

INFORMATION BEHAVIOUR OF
THE RESEARCHER OF THE FUTURE
A British Library / JISC Study



Case study I:

An evaluation of BL Learning: a website for younger
scholars

CIBER

University College London

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Table of Contents

1	Broad aim of the study.....	2
2	Background to Learning.....	2
3	Methodology.....	4
3.1	Characteristics of the BL Server Transactional log.....	5
3.2	Working definitions.....	6
4	Results.....	7
4.1	Learning v rest of BL site.....	7
4.1.1	Page views (usage).....	7
4.1.1.1	Daily page views.....	8
4.1.1.2	Page views by day of the week.....	10
4.1.1.3	Page views by hour of the day.....	11
4.1.1.4	Page view time.....	12
4.1.1.5	Users.....	12
4.1.2	Focus on Schools.....	14
4.1.3	Learning directory only.....	18
4.2	Page views by day of the week by organisational affiliation of user.....	18
4.2.1	Page views by day of the week for type of academic organisation.....	19
4.2.2	Page views by hour of the day by organisational affiliation of the user.....	20
4.2.3	Page views by hour of the day for type of academic organisation.....	21
4.2.4	Page view times by various user characteristics.....	22
4.2.5	Session analysis.....	23
4.3	Sessions conducted by organisational affiliation of the user.....	26
4.3.1	Sessions conducted by type of academic organisation.....	26
4.3.2	Sessions conducted by referrer link used.....	27
4.3.3	Sessions viewing a Learning page only.....	28
4.4	Day of the week by organisational affiliation.....	28
4.4.1	Day of the week by type of academic organisation.....	29
4.4.2	Hour of the day by organisational affiliation.....	30
4.4.3	Hour of the day by type of academic organisation.....	31
4.4.4	Hour of the day by organisational affiliation for UK user only.....	32
4.4.4.1	Views in a session by hour of the day of UK academic sessions only.....	33
4.4.4.2	Site penetration (number of views in a session).....	34
4.4.5	Session length by type of academic organisation.....	36
4.4.6	Use of search facility.....	37
4.4.7	Day of the week page views by referrer link.....	38
4.4.8	Hour of the day page views by referrer link.....	38
4.4.9	Site penetration by referrer link.....	39
4.4.10	Session time by referrer link.....	41
4.4.11	Referrer link across organisational affiliation.....	42
4.4.12	Referrer link across type of academic organisation.....	42
4.4.13	Search facility use by referrer link.....	43
4.4.14	Micro-analysis: schools.....	44
4.5	Search expressions.....	46
4.6	Questionnaire survey.....	53
4.7	Conclusions.....	61
5	Recommendations.....	63
6		

1 Broad aim of the study

As part of the Behaviour of the Researcher of the Future project two academic information services were subjected to deep log analysis evaluation in order to obtain a current picture of the information seeking behaviour of the virtual scholar. This was done to update and enhance earlier CIBER e-journal and e-book findings, largely based on commercial services. There was also the need to focus more strongly on the behaviour of younger people and the CIBER studies covered all age groups. This is the report of a service nominated by The British Library, BL learning, an information service for teachers and learners of all ages, but in regard to the latter the target group looks very much like younger learners, and in that has special appeal.

It proved possible to compare the usage and information seeking behaviour of young people: 1) from different countries/regions (United States, UK, European Community etc); 2) from different types of academic institution (schools, universities), and, therefore, ages; 3) searching from home and place of work. It was also possible to compare the information seeking behaviour of young people with that of the general population at large (by comparing use of Learning with use of the rest of the BL site). Valuable information on the changing nature of young people's information seeking can also be obtained through an analysis of the referrer link used (the site they came from) as it is possible to identify those that have arrived from blogs, FaceBook and Wikipedia.

A questionnaire was also used to obtain background data on the kinds of people that used the website and unsuccessful attempts were also made to relate user demographics directly to individual usage as represented in the logs.

2 Background to Learning

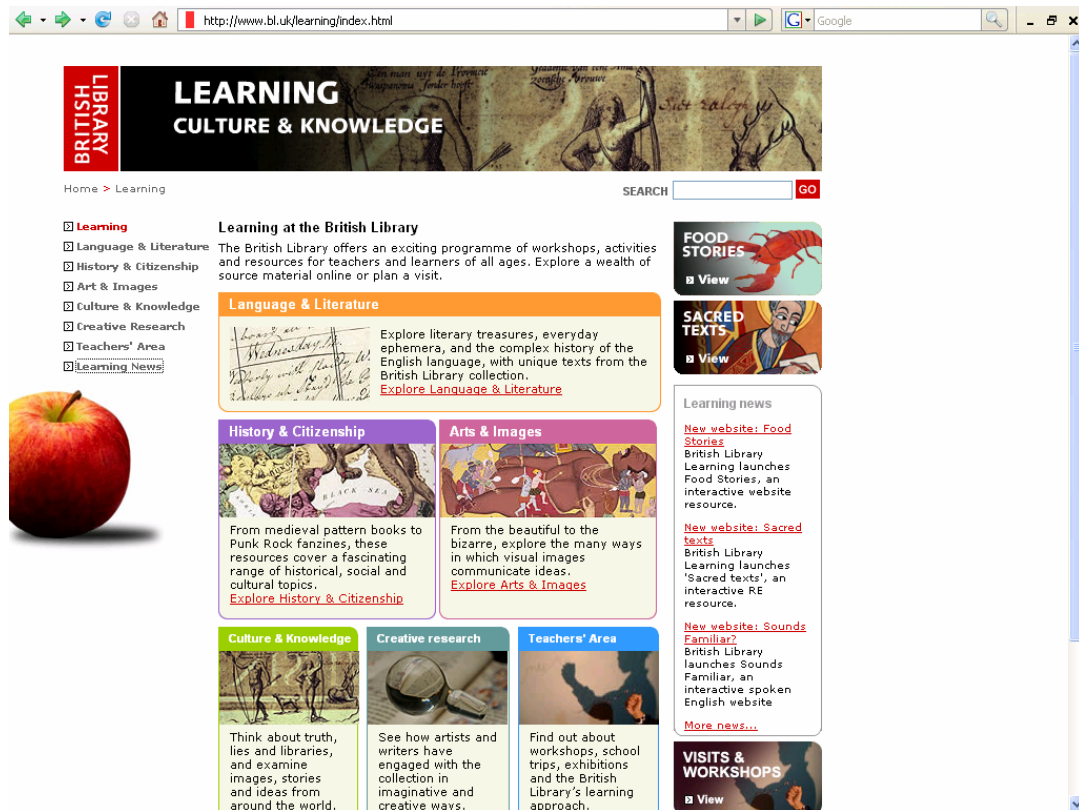
The Learning website offers a programme of workshops, activities and resources for teachers and learners of all ages, which is a section of the main BL website and featured on the homepage. In theory then it should be easy to find. Under the Learning graphic on the homepage it is possible to click through to: a) 'Explore Learning Resources Online'; b) Book a workshop. Clicking on the former takes us to the following categories (Figure 1):

