecology & Management	Atmospheric Environment	J. of Wind Engineering & Industrial Aerodynamics
7	Solar Energy	J. of Volcanology &	Ecological	Science of The	Energy Policy

		Geothermal Research	Modelling	Total Environment	
8	Electric Power Systems Research	Icarus	Agricultural & Forest Meteorology	Biomass & Bioenergy	Deep Sea Research Part I: Oceanographic Research Papers
9	Environmental Impact Assessment Review	Geomorphology	Agriculture Ecosystems & Environment	Bioresource Technology	J. of Hydrology
10	J. of Power Sources	Marine Geology	Chemosphere	Forest Ecology & Management	J. of Cleaner Production
11	Ocean Engineering	Geochimica et Cosmochimica Acta	Environmental Modelling & Software	J. of Arid Environments	Renewable Energy
12	Applied Thermal Engineering	Remote Sensing of Environment	Water Research	J. of Wind Engineering & Industrial Aerodynamics	Biomass & Bioenergy
13	Building & Environment	Quaternary Research	Advances in Water Resources	Agricultural & Forest Meteorology	J. of Hazardous Materials
14	Renewable & Sustainable Energy Reviews	Science of The Total Environment	J. of Environmental Management	Ecotoxicology & Environmental Safety	Geomorpholog y
15	Chemosphere	Renewable Energy	Remote Sensing of Environment	J. of Hydrology	Solar Energy Materials & Solar Cells
16	Ecological Economics	Environmental Pollution	J. of Environmental Radioactivity	Agricultural Water Management	Biological Conservation
17	J. of Wind Engineering & Industrial Aerodynamics	Biological Conservation	L&scape & Urban Planning	Chemical Geology	Engineering Structures
18	Atmospheric Environment	Energy & Buildings	Ecotoxicology & Environmental Safety	Water Research	Forest Ecology & Management
19	Energy & Buildings	Quaternary Int.	Geoderma	Biological Conservation	Chemosphere
20	Water Research	Ecological Economics	Biomass & Bioenergy	Geoderma	Marine Pollution Bulletin

Table 38: Journals featuring in the top five ranked lists of two or more institutions

Earth science titles	Number of Universities
Biological Conservation	4
Energy Policy	4
Quaternary Science Reviews	4
Science of The Total Environment	3
Earth & Planetary Science Letters	3
Forest Ecology & Management	2
Chemosphere	2
Ecological Economics	2
Geomorphology	2

Geochimica et Cosmochimica Acta	2
J. of Hydrology	2

2.5 Economics

2.5.1 Usage profiles

- Economics followed a similar pattern to those of the scientific fields, with the top institution accounting for a third of all use. Manchester proved the biggest user (it has a business school), accounting for around a third of all use according to all the metrics.
- UCL was the only institution to obtain a 5* ranking in the RAE but even so ranked only around 4 in usage ranking terms.
- Cambridge conducted the shortest sessions, 119 seconds, and Bangor (again) the longest ones (403 seconds).

Use over time

- There was greater variation between monthly use than we have previously witnessed and this often exceeded 10%. The busiest months proved to be February and March (Table 40)
- A good deal of use occurred over the weekends and, for Aberdeen, this accounted for 17% of all use. (Table 41)
- Similarly much use occurred out of normal office hours; in fact, at Bangor the figure exceeded 50%. This usage proved not to be mechanical or robotic, perhaps a security guard, studying economics part-time? (Table 42)

Table 39: Summary of key economics usage metrics

Institution	Total page views	Total full-text views	Total HTML views	Total PDF views	Session numbers	Session time

	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*Ave. in seconds*[24]
Aberdeen	4966	4	2078	4	820	7	1258	3	1403	4.5	168
Bangor	7325	6	4079	8	600	5	3479	8	1208	3.9	403
Cambridge	23540	19	8922	17	1517	13	7405	18	5958	19.1	119
Edinburgh	15494	12	5865	11	1111	9	4754	11	3478	11.2	169
Manchester	40880	33	18015	34	3917	34	14098	34	10202	32.8	149
Strathclyde	12108	10	6146	12	1301	11	4845	11	2938	9.4	267
Swansea	2976	2	1305	2	422	3	883	2	814	2.6	196
UCL	12844	10	4433	8	1193	10	3240	8	3574	11.5	111
CEH	12	0	2	0	2	0	0	0	7	.0	251
Rothamsted	22	0	13	0	5	0	8	0	9	.0	326

Table 40: Use over time (percentage of monthly page views)

		Jan	**Feb**	**Mar**	**Apr**
Aberdeen	%	20	28	26	26
Bangor	%	25	28	29	19
Cambridge	%	22	30	28	21
Edinburgh	%	26	29	24	20
Manchester	%	24	25	27	26

[24] Huber's M-Estimator

Strathclyde	%	24	27	26	25
Swansea	%	20	21	30	29
UCL	%	25	28	27	21
CEH	%	26	26	30	17
Rothamsted	%	28	23	15	34

Table 41: Use over time: (average day of the week percentage page views)

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Aberdeen	%	20	19	16	16	14	7	9
Bangor	%	19	18	18	16	14	7	8
Cambridge	%	19	18	16	17	17	6	8
Edinburgh	%	18	17	17	18	15	7	8
Manchester	%	18	18	16	19	15	6	7
Strathclyde	%	19	18	20	19	13	5	7
Swansea	%	19	19	16	18	16	5	8
UCL	%	18	18	18	18	15	6	8

CEH	%	22	19	23	18	17	1	1
Rothamsted	%	16	18	21	19	20	3	2

Table 42: Use over time (average hourly pay views)

		12-5am	**6-8am**	**9-11am**	**12-2pm**	**3-5pm**	**6-8pm**	**9-11 pm**
Aberdeen	*N*	134	79	904	1395	1472	591	391
	%	2.7	1.6	18.2	28.1	29.6	11.9	7.9
Bangor	*N*	1524	912	1410	1106	778	639	956
	%	20.8	12.5	19.2	15.1	10.6	8.7	13.1
Cambridge	*N*	1196	559	4583	5463	5851	3316	2572
	%	5.1	2.4	19.5	23.2	24.9	14.1	10.9
Edinburgh	*N*	904	412	2609	4168	4111	2002	1288
	%	5.8	2.7	16.8	26.9	26.5	12.9	8.3
Manchester	*N*	2716	1362	6822	9936	10295	5454	4295
	%	6.6	3.3	16.7	24.3	25.2	13.3	10.5
Strathclyde	*N*	511	234	2776	3493	2811	1392	891

	%	4.2	1.9	22.9	28.8	23.2	11.5	7.4
Swansea	*N*	46	99	336	820	1031	437	207
	%	1.5	3.3	11.3	27.6	34.6	14.7	7.0
UCL	*N*	556	361	2239	3113	3117	2059	1399
	%	4.3	2.8	17.4	24.2	24.3	16.0	10.9
CEH	*N*	0	0	4	4	4	0	0
	%	0	0	33.3	33.3	33.3	0	0
Rothamsted	*N*	0	6	10	5	0	1	0
	%	0	27.3	45.5	22.7	0	4.5	0

2.5.2 Information seeking behaviour (session data)

2.5.2.1 Method of access

- Unsurprisingly, the levels of gateway access were considerably down on what we have seen previously, reaching over a quarter of sessions only in the case of Aberdeen.
- Swansea again recorded the greatest use of Google and GoogleScholar – used in 5% of all sessions - and this might be explained by library training programmes.

2.5.2.2 Navigation

- Menu use was generally high, and very high at Edinburgh where menus were viewed in three quarters of all sessions;
- Swansea used the advanced search facility the most;
- Bangor recorded the highest levels of basic searching, around 5% of sessions saw it employed;
- Manchester recorded the greatest use of the citation facility, around 5% of all sessions saw it utilized.
- Abstracts again proved popular and at Aberdeen, Cambridge, Rothamsted and UCL were viewed in more than one in three sessions.