1. Learning. (This is homepage)
2. Language and Literature (www.bl.uk/learning/langlit/)
3. History and Citizenship (www.bl.uk/learning/histcitizen/)
4. Art and Images (www.bl.uk/learning/artimages/)
5. Culture and Knowledge (www.bl.uk/learning/cult/)
6. Creative Research (www.bl.uk/learning/cresearch/)
7. Teachers' area (www.bl.uk/learning/tarea/)
8. Learning News (www.bl.uk/learning/news/)

The list below shows the full structure and hierarchy of BL Learning site and its menu. Each of the second level menu options may have some sub-sub sections.

1. Learning
2. Language and Literature
 - I. Changing Language
 - II. Books for Cooks
 - III. Texts in Context
 - IV. Dictionaries and Meanings
 - V. English Literature
 - VI. Sounds Familiar?
3. History and Citizenship
 - I. Voices of the Holocaust
 - II. Food Stories
 - III. Campaign for Abolition
 - IV. Front Page
 - V. Citizenship: Dreamers & Dissenters
 - VI. Medieval Realms
 - VII. Trading Places
 - VIII. Making of the U.K. 1500-1750
4. Art and Images
 - I. Mapping History
- II. Bodies of Knowledge
- III. Why Write?
- IV. Sacred Book
5. Culture and Knowledge
 - I. Sacred texts
 - II. Bodies of Knowledge
 - III. Inside Story
 - IV. Ideas Storage Zone
 - V. Disinformation
6. Creative Research
 - I. Lizzie Ridout
 - II. A Little Dust Whispered
 - III. Magical Worlds
 - IV. Sweet Temptation
 - V. Research Skills
7. Teachers' area
 - I. Workshops
 - II. Projects
 - III. Learning Approach
8. Learning News

Figure 1: Homepage of BL Learning Website



It should be noted that on the right hand column items from the various sub-directories are featured, in the case of Figure 1, Food Stories (from History and Citizenship) and Sacred Texts (from Culture and Knowledge). This raises their visibility considerably and would be attractive to those preferring a graphic approach to navigating towards content.

3 Methodology

Logs

One month's (April 2007) of server transactional logs were provided by BL for the purpose. In all, but excluding robots and mechanical agents, about two and half (2,451,271) million pages were viewed during this period; of this figure over one in ten (13.4%) were views to pages specifically located in the Learning directory. There were about half a million (563,238) separate Internet Protocol (IP) numbers and of these 647 (0.1%) related to schools, our target group. Nearly a third of school use originated in London.

Questionnaire

It was hoped to link log data with user demographic and attitudinal data by linking it with a pop-up questionnaire which was hosted on the BL Learning site from 12th September 2007, rather later than wished (it was originally planned for end of June and then the holidays got in the way to delay it even further). Responses to the BL pop-up questionnaire were only running at about 3 a day until the 24th so on the 24th an email inviting people to respond was sent out and people could respond to the questionnaire by clicking on a link. They did not have to visit the BL site to respond to the questionnaire. About three quarters of responses were from the click-thru rather than a popup appearing during the users BL session. Unfortunately we could not link BL site use of those responding to the questionnaire via the email invitation because they did not use the site at that time.

Thus of the 401 completed online questionnaires that were delivered to UCL by end of September just 83 questionnaires were linked to the logs by IP number. Of these 83 just about half (41) had visited on the same day as the questionnaire was answered and were also unique IP numbers. These users probably responded to the pop-up questionnaire at the time of use. Nine of the questionnaires (about 10%) had just visited once in the period and hence may not be related to floating IP or IPs related to proxy servers. Hence this gave a figure of 50 questionnaires that could be linked to IP numbers but these were people of all ages and only 3 questionnaires could be linked to the age group 24 and under. It was decided instead to conduct a micro analysis of the data. Here all IP numbers linked, irrespective of date and amount of usage, were included in the study and usage studied. This procedure resulted in 6 users being included in the study.

3.1 Characteristics of the BL Server Transactional log

The following box gives an example of a line from the BL transactional server log file. The Domain Name Server address has been made anonymous by substituting xxx's for first sets of digits.

```
xx-xx-xxx-xxx.cable.ubr05.smal.blueyonder.co.uk - - [01/Apr/2007:13:19:46 +0100] "GET /search/learning/search?q=dartmoor+&output=xml_no_dtd&proxystylesheet=public_learnin g&client=public_learning&site=public_learning&btnG.x=10&btnG.y=7 HTTP/1.1" 200 13849" "http://www.bl.uk/learning/langlit/texts/tourists/townandtourists.html" "Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.1; SV1; .NET CLR 1.1.4322)"
```

The IP (Internet Protocol) number is a numeric address that is given to users connected to the Internet. In the BL logs the numbers have automatically been processed and the Domain Name Server or registered details of the corresponding IP is given. DNS information was not available for about 18% of IP numbers. DNS registration provides categories for organizations to register under, thus: .ac for academic organizations though most European universities do not follow this convention; .edu for US academic institutes; .net for ISP providers; and .co (.com for US) for commercial providers. However, few ISP companies follow the net registration code, for example, Btinternet.com. In the above example blueyonder.co.uk is in fact an ISP but has registered in the

UK as a commercial company. DNS can give an indication of country location. However, many users with a DNS address registered in the US are not in fact located in the US.

The date and time is the date and time stamp of when the file was sent to the user's computer. The file name gives an idea of the type of download. In this example the user has conducted a search and has searched for 'Dartmoor'. Following the download information includes status of delivery (codes 200 and 304 or successful downloads) and number of bytes downloaded. The refer information follows this and gives the last page that the user had viewed. Here the user had viewed townandtourists.html in the learning (langlit) directory. The browser details of the client computer follow this.

3.2 Working definitions

Use

We have employed three 'use' metrics – number of pages viewed, number of sessions conducted and amount of time spent online, in order to get more accurate estimates of activity. Pages here are a download in response to a request includes a menu or an actual content page. Page view time is estimated by the difference in time between one page and the next page viewed. No estimate can be generated for the last page viewed in a session, because there is no log off recorded in the logs.

Site penetration

This measure looks at the number of pages viewed during the average visit. It indicates how deep into the service users penetrate or burrow; how much they take away with them. This is determined by counting the number of items viewed by a particular user during a visit to the site or service.

Users

To really make the most of logs – exercise the DLA techniques, we need to identify individual users and obtain some general characteristics about them. This is not easy. Web logs provide a user 'trace', but not real user or individual identification. All we had to work with is the Internet Protocol (IP) number, which provided us with the name of the institution to which the user belonged. However, the IP number cannot be traced back to an individual, only to a machine. The use of proxy servers, network address translation (NAT) etc mean that the IP address cannot be assumed to relate to use on a specific machine and use might also relate to a group of users, rather than an individual. This pattern of use can be inferred by looking at the amount of use (time and traffic) attributed to a single internet protocol (IP) address, where this is high the computer was classified as having used a proxy server.

Furthermore, access to a site may be via a multiple user machines, such as library machines, or the IP number might have been allocated temporarily to a client's machine (floating IP numbers). Hence the IP number assigned to a machine in one period may not correspond to the IP number assigned in another period. Hence the identification of returning users is especially difficult.

The identification of users can be improved using additional log fields or devices. Sub-network information enables users to be identified by subject and academic status (see below). By relating documents used to a subject classification we can also identify the subject background of the user another way. Cookie technology, which sits on the client's machine and is recognised by the server as an identification tag, can be employed to help overcome these problems. Clearly the monitoring of all activity on a client machine is possible but would probably be too intrusive in an academic environment.

University and School identification. We were clearly interested in identifying use emanating from universities and schools as this would suggest we were hitting our target of young researchers. JANET provided a list of IP ranges used by schools (School names and identities were not supplied) and this list use was used to identify school users.

UK universities were identified by whether .ac.uk appeared in the DNS name, US universities were identified by if .edu appeared in the last section of the DNS name and EU universities were identified from a database of the top 500 EU universities assembled for the purpose.

Robots

Robots are electronic agents used by search engines and organisations to log, cache, update links (RSS) and index pages into a database. Robot activity is recorded as a use in the log file. Robots were identified by a variety of methods including their visit to the "Robot.txt" file, from known lists of robots (Googlebot, Inktomisearch etc.), a particularly fast page view time (two seconds or less), repeated viewing of the same page, the downloading of hundreds of pages within the same session sharing the same page view time. Well over half (58%) of overall BL site use can be attributed to robot usage. Robots were excluded from the analysis, because it was clearly human information seeking behaviour that we were interested in.

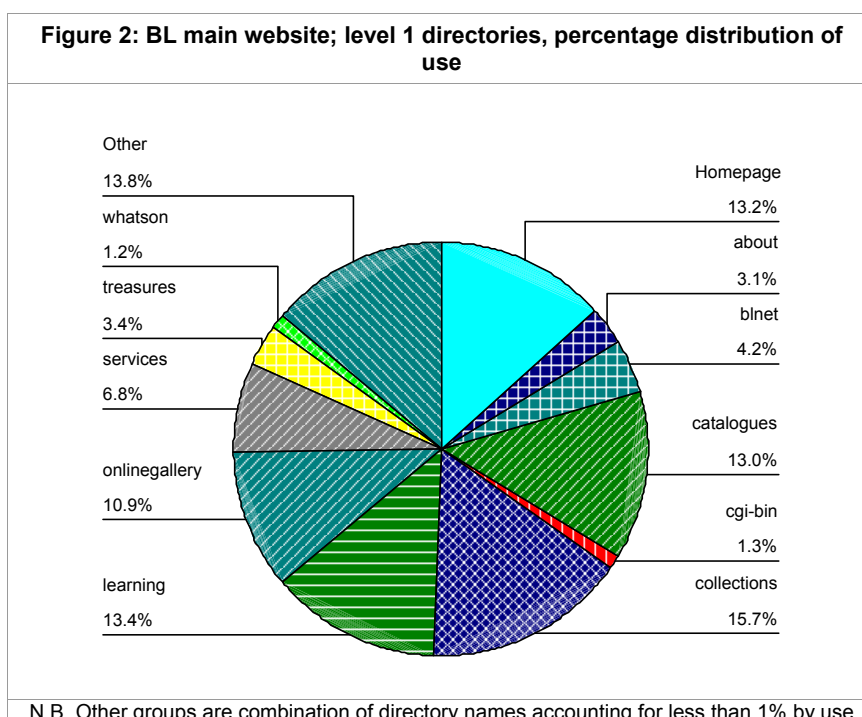
4 Results

4.1 Learning v rest of BL site

4.1.1 Page views (usage)

Comparisons were made between users of the Learning site and the rest of the BL site, an analysis which provided us with data on whether the apparently younger users of Learning behaved differently with the somewhat older users of the rest of the site.

Figure 2 gives the distribution of use for the whole BL site by level 1 directory used. Learning made up about 13.6% of use, Collections 15.9%, Catalogues 13.2% and the onlinegallery 11.1%. This would appear to be a relatively good performance on the part of Learning as Collections and Catalogues are clearly what the BL has been associated with for a long time and one would naturally expect people to go to the BL for them.