Table 43: Method of access and navigation (sessions)

		Gateway access	Google access	Google scholar	PubMed access	Athens access	Menu use	Advanced search	Basic search	Citation function
Aberdeen	*N*	494	22	0	12	7	857	2	39	28
	%[25]	25.2	2.8	0	1.5	0.9	61.0	0.1	2.8	2.0
Bangor	*N*	170	8	0	1	38	896	2	63	16
	%	14.0	0.8	0	0.1	3.7	74.0	0.2	5.2	1.3
Cambridge	*N*	740	156	0	8	373	3675	7	108	105
	%	12.4	3.3	0	0.2	8.0	61.6	0.1	1.8	1.8
Edinburgh	*N*	474	30	2	10	10	2636	11	108	48
	%	13.6	1.5	0.1	0.5	0.5	75.8	0.3	3.1	1.4
Manchester	*N*	2198	38	5	6	1361	6480	20	338	472
	%	21.5	0.5	0.1	0.1	18.3	63.4	0.2	3.3	4.6
Strathclyde	*N*	560	17	0	0	509	2050	6	134	25
	%	19.1	0.8	0	0	25.3	69.8	0.2	4.6	0.9
Swansea		175	31	23	3	17	562	9	37	7
		21.5	5.7	4.2	0.6	3.1	69.0	1.1	4.5	0.9
UCL	*N*	763	67	0	6	5	2186	3	86	32
	%	21.8	2.7	0	0.2	0.2	61.1	0.1	2.4	0.9
CEH	*N*	2	0	0	0	0	5	0	1	0
	%	28.6	0	0	0	0	71.4	0	14.3	0

[25] percentage of all session for that subject

Rothamsted	*N*	3	0	0	0	0	6	0	1	0
	%	33.3	0	0	0	0	66.7	0	11.1	0

2.5.2.3 Content viewed

- Bangor recorded the busiest sessions, which averaged 5.1 page views and 2.4 articles. [The CEH data were too low to count]. Edinburgh though viewed the most unique journals in a session (2.4).
- In regard to universities, abstract viewing was greatest at Aberdeen where more than a third of sessions saw an abstract and lowest at Edinburgh and Bangor, where abstracts were viewed in less that a quarter of sessions.
- Cambridge, Edinburgh, Manchester and Strathclyde all viewed articles aged 1700 days or older.
- Bangor and Swansea recorded the highest proportions of their sessions viewing an AIP, around 1 in 10 sessions did so.
- Generally, the Impact Factors of the journals viewed were on the low site with the relative factor dropping below the key 1.0 mark for Cambridge and Swansea. The high score for Strathclyde stands out (1.4) and is unexplained.

Table 44: Content viewed (sessions)

Subject	Volume	Form	Age/currency	Impact

	Ave. no. of pages viewed	*Ave. no. of articles viewed*	*Ave. no. of journals viewed*	*% viewing an abstract*	*Ave. age of article viewed (days)*	*Alerts %*	*% viewing an AIP*[26]	*Ave. impact factor of journal viewed*	*Relative impact factor*
Aberdeen	3.9	1.6	1.4	35.9	1049	0.1	7.7	1.4	1.0
Bangor	5.1	2.4	1.4	24.3	1471	0	9.8	1.4	1.0
Cambridge	3.6	1.3	1.1	34.0	1756	0.1	4.5	1.3	0.9
Edinburgh	4.4	1.6	1.2	24.9	1736	0.1	5.9	1.4	1.1
Manchester	3.7	1.5	1.1	28.0	1746	0	5.1	1.5	1.0
Strathclyde	4.4	1.8	1.3	32.5	1731	0.1	8.9	2.0	1.4
Swansea	4.2	1.6	1.3	30.1	1431	0.2	9.8	1.2	0.8
UCL	3.3	1.0	1.1	33.4	1266	0	5.1	1.4	1.0
CEH	5.7	1.8	n/a	28.6	729	0	0	1.5	1.1
Rothamsted	5.3	3.6	n/a	44.4	1011	0	22.0[27]	0.7	0.5

2.5.3 Journals used

- High levels of concentration were found at Bangor where two thirds of use was accounted for by 5% of journals. There was quite a different picture at Swansea where 5% of journals accounted for just 40% of use.
- Excluding the laboratories, where figures were too small to be counted the highest number of journals was viewed at Manchester (127) and lowest at Swansea (83).

Table 45: Economics journal title use and scatter

	Scatter[28]	**Unique journals**	**As a proportion of subject journals**

articles in press – accepted manuscripts, uncorrected proofs and corrected proofs;

[27] Based on just 4

[28] Based on unique session views; thus multiple views to the same journal not counted

				viewed	available (132)
	Top 5% of journals viewed account for % use	Top 25% of journals viewed account for % use	Top 50% of journals viewed account for % use	*N*	%
Aberdeen	40	77	93	99	75
Bangor	66	88	96	91	69
Cambridge	47	86	96	117	89
Edinburgh	46	85	97	111	84
Manchester	59	89	97	127	96
Strathclyde	56	86	96	102	77
Swansea	40	79	93	83	63
UCL	46	84	95	113	86
CEH[29]	n/a	n/a	n/a	6	5
Rothamsted[30]	n/a	n/a	n/a	8	6

- World development was clearly the most popular journal in the field, ranked first by six of the eleven institutions (Table 46).

Table 46: Economics top twenty journals

Rank	**Aberdeen**	**Bangor**	**Cambridge**	**Edinburgh**	**Manchester**
1	J. of Health Economics	J. of Econometrics	World Development	World Development	World Development
2	Critical Perspectives on Accounting	J. of Environmental Economics & Management	J. of Financial Economics	J. of Financial Economics	J. of Financial Economics
3	Management Accounting Research	J. of Banking & Finance	J. of Econometrics	Research Policy	Research Policy
4	World Development	World Development	J. of Monetary Economics	J. of Development Economics	J. of Banking & Finance
5	J. of Financial Economics	J. of Financial Economics	J. of Development Economics	J. of Banking & Finance	Management Accounting Research
6	J. of Urban Economics	J. of Monetary Economics	European Economic Review	Management Accounting Research	J. of Accounting & Economics
7	J. of Accounting & Economics	Food Policy	J. of Public Economics	J. of Public Economics	Int. J. of Production Economics

[29] just 6jnls viewed

[30] just 2jnls viewed

8	J. of Econometrics	J. of Economics & Business	Research Policy	J. of Health Economics	J. of Development Economics
9	Regional Science & Urban Economics	J. of Accounting & Economics	Explorations in Economic History	China Economic Review	Critical Perspectives on Accounting
10	J. of Int. Accounting Auditing & Taxation	Economics Letters	J. of Economic Theory	J. of Monetary Economics	European Economic Review
11	European Economic Review	European Economic Review	Economics Letters	Food Policy	J. of Econometrics
12	J. of Economic Behavior & Organization	Emerging Markets Review	J. of Economic Dynamics & Control	J. of Economic Behavior & Organization	J. of Monetary Economics
13	J. of Macroeconomics	J. of Int. Money & Finance	J. of Banking & Finance	J. of Comparative Economics	J. of Int. Economics
14	J. of Int. Money & Finance	J. of Multinational Financial Management	Int. J. of Production Economics	European Economic Review	Economics Letters
15	J. of Banking & Finance	J. of Int. Financial Markets Institutions & Money	J. of Int. Economics	J. of Int. Economics	J. of Int. Money & Finance
16	Int. J. of Production Economics	Economics of Education Review	J. of Environmental Economics & Management	J. of Environmental Economics & Management	J. of Economic Behavior & Organization
17	Research Policy	J. of Economic Behavior & Organization	J. of Economic Behavior & Organization	J. of Econometrics	Structural Change & Economic Dynamics
18	Food Policy	Quarterly Review of Economics & Finance	Int. J. of Industrial Organization	Critical Perspectives on Accounting	J. of Economic Dynamics & Control
19	J. of Policy Modeling	J. of Financial Intermediation	Games & Economic Behavior	Economics Letters	J. of Public Economics
20	J. of Economic Psychology	J. of Econometrics	J. of Health Economics	Explorations in Economic History	J. of Economic Psychology