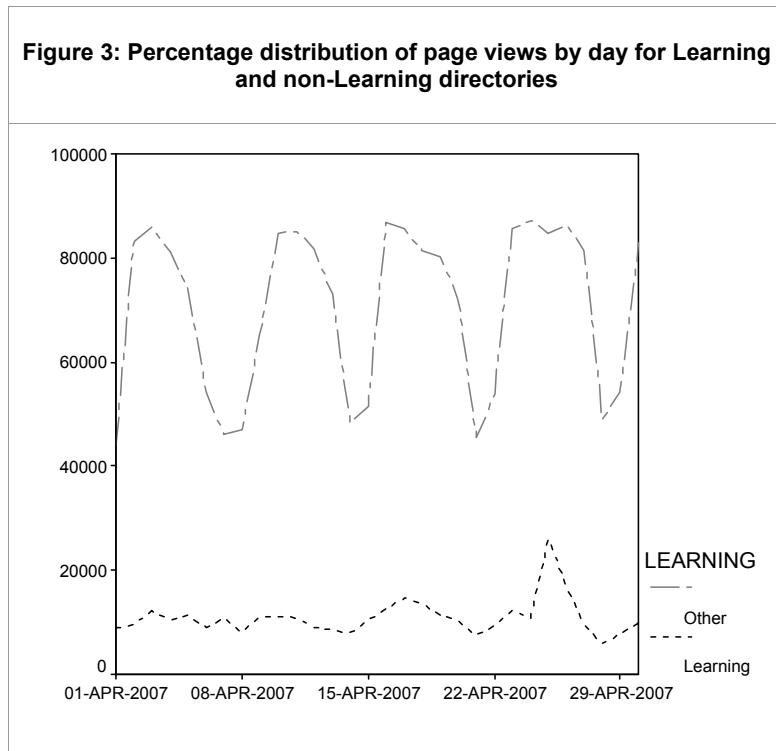


4.1.1.2 Daily page views

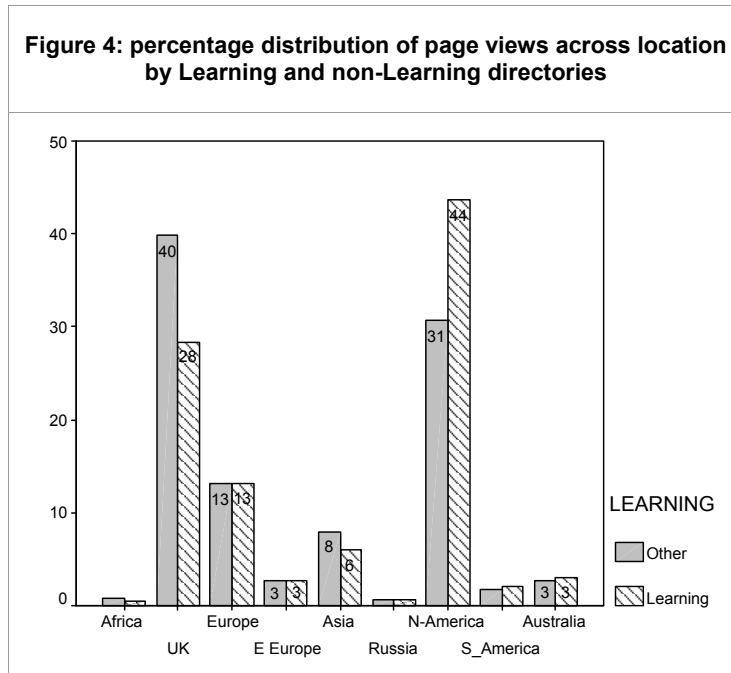
Figure 3 gives the frequency of download views by day for April 2007 broken down by the Learning site and non-Learning (other) site page use. There appears to be a strong pattern regarding non-Learning (other) page use. Weekdays recorded between 80,000 and 90,000 views a day, while weekends recorded just about half this amount (about 45,000 views per weekend day). Average daily downloads for non-Learning was 72,795¹; weekend days recorded a lower average of 50,558 and weekdays recorded a higher average of 82,326. There appears to be much less of a pronounced pattern with the Learning site, where there was about 10,000 views a day to pages in the Learning directory. Average daily downloads for Learning was 13,000;

¹ From BL retrospective statistics shown to the research team April saw a big surge in usage due to the launch in late March of a site called Sounds Familiar

weekends recorded a lower average of 10361 and weekdays recorded a higher average of 14,130.

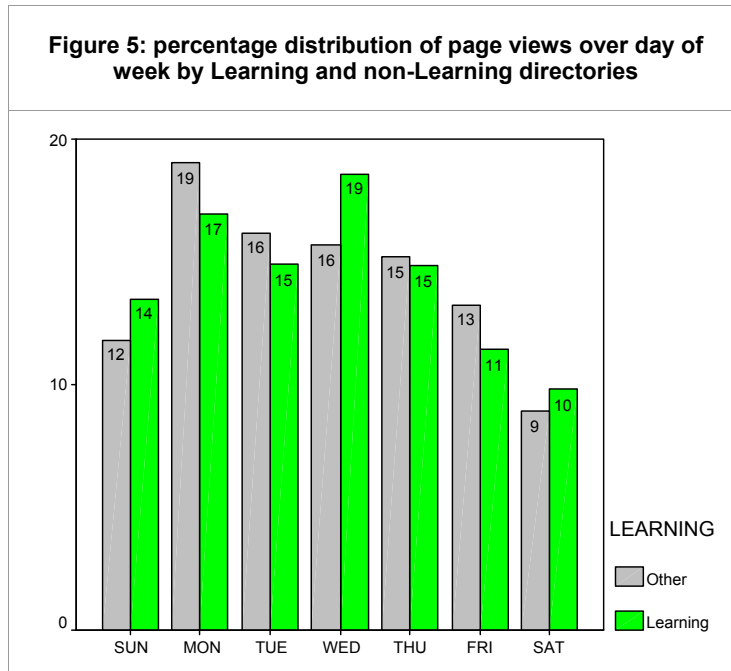


In terms of geographical location most use came from UK and US. US users accounted for 44% of views to Learning pages; by comparison just 28% were accounted for by UK users.



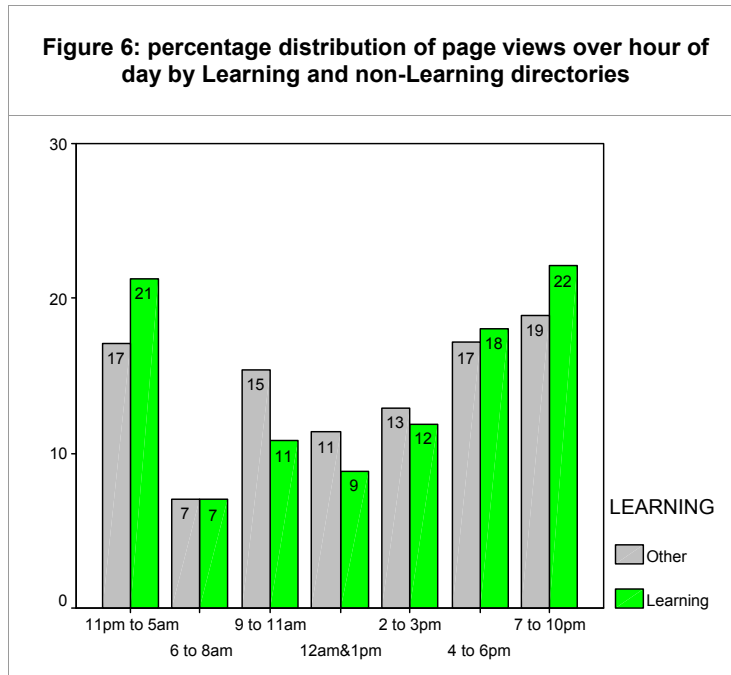
4.1.1.3 Page views by day of the week

In terms of day of week (Figure 5) pages in directories other than Learning tended to attract the most use on Mondays (19%) while the Learning directory was most accessed, for this one month study, on Wednesdays (19%). Fridays attracted the least weekday usage for both groups (13% and 11%). Weekend use attracted lower usage compared to weekdays and Saturdays (9% and 10%) recorded less than Sundays (12% and 14%). Use, as a percentage distribution over weekends, of the Learning directory was higher compared to than of other directories.