Rank	**Strathclyde**	**UCL**	**CEH**	**Rothamsted**	**Swansea**
1	J. of Financial Economics	World Development	Research Policy	World Development	World Development
2	Critical Perspectives on Accounting	J. of Public Economics	World Development	Economics of Education Review	J. of World Business
3	Management Accounting Research	J. of Econometrics		Economic Modelling	Economics Letters
4	Research Policy	J. of Development Economics		Economics Letters	J. of Banking & Finance
5	J. of Banking & Finance	Handbook of Labor Economics		China Economic Review	J. of Financial Economics
6	World Development	J. of Economic Theory		Food Policy	Food Policy
7	J. of Accounting & Economics	Handbook of Econometrics			J. of Development Economics
8	J. of Corporate Finance	J. of Monetary Economics			J. of Public Economics
9	Int. J. of Production Economics	European Economic Review			J. of Health Economics
10	J. of Econometrics	Games & Economic Behavior			J. of Econometrics
11	J. of Int. Economics	J. of Economic Behavior & Organization			J. of Economic Psychology
12	J. of Monetary Economics	J. of Health Economics			J. of Economic Behavior & Organization

13	European Economic Review	J. of Int. Economics			European Economic Review
14	J. of Int. Money & Finance	J. of Economic Psychology			J. of Int. Economics
15	J. of World Business	Labour Economics			Research Policy
16	J. of Economics & Business	Economics Letters			J. of Monetary Economics
17	J. of Development Economics	Research Policy			Labour Economics
18	J. of Empirical Finance	J. of Urban Economics			Insurance: Mathematics & Economics
19	Review of Financial Economics	J. of Banking & Finance			J. of Economic Dynamics & Control
20	J. of Financial Economics	J. of Comparative Economics			World Development

Table 47: Journals featuring in the top five ranked lists of two or more institutions

Economics titles	Number of Universities
World Development	10
J. of Financial Economics	7
J. of Banking & Finance	5
Research Policy	4
Management Accounting Research	3
J. of Development Economics	3
J. of Health Economics	2
Critical Perspectives on Accounting	2
J. of Econometrics	2
Economics Letters	2

2.6 Physics

2.6.1 Usage profiles

- Manchester was clearly the powerhouse in usage terms, in some cases (PDF and full-text views) accounting for more than 40% of all use. Cambridge, which has a 5* department, came a close second in regard to sessions viewed and HTML views.
- There are quite astonishing differences in session time, with UCL recording just 85 seconds per sessions, which compares to 161 for Manchester and 350 for Bangor.

Table 48: Summary of key physics usage metrics

Institution	Total page views		Total full-text views		Total HTML views		Total PDF views		Session numbers		Session time
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*Ave. in seconds*[31]
Aberdeen	6184	4	3653	3	1789	4	1864	3	2065	3.5	169
Bangor	2747	2	1695	2	815	2	880	1	1061	1.8	350
Cambridge	50513	29	30370	27	14677	30	15693	27	17295	28.9	99
Edinburgh	10522	6	5757	5	3076	6	2681	5	4348	7.3	84
Manchester	64566	37	44649	40	15717	32	28932	43	19030	31.8	161
Strathclyde	10782	6	7508	7	3377	7	4131	6	3805	6.4	164
Swansea	6293	4	4417	4	1844	4	2573	4	2380	4.0	240
UCL	18548	11	10223	9	5581	11	4642	8	7297	12.2	85
CEH	47	0	36	0	23	0	13	0	35	.1	6
Rothamsted	271	0	150	0	91	0	59	0	150	.3	46

Use over time

- With the exception of the laboratories, where the figures were too low to read anything into them, monthly use varied most at Aberdeen where use varied by more than 10%. Monthly use was quite even at Cambridge, where there was less than a 4% variation. (Table 49).
- Significant volumes of use occurred at Aberdeen over the weekend - 20% of use took place then, and in the evenings (17% of daily use). (Tables 50, 51)

[31] Huber's M-Estimator

Table 49: Use over time (percentage monthly page views)

		Jan	Feb	Mar	Apr
Aberdeen	%	17	24	30	30
Bangor	%	27	24	29	20
Cambridge	%	25	26	27	23
Edinburgh	%	27	24	26	22
Manchester	%	22	22	28	28
Strathclyde	%	25	20	25	29
Swansea	%	27	27	22	23
UCL	%	26	29	27	19
CEH	%	30	6	40	24
Rothamsted	%	19	20	17	44

Table 50: Use over time: (average day of the week percentage page views)

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Aberdeen	%	18	18	18	14	14	12	8
Bangor	%	23	16	17	16	19	5	4
Cambridge	%	29	18	18	18	16	5	6
Edinburgh	%	18	20	17	19	16	5	6
Manchester	%	17	20	18	18	15	6	8
Strathclyde	%	21	19	16	18	16	5	6
Swansea	%	18	22	18	18	17	3	5
UCL	%	20	19	18	17	17	4	6
CEH	%	15	13	30	15	28	0	0
Rothamsted	%	17	30	12	15	23	3	1

Table 51: Use over time (average hourly page views)

		12-5am	6-8am	9-11am	12-2pm	3-5pm	6-8pm	9-11 pm
Aberdeen	*N*	103	178	1381	1970	1518	747	287
	%	1.7	2.9	22.3	31.9	24.5	12.1	4.6
Bangor	*N*	127	63	691	853	704	204	105
	%	4.6	2.3	25.2	31.1	25.6	7.4	3.6
Cambridge	*N*	1140	1685	11500	14032	14142	5454	2560
	%	2.3	3.3	22.8	27.8	28.0	10.8	5.1
Edinburgh	*N*	233	207	2582	3038	2782	1113	567
	%	2.2	2.0	24.5	28.9	26.4	10.6	5.4
Manchester	*N*	4024	4832	14786	16457	15370	5704	3393
	%	6.2	7.5	22.9	25.5	23.8	8.8	5.3
Strathclyde	*N*	132	310	2888	3453	2564	1060	375
	%	1.2	2.9	26.8	32.0	23.8	9.8	3.5
Swansea	*N*	176	221	1417	2110	1564	513	292
	%	2.8	3.5	22.5	33.5	24.9	11.2	4.7
UCL	*N*	456	654	3849	5189	5450	2072	878
	%	2.5	3.5	20.8	28.0	29.4	11.2	4.7
CEH	*N*	0	3	15	10	15	4	0
	%	0	6.4	31.9	21.3	31.9	8.5	0
Rothamsted	*N*	37	54	73	75	28	4	0
	%	13.7	19.9	26.9	27.7	10.3	1.5	0

2.6.2 Information seeking behaviour (session data)

2.6.2.1 Method of access

- Gateway traffic accounted for around two-thirds of all sessions conducted at Cambridge, Edinburgh, CEH and Rothamsted
- A large number of Physics journals had been opened to Google indexing during the survey period and this showed especially in the high volumes of

users coming in via Google at Edinburgh (accounting for 41% of sessions), Swansea (42%) and CEH (55%).

- GoogleScholar figures were also generally up on the low numbers found elsewhere, but they still did not account for more than one in 20 sessions conducted.

2.6.2.2 Navigation

- Menu viewing varied, occurred in more than half of all Aberdeen and Bangor sessions and less than 40% of Cambridge and Edinburgh sessions.
- Advanced searching was undertaken in less than 1% of sessions, only used 18 times in four months by Cambridge scholars for instance.
- Basic searching was undertaken more frequently, but never used in more than one in eleven sessions (Swansea).
- Manchester again topped the rankings in terms of use of the citation facility (used in 5% of sessions).

Table 52: Method of access and navigation (sessions)

		Gateway access	Google access	Google scholar	PubMed access	Athens access	Menu use	Advanced search	Basic search	Citation function
Aberdeen	*N*	1044	399	47	10	18	1148	0	99	38
	%[32]	50.5	33.6	4.0	0.8	1.5	55.5	0	4.8	1.8
Bangor	*N*	507	191	10	3	99	596	7	57	32
	%	47.6	26.3	1.4	0.4	13.6	56.0	0.7	5.4	3.0
Cambridge	*N*	10917	4838	445	90	454	6719	18	520	473
	%	62.7	36.8	3.4	0.7	3.5	38.6	0.1	3.0	2.7

[32] percentage of all session for that subject

Edinburgh	*N*	2733	1291	97	24	5	1712	3	102	116
	%	62.3	41.2	3.1	0.8	0.2	39.0	0.1	2.3	2.6
Manchester	*N*	10567	3973	410	73	1271	8571	52	1427	1041
	%	55.1	30.7	3.2	0.6	9.8	44.7	0.3	7.4	5.4
Strathclyde	*N*	2206	1282	103	6	285	1721	16	146	52
	%	57.8	44.1	3.5	02.	9.8	45.1	0.4	3.8	1.4
Swansea		1185	702	71	3	44	1273	21	210	70
		49.4	42.1	4.3	0.2	2.6	53.1	0.9	8.8	2.9
UCL	*N*	4208	1946	239	53	8	3171	8	147	127
	%	57.3	35.8	4.4	1.0	0.1	43.1	0.1	2.0	1.7
CEH	*N*	24	11	0	1	0	14	0	2	1
	%	68.6	55.0	0	5.0	0	38.6	0	5.7	2.9
Rothamsted	*N*	96	22	2	1	0	63	0	4	5
	%	61.9	26.5	2.4	1.2	0	40.6	0	2.6	3.2

2.6.2.3 Content viewed

- Bangor again recorded the busiest sessions, in terms of pages, articles and journals viewed.
- The Impact Factors for journals viewed were much the same for the institutions, with those for Manchester slightly higher than the others
- Abstract viewing was generally quite uniform, around the 20-24% mark, although it only reached 16% for Strathclyde.
- Aberdeen viewed the most recent articles (average 629 days old) and Manchester the oldest (1416 days), more than twice as old.
- Alerts were not popular with Physicists, not used at all by those at Manchester and Edinburgh in the four month survey period.

- Swansea and Bangor topped the table in regard to their use of AIPs.

Table 53: Content viewed (sessions)

Subject	Volume			Form	Age/currency			Impact	
	Ave. no. of pages viewed	*Ave. no. of articles viewed*	*Ave. no. of journals viewed*	*% viewing an abstract*	*Ave. age of article viewed (days)*	*Alerts %*	*% viewing an AIP*[33]	*Ave. impact factor of journal viewed*	*Relative impact factor*
Aberdeen	3.6	2.0	1.5	22.4	629	0.0	9.6	1.5	1.0
Bangor	4.6	2.5	2.2	21.1	876	0.3	11.9	1.7	1.2
Cambridge	2.3	1.7	1.4	21.2	1099	0.1	6.2	1.7	1.2
Edinburgh	2.2	1.4	1.3	24.2	1045	0.0	6.3	1.6	1.1
Manchester	3.2	1.9	1.5	19.8	1416	0.0	7.5	1.9	1.3
Strathclyde	3.1	2.0	1.5	16.4	952	0.2	10.1	1.6	1.1
Swansea	3.5	2.1	1.6	19.9	1045	0.1	11.6	1.7	1.2
UCL	2.2	1.4	1.3	17.0	739	0.1	6.0	1.5	1.0
CEH	n/a	1.6	n/a	20.0	302	0.0	8.6	1.5	1.0
Rothamsted	n/a	1.1	n/a	12.9	448	0.0	5.2	1.7	1.2

articles in press – accepted manuscripts, uncorrected proofs and corrected proofs;

2.6.3 Journals used

- The figures from the laboratories can probably be discounted because of the low numbers of page views involved. Given that, Bangor, with 40% of usage accounted for by 5% of journals, showed the highest levels of concentration and UCL, Cambridge and Edinburgh the lowest levels – 27% of use was accounted for by 5% of journals.
- Manchester, again, used the most journals (201) and Bangor the least (136). At the laboratories use was too low to really comment on.

Table 54: Journal title use and scatter

	Scatter[34]			**Unique journals viewed**	**As a proportion of subject journals available (209)**
	Top 5% of journals viewed account for % use	Top 25% of journals viewed account for % use	Top 50% of journals viewed account for % use	*N*	*%*
Aberdeen	39	73	90	157	75
Bangor	40	78	94.2	136	65
Cambridge	27	77	95	182	87
Edinburgh	27	71	93	155	74
Manchester	37	79	96	201	96
Strathclyde	31	77	95	153	73
Swansea	36	77	94	148	71
UCL	27	73	93	165	79
CEH	23	57	75	19	9
Rothamsted	63	87	94	32	15

[34] Based on unique session views; thus multiple views to the same journal not counted

- Thin Solid Films was ranked first by three institutions but generally it looked like institutions were each viewing a different journal population (Table 55).

Table 55: Physics top twenty journals

Rank	Aberdeen	Bangor	Cambridge	Edinburgh	Manchester
1	Cement & Concrete Research	Thin Solid Films	Thin Solid Films	Physica A: Statistical Mechanics & its Applications	Physica B+C
2	J. of Sound & Vibration	J. of Crystal Growth	Materials Science & Engineering: A	J. of Magnetism & Magnetic Materials	Physica D: Nonlinear Phenomena
3	Nuclear Instruments & Methods in Physics Research Section A: Acce	Synthetic Metals	J. of Magnetism & Magnetic Materials	J. of NonCrystalline Solids	Materials Science & Engineering: A
4	International J. of Radiation Oncology*Biology* Physics	Applied Surface Science	Scripta Materialia	Carbon	Physica
5	Chaos Solitons & Fractals	J. of NonCrystalline Solids	Surface & Coatings Technology	Thin Solid Films	J. of Materials Processing Technology
6	Composite Structures	Materials Science & Engineering: A	J. of Computational Physics	J. of Constructional Steel Research	Surface & Coatings Technology
7	Composites Part A: Applied Science & Manufacturing	Physica A: Statistical Mechanics & its Applications	J. of Crystal Growth	J. of Computational Physics	Thin Solid Films
8	Magnetic Resonance Imaging	Materials Letters	Solid State Communications	Nuclear Instruments & Methods in Physics Research Section A: Acce	Acta Materialia
9	Composites Science & Technology	Surface & Coatings Technology	J. of Materials Processing Technology	Cement & Concrete Research	Corrosion Science
10	Materials Science & Engineering: A	Microelectronic Engineering	Physica E: Low-dimensional Systems & Nanostructures	J. of Materials Processing Technology	International J. of Radiation Oncology*Biology* Physics
11	Cement & Concrete Composites	Organic Electronics	J. of NonCrystalline Solids	Nuclear Instruments & Methods in Physics Research Section B: Beam	Applied Surface Science
12	J. of Constructional Steel Research	Corrosion Science	Acta Materialia	Sensors & Actuators A: Physical	Scripta Materialia
13	J. of Magnetic Resonance	Composites Part A: Applied Science & Manufacturing	Applied Surface Science	Microelectronic Engineering	J. of Nuclear Materials
14	Physica A: Statistical Mechanics & its Applications	Magnetic Resonance Imaging	Microelectronic Engineering	Magnetic Resonance Imaging	J. of Sound & Vibration
15	Thin Solid Films	Solid-State Electronics	Physics Letters B	Ultrasonics	Composite Structures
16	J. of Materials Processing Technology	Solid State Ionics	Diamond & Related Materials	International J. of Radiation Oncology*Biology*Physics	Nuclear Instruments & Methods in Physics Research Section A: Acce
17	Surface & Coatings Technology	Optical Materials	Physica A: Statistical Mechanics & its Applications	Nuclear Physics A	J. of the European Ceramic Society
18	Composites Part B: Engineering	Optics Communications	J. of Magnetic Resonance	Materials Science & Engineering: A	Composites Science &