4.1.1.4 Page views by hour of the day

Figure 6 gives the page view distribution over hour of the day for the Learning and non-Learning (other) directories. There appears to be a raised level of use of the Learning site during the evening (7pm to 10pm) and night (11pm to 5am). About 43% of Learning use and 36% of non-Learning (other) directory usage occurs between 7pm and 5am. There was a build up of use through out the day and there is not a specific lunch hour peak suggesting that users were using the service as part of their work rather than using the service recreationally.

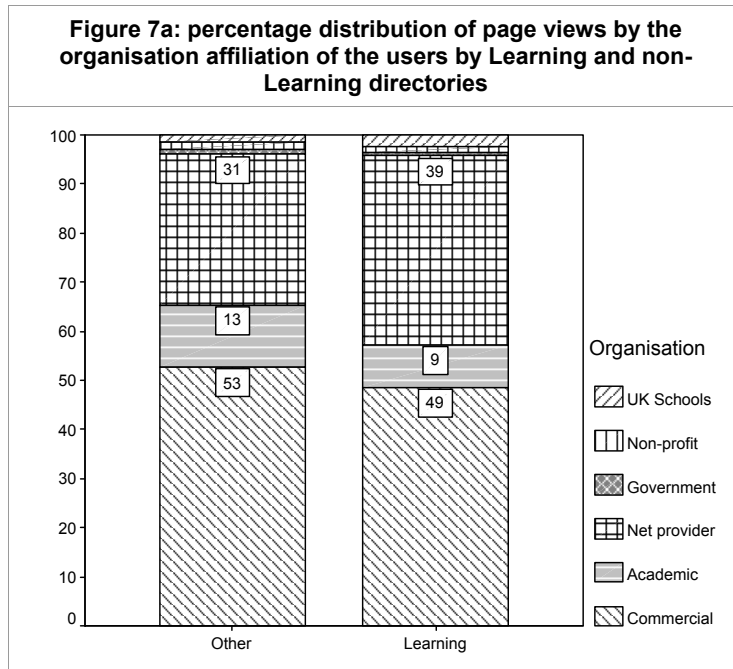


4.1.1.5 Page view time

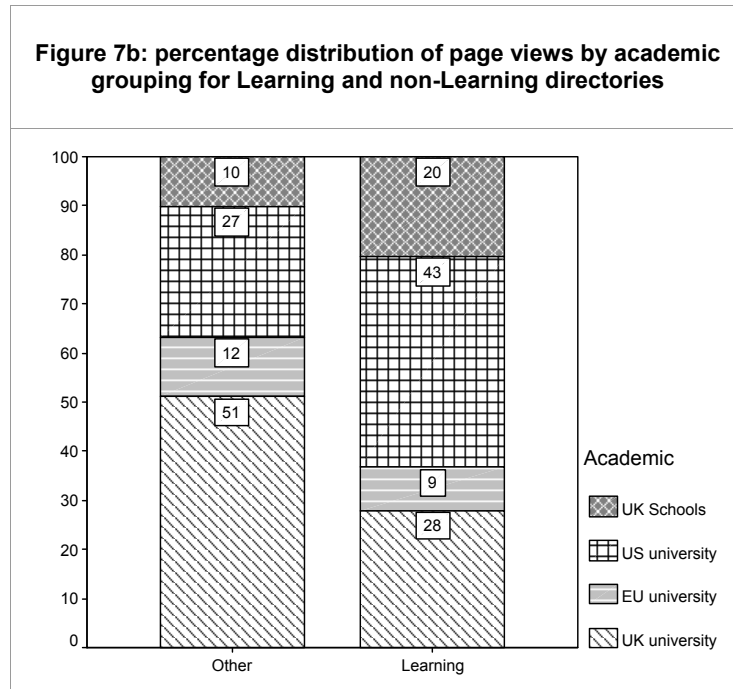
In terms of page view time those people visiting the Learning site recorded a faster view time of about 14 seconds compared to 17 seconds for those viewing non-Learning (Other) directory pages. These of course are very fast times but we have found short viewing times a feature of the virtual scholar everywhere we have conducted research.

4.1.2 Users

In regard to organisational affiliation of the users (Figure 7a) the Learning directory pages appeared to attract great use from people coming in via an Internet Service Provider (Net/ISP): 39% compared to 31% for users of the rest of the site. Non-Learning (Other) directories, ironically, appeared to attract a greater academic usage 13% compared to 9%, which might be surprising. However, UK schools made up 2.5% of Learning users compared to 1.6% for Other BL.



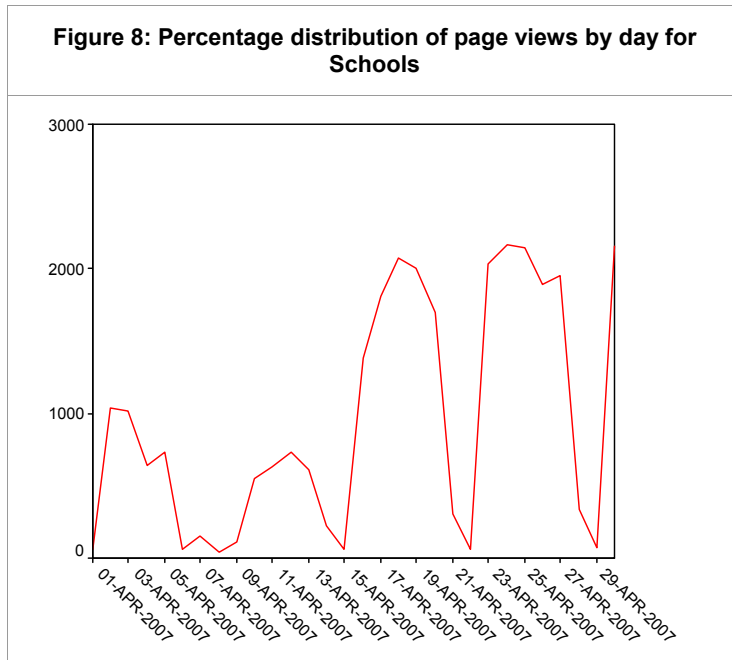
Academic use was further sub-divided into that for UK schools and US, EU and UK universities. Figure 7b gives this academic usage percentage share breakdown across Learning and non-Learning (Other) directories. Interestingly, as a percentage share, US universities were the biggest users of the Learning directory. US universities accounted for 43% of the academic usage of Learning pages but only made up about a quarter (27%) of non-Learning (Other) pages. UK universities made up a half (51%) of academic usage of the non-Learning (Other) pages but only 28% of Learning pages. Usage (page views) by UK schools made up 20% of Learning pages and about 10% of pages from other the other BL directories.