					Technology
19	Physica D: Nonlinear Phenomena	J. of Magnetism & Magnetic Materials	Physica C: Superconductivity	Physica B: Condensed Matter	J. of Magnetism & Magnetic Materials
20	Applied Radiation & Isotopes	Physica B: Condensed Matter	Nuclear Instruments & Methods in Physics Research Section A: Acce	Solid State Communications	Wear

Rank	**Strathclyde**	**UCL**	**CEH**	**Rothamsted**	**Swansea**
1	J. of Materials Processing Technology	Thin Solid Films	Physica A: Statistical Mechanics & its Applications	Physica A: Statistical Mechanics & its Applications	Materials Science & Engineering: A
2	J. of Sound & Vibration	Nuclear Instruments & Methods in Physics Research Section A: Acce	Ultrasonics	Physics Letters A	J. of Materials Processing Technology
3	Acta Astronautica	Nuclear Instruments & Methods in Physics Research Section B: Beam	J. of Quantitative Spectroscopy & Radiative Transfer	Physica D: Nonlinear Phenomena	Surface & Coatings Technology
4	Materials Science & Engineering: A	International J. of Radiation Oncology*Biology*Physics	Radiation Physics & Chemistry	Applied Surface Science	J. of Computational Physics
5	Thin Solid Films	Surface & Coatings Technology	J. of Materials Processing Technology	Nuclear Instruments & Methods in Physics Research Section B: Beam	J. of Constructional Steel Research
6	Wear	J. of Magnetism & Magnetic Materials	Computer Physics Communications	Micron	Scripta Materialia
7	J. of NonCrystalline Solids	J. of NonCrystalline Solids	Micron	Ultramicroscopy	Acta Materialia
8	Optics Communications	Physica A: Statistical Mechanics & its Applications	J. of Computational Physics	Applied Radiation & Isotopes	Thin Solid Films
9	Nuclear Instruments & Methods in Physics Research Section A: Acce	Magnetic Resonance Imaging	Nuclear Instruments & Methods in Physics Research Section B: Beam	Progress in Nuclear Magnetic Resonance Spectroscopy	J. of Magnetism & Magnetic Materials
10	Surface & Coatings Technology	Applied Surface Science	J. of Luminescence	Solid State Ionics	Composites Science & Technology
11	Carbon	Diamond & Related Materials	Materials today	Optics & Laser Technology	Corrosion Science
12	J. of Computational Physics	J. of Computational Physics	Current Applied Physics	Corrosion Science	Physica A: Statistical Mechanics & its Applications
13	Composite Structures	Ultrasonics	Nuclear Instruments & Methods in Physics	Radiation Physics & Chemistry	Composite Structures

			Research Section A: Acce		
14	Scripta Materialia	Materials Science & Engineering: A	Optical Materials	J. of Magnetism & Magnetic Materials	Composites Part A: Applied Science & Manufacturing
15	Physica A: Statistical Mechanics & its Applications	Solid State Ionics		Cryogenics	Nuclear Instruments & Methods in Physics Research Section A: Acce
16	Ultrasonics	Microelectronic Engineering		J. of Materials Processing Technology	J. of Sound & Vibration
17	Applied Surface Science	Physica B: Condensed Matter		J. of Crystal Growth	Applied Surface Science
18	J. of Crystal Growth	Solid State Communications		Fluid Dynamics Research	J. of NonCrystalline Solids
19	Materials & Design	J. of Sound & Vibration		Thin Solid Films	Ultramicroscopy
20	Physics Letters A	Composite Structures		Physica E: Low-dimensional Systems & Nanostructures	Materials Characterization

Table 56: Journals featuring in the top five ranked lists of two or more institutions

Physics titles	Number of Universities
Thin Solid Films	5
Materials Science & Engineering: A	4
Physica A: Statistical Mechanics & its Applications	4
Surface & Coatings Technology	3
Nuclear Instruments & Methods in Physics Research Section A:	3
International J. of Radiation Oncology*Biology*Physics	3
J. of Sound & Vibration	2
Applied Surface Science	2
J. of Magnetism & Magnetic Materials	2
Nuclear Instruments & Methods in Physics Research Section B: Beam	2
J. of NonCrystalline Solids	2

2.7 Conclusions and reflections

- **An enormous amount of scholarly information research goes on in the UK's research institutions**. Thus, in the space of just four months, in regard to nearly 1400 scholarly journals, over half a million ScienceDirect sessions were undertaken and more than a million and a half pages viewed across

11 research institutions and 5 subjects. The picture was equally impressive in the case of Oxford Journals where nearly two thirds of a million pages were viewed and just under a quarter of a million sessions conducted in regard to 61 journals from three subjects over a period of 12 months. Furthermore, a good deal of journal searching was conducted out of traditional office hours and over the weekends; researchers were plainly taking advantage of the massive improvements that have occurred. Journals are clearly the lifeblood of UK researchers.

- **There was considerable variation between universities in use and information seeking terms**. This is most apparent when we compare big research intensive universities with smaller less research intensive ones. Firstly, the most research active universities were the biggest users, although some of this must, undoubtedly, come down to the fact that they have more researchers on the books. Secondly, surprisingly, the biggest users (the most research active universities) were the quickest or shortest searchers. Thirdly, also surprisingly, it was the smaller research universities (Bangor, Swansea and Strathclyde) that used the fullest range of online facilities and functions, and especially the so-called 'advanced' ones (advanced search for instance). This might be down to library training and support and is worth further investigation.
- **The University of Manchester proved to be *the* super user**. In the cases of Chemistry, Earth Sciences, Economics and Physics Manchester proved to be the biggest user. Cambridge, however, came first in the case of the Life Sciences.
- **There were bigger differences between universities and government laboratories**. Some of this was clearly due to their smaller size and narrower research focus, but some of it is clearly down to the different rhythms and requirements of the job. Thus laboratories were generally much more interested in current material, showed a greater preference for browsing (something which could be related to a strong current awareness need), used a narrower range of journals and undertook most of their information seeking during traditional office hours.

- **Bouncing was a very strong characteristic of scholarly information seeking behaviour.** Thus, a large proportion of researchers (around half) entered ScienceDirect via a third-party site, staying just sufficient time to pick-up the full-text of the document that they have identified elsewhere as being relevant. This is especially the case in the Life Sciences and the higher ranked research institutions. Researchers appeared very focussed and traditional in their use of a database.
- **Concentrated use.** Despite the huge choice on offer much use was concentrated on only a relatively few journals. Thus typically 5% of journals accounted for a third to half of all use.
- **It is in regard to the age of the article viewed that most diversity was evidenced.** This was true in regard to both institution and subject. There were differences of the order of 100-300% in the age of material viewed.
- **Average Impact factor of journal viewed.** For the Life Sciences there was a very strong correlation between research ranking of institution/department and ranking of journal, but link was much weaker in the case of the other subjects.
- **Subject profile differences.** Life sciences and Economics had the most distinctive profiles, the former because of the influence of PubMed on use and information seeking, and the latter because it is a social science
- **Life sciences** have a huge literature and it proved to be a very big user of it, accounting for nearly half of all the use generated by the case study subjects.
- **Google.** Once Google access is provided to content, it will be used by large numbers of even the most proficient and informed information seekers. After just four months of opening Physics content up to Google searching, more than a third of all traffic to ScienceDirect looking for Physics material arrived via Google. This in a field rich with online information resources.
- **Searching.** The irony is that while Google searching proved hugely popular, once people entered a site they would far rather browse than search again using the internal search engine. The advanced search function was not used by really anyone, and the higher the research rank the truer this was.

- **Relative impact factors of journals viewed.** This innovative information seeking characteristic, which gave an insight into the Impact Factors of the journals viewed, furnished interesting results. In subject terms, Life sciences titles ranked highest (1.24) and Physics the lowest (0.97). More interestingly perhaps were the institutional rankings: Aberdeen (1.16), Bangor (1.10), Cambridge (1.30), CEH (1.18), Edinburgh (1.18), Manchester (1.24), Rothamsted (1.30), Strathclyde (1.20), Swansea (1.04) and UCL (1.22).

3. OXFORD JOURNALS

Platform differences and the relatively small number of journals involved meant that Oxford data cannot be strictly compared with Elsevier data, indeed it would have been dangerous to do so in many cases. Nor for the same reasons can we combine the two sets of data. Instead the Oxford data were employed specifically to: 1) fill in gaps in the ScienceDirect data – thus History was not covered by ScienceDirect, but was covered well by Oxford; 2) provide some broad brush comparisons with the ScienceDirect data; 3). examine use throughout the whole year – the smaller size of the dataset meant this was more easily undertaken in respect to Oxford Journals database. Furthermore, the pilot nature of the study and its limited time frame, combined with the fact that Oxford Journals provided a comprehensive dataset covering all subjects and all institutions meant that much data analysed could not be evaluated. Nevertheless the data are there for future study should it be required.

The logs of Oxford Journals in respect to three subjects (History, Economics and Life Sciences) were analysed for a twelve month period, January to December 2007. Sixty one journals were covered: 11 History. 19 Economics and 31 Life science journals and the same institutions were covered, however in the case of the Government laboratories there was very little use indeed of History.

3.1 Usage profiles

- As was the case with ScienceDirect Life Sciences proved to be a giant in terms of usage, accounting for over 80% of all the page views to the three case study subjects covered. Admittedly, Life Sciences were pitted against subjects, which had relatively small journal populations. However, even so, as was the case with ScienceDirect, it more than punched its weight as it had only 50% of the journals.
- Over half a million pages were viewed over the 12 months, as compared to the 700,044 pages viewed over 4 months for ScienceDirect. What stood out most in terms of the use metrics was the much higher viewing of articles in HTML format in the Life Sciences, and the strong showing of History, where usage compared well with Economics, which had about three-quarters more journals.
- Average session times were uniform and a little longer on average than times for ScienceDirect. Platform differences might explain this. Page view times were computed for Oxford Journals and were around 97 seconds, with History recording a slightly lower figure of 94 seconds.

Table 57: Summary of key subject usage metrics

Subject	Total page views		Total full-text views		Total HTML views		Total PDF views		Sessions		
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*Ave. in secs*
Life Sciences (51% of journals)	509457	80.7	240037	84.3	101094	94.9	138943	78.0	192724	82.6	262
Economics	66827	10.6	25099	8.8	2567	2.4	22532	12.6	24490	11.5	261

(31% of journals)											
History **(18% of journals(**	54857	8.7	19598	6.9	2921	2.7	16677	9.4	16154	6.9	262
All case study subjects **(61 journals)**	631141	100.0	284734	100.	106582	100	178152	100	233368	100	

Use over time

- As mentioned earlier, one of the main reasons for undertaking a supplementary study of Oxford Journals was because its relatively small size meant it was easier and more economic to study use over time, over the full year. In fact, the study was well worth doing as it showed greater volatility than was observed in the four month (January to April) Elsevier study.
- In the cases of Economics and History, November proved to be the month in which most use took place (nearly 15% of annual use). For these two subjects, respectively, September and August were the quietest months when less than 5% of use occurred. In the case of the Life Sciences use was generally more even, with October the peak month (nearly 11% of use) and December the low month (around 6% of use).

Table 58: Use over time (monthly percentage of page views)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Life Sciences	%	8.9	8.9	10.0	7.8	8.9	7.0	7.2	7.3	6.8	10.6	10.4	6.3
Economics	%	8.8	10.7	9.9	8.7	10.2	4.7	4.3	5.2	4.2	11.4	14.7	7.2
History	%	9.5	9.9	9.7	7.1	8.8	5.9	4.2	3.4	4.7	13.9	14.9	7.9
All case study subjects	%	9.0	9.2	9.9	7.8	9.0	6.7	6.6	6.7	6.3	10.9	11.2	6.6

Table 59: Use over time: (average day of the week page views)

		2007	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	N	509,457	96,422	99,558	96,044	94,379	80,269	20,561	22,224
Life Sciences	*%*	100	**18.9**	**19.5**	**18.9**	**18.5**	**15.8**	**4.0**	**4.4**
	N	66,827	11,776	11,909	11,066	10,754	9,620	5,861	5,841
Economics	*%*	100	**17.6**	**17.8**	**16.6**	**16.1**	**14.4**	**8.8**	**8.7**
	N	54,857	9,964	10,323	9,238	10,052	7,951	3,536	3,793
History	*%*	100	**18.2**	**18.8**	**16.8**	**18.3**	**14.5**	**6.4**	**6.9**
	N	631,141	118,162	121,790	116,348	115,185	97,840	29,958	31,858
All case study subjects	*%*	100	**18.7**	**19.3**	**18.4**	**18.3**	**15.5**	**4.7**	**5.0**

Table 60: Use over time (average hourly page views)

		12-6am	6-8am	9-11am	12-2pm	3-5pm	6-8pm	9-11 pm
Life Sciences	*N*	12706	9471	112670	150338	152975	50254	21043
	%	2.5	1.9	22.1	29.5	30.0	9.9	4.1
Economics	*N*	4379	1301	10195	17417	18365	9394	5776
	%	6.6	1.9	15.3	26.1	27.5	14.1	8.6
History	*N*	1760	820	9949	17185	15968	5719	3456
	%	3.2	1.5	18.1	31.3	29.1	10.4	6.3
All case study subjects	*N*	18845	11592	132814	184940	187308	65367	30275
	%	4.5	2.8	31.8	44.3	44.8	15.6	7.2

3.2 Information seeking behaviour (session data)

3.2.1 Navigation

- Oxford Journals have been open to Google for some years now, and it showed. Around 40% of sessions arose from a Google search, a figure very similar to that for Physics in ScienceDirect, a subject which had been opened to Google the longest. Google access proved particularly popular with Historians, 45% of their sessions arose from a Google search. Google Scholar proved more popular too, and especially in the case of Economics, where 22% of sessions originated from Scholar.
- Advanced searching proved a little more popular than was the case with Elsevier, with, for instance, 2% of History sessions seeing it employed. Basic (internal) searching proved a little more popular, but nowhere near as popular as web engine searching. Historians proved to be the biggest users of the facility, with 10% of sessions seeing it employed.
- As with ScienceDirect menus provided the most popular way of finding content once in the database, although they did not provide quite so popular, and platform differences might well account for this. They proved most popular in the case of Historians, 43% of sessions featured a view of a menu.

Table 61: Method of access and navigation (sessions)

		Access		Search		Browse
Subject		**Google access**	**Google scholar**	**Advanced search**	**Basic search**	**Menus**
Life Sciences	*N*	74230	3291	3904	13118	79392
	%[35]	39%	2%	1%	3%	16%
Economics	*N*	8980	5332	757	3115	22341
	%	37	22%	1%	5%	33%

[35] percentage of all session for that subject

History	*N*	7325	1313	1170	5293	23755
	%	45%	8%	2%	10%	43%
All case study subjects	*N*	90535	9936	5831	21526	125488
	%	39%	4%	1%	3%	20%

3.2.2 Content viewed

- Despite the fact that a good proportion of History journals had abstracts, very few Historians viewed an abstract is a session. Three times as many Life Science and Economics sessions saw an abstract viewed. Maybe an abstract is less useful in arts subjects. In sciences it is probably fairly clear from the abstract how the result/conclusion of a paper fits with one's own research programme. An in depth argument requires repeating the experiment etc. For a History paper there is more likely to be argument in depth within the text of a paper; so Historians would be more likely to read (or more likely skim) the whole paper rather than an abstract.
- The average number of pages viewed in a session was within the parameters of what we have seen in Elsevier, there was just less variation in the case of Oxford Journals. Page number counts were quite similar for Life Sciences but a little less for Economics. The average number of articles viewed was the same for all fields and in line with what was found for ScienceDirect.