4.1.3 Focus on Schools

This section focuses on school use and Figures are based on views to learning and non-learning sections.

Figure 8 gives the frequency of pages viewed by day for April 2007 for school use only. For the period school use amounted to 29,437 views this made up about 1.2% of all views. March covered a holiday period and the start of term. There was a jump in weekday usage with the start of term, 16th April, from about 750 views per week day to just under 2,000 views a day. Weekend use, as might be expected, from schools was low.



Approaching a third (29%) of school usage originated in London, use between the other regions was pretty evenly distributed with each accounting from between 8 to 10%. Northern Ireland (1.8%), the North West (2.2%) and Northern (3.5) did not perform so well, so quite a bit of diversity throughout the country.

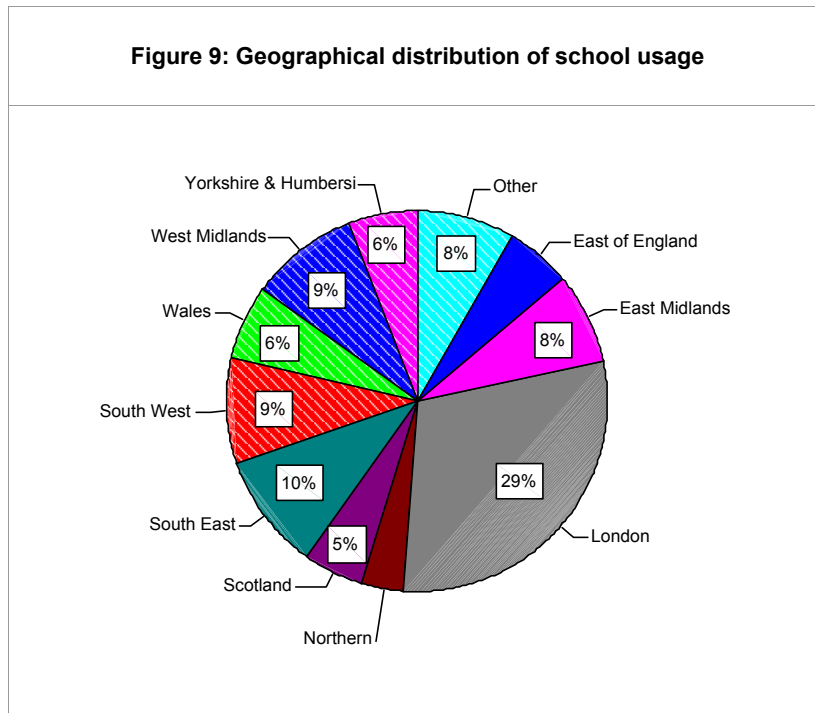


Figure 10 gives the distribution of use from schools for the whole BL site by level 1 directory. Learning made up about 20% of use, Collections 15%, the onlinegallery 12% and Catalogues 8%. This is what might have been expected.

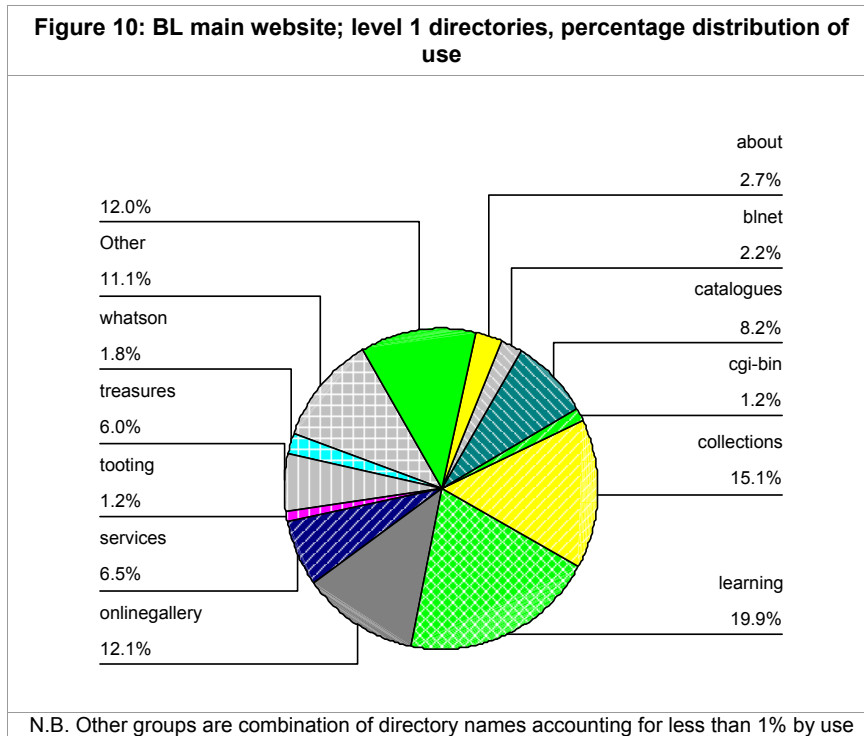
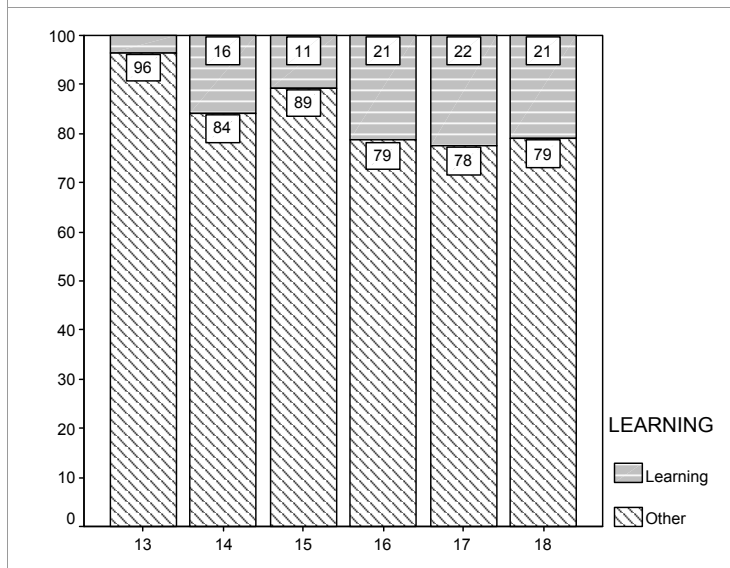