Table 62: Content viewed (sessions)

Subject	Volume	Form	Age/currency	
	Ave. no. of pages viewed	*Ave. no. of articles viewed*	*% viewing an abstract*	*Ave. age of article viewed (years)*
Life Sciences	2.7	1.1	16.0	
Economics	2.7	1.1	18.3	
History	2.8	1.1	5.2	

3.3 Journals used

Table 63 lists the most used journals for each field.

Table 63: Top twenty journals

Rank	Life Sciences	Economics	History
1	Nucleic Acids Research	Oxford Review of Economic Policy	English Historical Review
2	Human Molecular Genetics	Cambridge J. of Economics	History Workshop J.
3	Bioinformatics	Review of Finance	Social History of Medicine
4	Cerebral Cortex	Industrial and Corporate Change	Twentieth Century British History
5	Molecular Biology and Evolution	Oxford Economic Papers	J. of the History of Medicine and Allied Sciences
6	J. of Experimental Botany	World Bank Economic Review	French History
7	Carcinogenesis	World Bank Research Observer	J. of Semitic Studies
8	J. of Biochemistry	J. of Economic Geography	J. of Islamic Studies
9	Annals of Botany	J. of Financial Econometrics	Holocaust and Genocide Studies
10	Int Immunology	European Review of Agricultural Economics	J. of the History of Collections
11	Behavioral Ecology	Contributions to Political Economy	J. of Design History
12	Integrative and Comparative Biology	J. of Financial Econometrics	
13	J. of Petrology	Socio-Economic Review	
14	Plant and Cell Physiology	J. of Competition Law and Economics	
15	Protein Engineering, Design and Selection	CESifo Economic Studies	
16	MHR: Basic science of reproductive medicine	American Law and Economics Review	
17	Toxicological Sciences	Review of Finance	
18	Forestry: An Int J. of Forest Research	Review of Environmental Economics and Policy	
19	Glycobiology		
20	J. of Plankton Research		

3.4 History

Because History was not covered in the ScienceDirect investigation (and because of the length of this report) we are singling it out only for depth treatment and used it as the vehicle for reporting on institutional diversity. It has to be said, quite unlike ScienceDirect, there was not a level-playing field. There is a bewildering variety of arrangements by which institutions access the service which diminishes the value of the institutional comparisons. Thus only three case study institutions had rights to use the whole collection of journals: Bangor, King's College London and University of Manchester. Aberdeen had access to

about 60 titles across the various subject fields and CEH had about 11 in the Life sciences.

The other institutions had regular subscriptions to specific titles which will be established in the second phase of the project. In addition Oxford Journals provide some of their content for free:

- some titles made their recent archives freely available after a fixed period of time;
- some titles were completely open access;
- some were hybrid subscription/open access journals where some articles were freely available to all and some articles only to subscribers.

Also in 2006 OUP did a national deal with JISC which allowed any HE institution in the UK to register for access to the digitised archive (pre 1996 content). We believe most institutions signed-up for this.

The impact of all this on usage is not clear and we shall be investigating this in phase 2 of the project.

3.4.1 Usage profiles

- Cambridge, with a 5* department was clearly the super user in History, accounting for around a third of all usage according to most metrics. Manchester was a clear second. As might be expected the government laboratories made virtually no use of History journals.
- Interestingly – and something which bears out ScienceDirect findings – Swansea and Bangor conducted the longest sessions and the big users, like Cambridge, tended to conduct the shortest sessions. However, Strathclyde actually conducted the shortest sessions.

Table 64: Summary of key History usage metrics

Institution	Total page views	Total full-text views	Total HTML views	Total PDF views	Session numbers	Session time

	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*Ave. in seconds*
Aberdeen	1685	3.1	859	4.4	145	5.0	714	4.3	779	4.8	275
Bangor	3429	6.3	836	4.3	128	4.4	708	4.2	656	4.1	307
Cambridge	15505	28.3	5573	28.4	1001	34.3	4572	27.4	4891	30.3	266
Edinburgh	6393	11.7	2313	11.8	366	12.5	1947	11.7	1841	11.4	286
Manchester	13927	25.4	4793	24.5	548	18.8	4245	25.5	3998	24.7	254
Strathclyde	1540	2.8	546	2.8	75	2.6	471	2.8	418	2.6	189
Swansea	1907	3.5	800	4.1	128	4.4	672	4.0	632	3.9	310
UCL	5194	9.5	2066	10.5	303	10.4	1763	10.6	1749	10.8	243
CEH	0	0.0	0	0.0	0	0.0	0	0.0	0	0	0
Rothamsted	22	0.0	3	0.0	0	0.0	3	0.0	6	0	255

Use over time

There were big differences in monthly use at the institutional level. What stood out was: Swansea's high usage in January (15.9) and Bangor's high usage in November (20.2).

Table 65: Use over time (monthly percentage of page views)

		Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Aberdeen	%	7.0	7.1	7.1	15.1	9.1	4.4	4.9	3.0	4.9	17.1	12.9	7.5
Bangor	%	11.3	7.5	13.4	5.1	4.1	3.0	4.4	2.7	3.0	15.9	20.2	9.4
Cambridge	%	9.1	10.3	9.7	7.4	10.8	7.3	4.9	3.3	4.7	12.1	13.8	6.6
Edinburgh	%	11.6	10.6	7.8	4.7	5.0	4.0	3.9	5.4	6.6	17.4	15.8	7.0
Manchester	%	8.9	10.8	11.5	8.6	11.2	5.1	2.6	3.3	5.0	10.3	15.1	7.7
Strathclyde	%	7.9	14.4	11.8	5.0	7.0	2.7	3.6	3.8	3.4	17.1	16.7	6.5
Swansea	%	15.9	7.3	8.8	3.8	12.9	6.3	0.9	1.9	5.3	18.5	11.8	6.6

UCL	%	7.3	10.4	8.0	6.6	7.9	6.2	5.5	4.3	2.6	17.6	15.5	8.2
CEH	%												
Rothamsted	%	0	9.1	0	0	4.5	0	81.8	0	0	0	0	4.5

Bangor conducted much searching on weekends – 17.6% was conducted then. Levels generally were less than we have found with ScienceDirect. Thus take Cambridge, the super user, 11.2% of History searching was undertaken over the weekend. Economists at the same institution by contrast conducted 14% of their searching then.

Table 66: Use over time: (average day of the week sessions)

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Aberdeen	%	16.4	18.6	20.4	18.2	17.1	4.7	4.5
Bangor	%	16.2	16.9	15.1	19.2	14.9	5.9	11.7
Cambridge	%	17.8	18.4	17.2	18.7	16.7	4.9	6.3
Edinburgh	%	19.6	18.4	17.7	19.9	14.6	4.7	5.1
Manchester	%	18.5	18.9	19.2	17.3	14.3	7.4	4.4
Strathclyde	%	16.6	19.7	19.2	19.7	15.6	3.4	5.8
Swansea	%	18.4	18.7	19.0	19.4	16.7	2.9	4.9
UCL	%	17.8	21.5	18.6	18.9	14.9	4.5	3.7
CEH	%							
Rothamsted	%	66.7	16.7	0.0	0.0	16.7	0.0	0.0

3.3.2 Navigation

- Cambridge was the biggest user of Google, demonstrating that even super users appreciate its retrieval powers.
- Manchester proved to be the biggest GoogleScholar user, over 10% of sessions arose from its use.
- At Bangor more that half of all sessions saw a menu used; by contrast at Aberdeen the figure was less than half that (24%).
- The super users tended to use advanced search the least.
- There were large differences in regard to the use of the basic search facility, with Bangor employing it most (15% of sessions) and UCL and Cambridge the least (7%).

Table 67: Method of access and navigation (sessions)

		Google access	Google scholar	Menu use	Advanced search	Basic search
Aberdeen	*N*	402	71	411	61	206
	%[36]	52	9	24	4	12
Bangor	*N*	189	18	1745	123	517
	%	29	3	51	4	15
Cambridge	*N*	2662	269	7337	218	1013
	%	54	5	47	1	7
Edinburgh	*N*	918	163	2597	190	844
	%	50	9	37	3	12
Manchester	*N*	1310	433	6011	291	1454
	%	33	11	43	2	10
Strathclyde	*N*	180	41	660	34	169

[36] percentage of all session for that subject

	%	43	10	43	2	11
Swansea	*N*	272	53	615	32	228
	%	43	8	32	2	12
UCL	*N*	874	156	1999	61	387
	%	50	9	38	1	7
CEH	*N*	0	0	0	0	0
	%					
Rothamsted	*N*	5	0	7	2	9
	%	83	0	32	9	41

3.3.3 Content viewed

- Historians at UCL proved to be the busiest users, viewing 3.5 pages and 1.7 articles in a session.
- UCL Historians were also the biggest users of abstracts (viewed in 7.8% of sessions). By contrast Historians at Bangor only viewed abstracts in 2% of sessions.

Table 68: Content viewed (sessions)

Subject	Volume		Form	Age
	Ave. no. of pages viewed	*Ave. no. of articles viewed*	*% viewing an abstract*	*Ave. age of article viewed (years)*
Aberdeen	2.2	1.0	5.0	[The data will be added later]
Bangor	3.1	1.2	2.0	
Cambridge	2.9	1.1	4.9	
Edinburgh	2.6	1.1	3.9	
Manchester	2.4	1.0	6.2	
Strathclyde	2.4	1.2	4.8	

Swansea	2.5	1.2	6.3	
UCL	3.5	1.7	7.8	
CEH	0	0.0	0	
Rothamsted	2.2	1.2	4.5	

3.3.4 Journals used

- With just 11 titles on offer it was not surprising that they were all used at all institutions.
- The smaller journal pool for History meant that most institutions viewed the same titles (Table 69 & 70). The English Historical Journal was clearly top ranked in usage terms by all institutions that made use of History journals.

Table 69: History top ten journals

Rank	**Aberdeen**	**Bangor**	**Cambridge**	**Edinburgh**
1	English Historical Review	English Historical Review	English Historical Review	English Historical Review
2	French History	Twentieth Century British History	History Workshop J.	History Workshop J.
3	Twentieth Century British History	History Workshop J.	Social History of Medicine	J. of Islamic Studies
4	J. of the History of Medicine and Allied Sciences	Holocaust and Genocide Studies	Twentieth Century British History	Social History of Medicine
5	J. of Semitic Studies	French History	J. of the History of Medicine and Allied Sciences	Twentieth Century British History
6	History Workshop J.	J. of the History of Medicine and Allied Sciences	J. of Semitic Studies	J. of the History of Medicine and Allied Sciences
7	Social History of Medicine	Social History of Medicine	French History	J. of Semitic Studies
8	J. of Islamic Studies	J. of Semitic Studies	J. of the History of Collections	French History
9	Holocaust and Genocide Studies	J. of Design History	J. of Islamic Studies	Holocaust and Genocide Studies
10	J. of Design History	J. of Islamic Studies	Holocaust and Genocide Studies	J. of the History of Collections
11	J. of the History of Collections	J. of the History of Collections	J. of Design History	J. of Design History

Rank	Manchester	Strathclyde	UCL	CEH	Rothamsted	Swansea
1	History Workshop J.	Social History of Medicine	Social History of Medicine		English Historical Review	English Historical Review
2	Social History of Medicine	English Historical Review	History Workshop J.		History Workshop J.	Social History of Medicine
3	Twentieth Century British History	Twentieth Century British History	English Historical Review		J. of the History of Medicine and Allied Sciences	History Workshop J.
4	English Historical Review	History Workshop J.	J. of the History of Medicine and Allied Sciences		Social History of Medicine	Twentieth Century British History
5	J. of the History of Medicine and Allied Sciences	J. of the History of Medicine and Allied Sciences	French History			Holocaust and Genocide Studies
6	French History	J. of Design History	Twentieth Century British History			French History
7	J. of Semitic Studies	Holocaust and Genocide Studies	Holocaust and Genocide Studies			J. of the History of Medicine and Allied Sciences
8	Holocaust and Genocide Studies	French History	J. of the History of Collections			J. of Semitic Studies
9	J. of Islamic Studies	J. of Islamic Studies	J. of Semitic Studies			J. of the History of Collections
10	J. of the History of Collections	J. of Semitic Studies	J. of Design History			J. of Islamic Studies
11	J. of Design History	J. of the History of Collections	J. of Islamic Studies			J. of Design History

Table 70: Journals featuring in the top five lists of two or more institutions

History titles	Number of Universities
English Historical Review	10
History Workshop J.	9
Social History of Medicine	8
Twentieth Century British History	8
J. of the History of Medicine and Allied Sciences	6
French History	4
Holocaust and Genocide Studies	2

3.5 Conclusions

- The Oxford Journals data tended to support that of ScienceDirect.

- As with ScienceDirect the Life Sciences proved to be a giant in terms of usage and (again) more than punched its weight, accounting for over 80% of views to the three case study subjects, yet having 50% of the journals.
- An examination of use over the whole year showed that Life Science use was much more even throughout the year and that the most volatile period of the year was August to December, which featured all the use highs and lows of the year for History, Life Sciences and Economics.
- Google proved again to be a popular means of accessing journal services and data, being responsible for 40% of Oxford Journal sessions.
- Historians used and searched for information in very different ways from their scientific and social science colleagues, which is perhaps what we would expect – journal databases do not appear to make users conform to a standard form of behaviour. Thus for instance Historians used Google, advanced searching, basic searching and menus, abstracts a great deal less and recorded shorter page view times.

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Appendix 1 Definitions used in ScienceDirect analyses

Term	Definition/explanation
Alerts	There are four kinds of Alert: 1) AlertSearch_Alert which is a type of alert by which users can set to receive the results of a search for specific keywords on weekly, monthly or even daily basis; 2). AlertCitedBy_Alert, which is a feature which researchers can use whenever they view an article and this enables them to set an email alert to be notified whenever the article is cited by another article; 3) AlertTopic_Alert which is a topic alert by which users choose a subject category from a drop down menue (e.g. Chemistry) then they see a list of predifined topic alerts for that subjects (e.g. for Chemistry there are Analytical Chemistry, Chemistry, Electrochemistry and so on). They can choose one or a few of these and they will receive weekly alerts for that topic (a list of articles.); 4) AlertVolume_Issue is simply a ToC alert for specific journals
Citation	There are two types of citation activity mention in the logs: 1) Citation_Download; 2) CIted_By. The first is when a user wants to export the result of a search to endnote or ref man software. This option is also available as Export Citation on article pages, by which you can export the bibliographic information. Cited_By is an option available at the article level. When an article page is viewed it is possible to click on this option to see what other articles have cited the viewed one. If users activate a reference link within a session then this activity appears under gateway not sure about the following two
Gateway	Gateway is an Elsevier term that describes an access via a link that jumps direct to content. In these circumstances no publisher site menus or non content resource pages are used. It can be thought of as an enhanced referrer field that just lists sites resulting in a direct view of a ScienceDirect article. Links take the user directly to the article and no menus are viewed. Most users linked via gateways like pubmed, some users surfed from paper to paper but they were in the minority.
Menus	These are tables of contents, list of journals and subjects
Page views	This is the main usage indicator and includes the following types of pages: abstracts, articles, menus and search pages
PDF and HTML views	This is really a note about double counting). In some cases users viewed both the HTML and PDF version of the document in the same session. This should not be presumed to be the users choice. They are not offered a button choice between HTML vs PDF. What maybe happening is that users are directed - by a gateway - to one version then users may select an alternative version.
Session time	Last download time minus the first down load time. No last download time can be computed if the user views a single page hence no session time estimate for these users. Further the page view time of the last page viewed cannot be estimated and this cannot be included in the session time.*
Session numbers	Session id numbers are given in the ScienceDirect logs and these were used.
Unique journals viewed	These are unique journals viewed within subjects