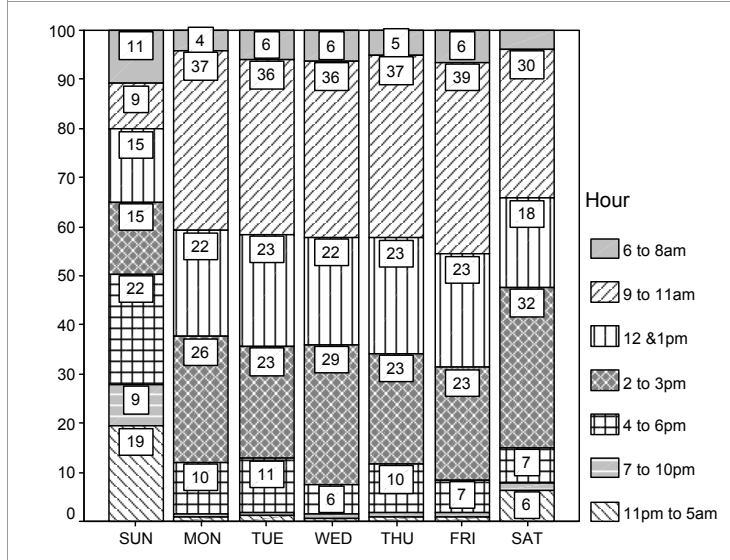
Figure 11 gives the percentage share of usage broken down by whether usage related to the Learning directory or non-Learning (Other) directories by week of use. The share of learning use increased during the school period weeks compared to the Easter holiday from about 11% to 20%. For Figure, 11 weeks 13 to 15 fell within the Easter break.

Figure 11: share of usage broken down by directory (Learning and non-learning) and week



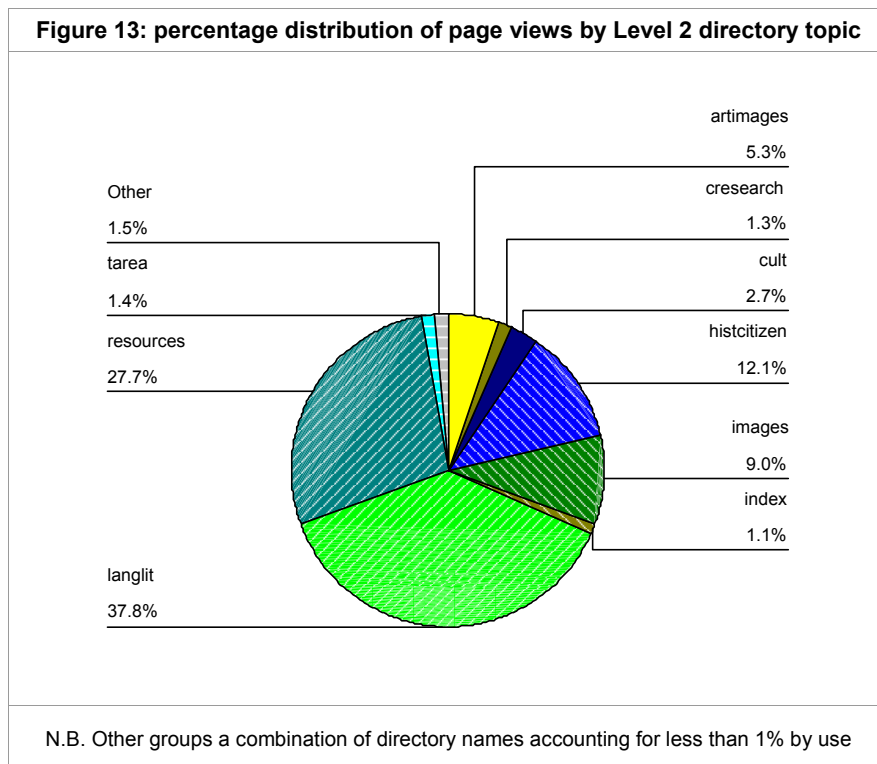
In terms of UK school use by day of week just 1.2% of weekly use occurred on Sundays, 3.4% occurred on Saturdays and about 20% of weekly use was recorded for weekdays, marginally more on Mondays (23.2%) and less on Fridays (14.7%). In terms of time of access most school use, about 85%, occurred during the day time period between 9am and 3pm. Over a third of use occurred during the period 9 to 11 am and a quarter between 12 and 1pm and 2 to 3pm.

Figure 12: School usage broken down by hour of day and day of week



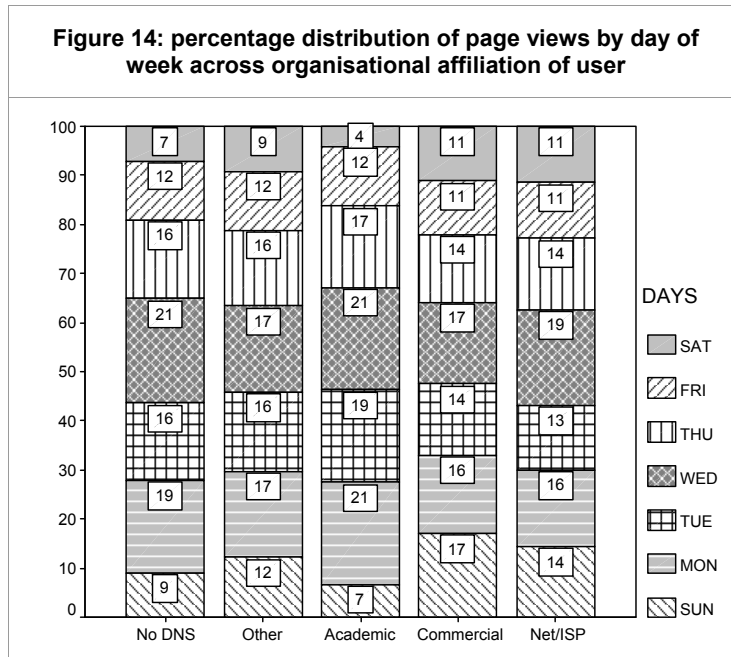
4.2 Learning directory only

This section only examines usage within the Learning directory. Language and Literature (langlit) attracted the most use (38% of page views) and this was followed by resources (28%). The latter is a directory that is used to store content files, like PDF and flash and sound files) and its high usage is probably down to the high usage of Sounds Familiar which contains a Flash maps on its homepage. These subjects were followed by History and citizenship (12%), and images, 9%. The Teachers section (tarea) accounted for just 1.4% of page views. However this might be expected as it just contains information on booking a school visit and school projects. The whole Learning website is for teachers and the BL would expect them to use the various resources for lesson ideas and in class. Culture and Knowledge appears to be an unpopular area (2.7%).



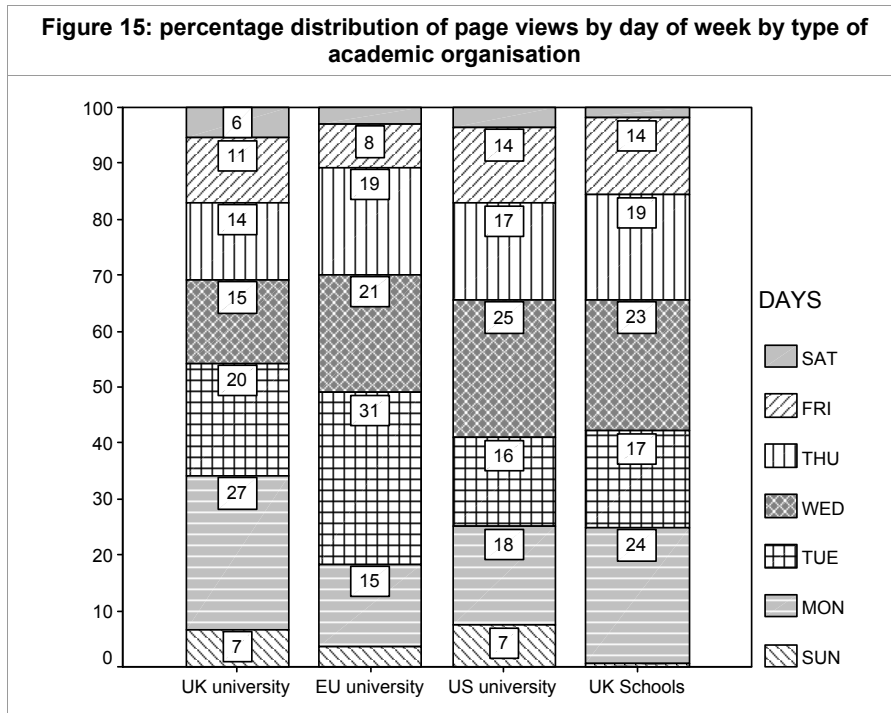
4.2.1 Page views by day of the week by organisational affiliation of user

There appears to be a greater commercial and Net provider use at weekends; about 28% of commercial use occurs at the weekend compared to 11% of academic usage. These were users connecting via ISP (Internet service Providers) and were most likely to be surfing from home.



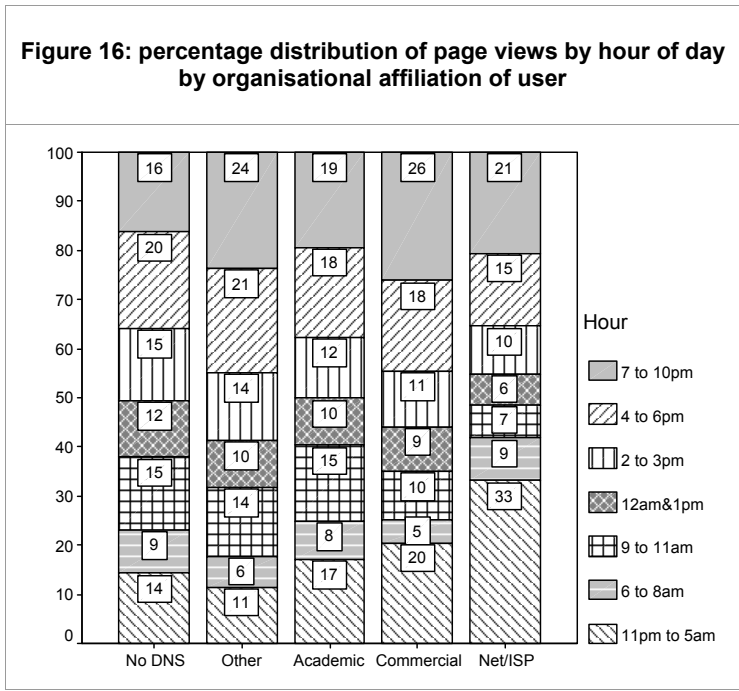
4.2.2 Page views by day of the week for type of academic organisation

Figure 15 breaks down page views by day of week by type of academic organisation. A high proportion of EU university use was recorded on Tuesdays (31%), while school usage was highest on Mondays (24%), as was UK university use (27%). These figures may be biased as schools are underrepresented and usage by one user may well have a greater impact.



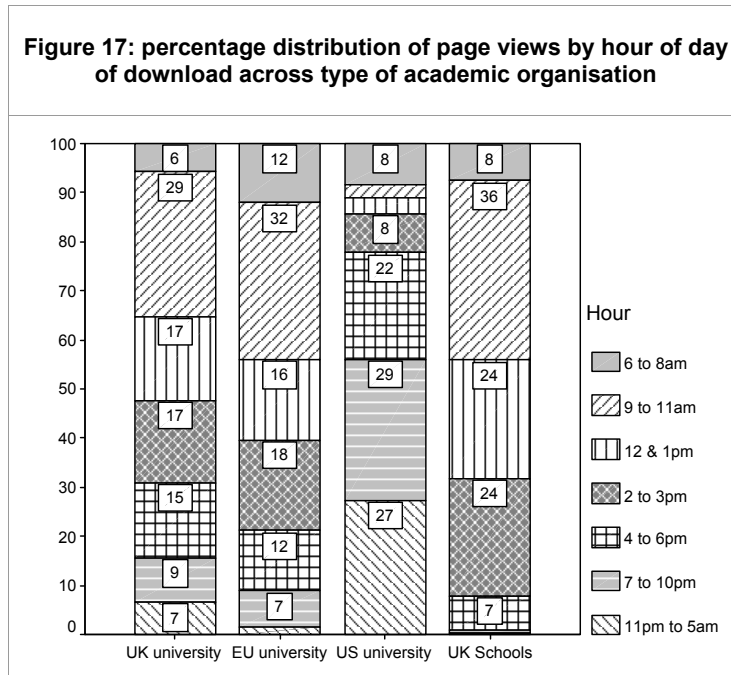
4.2.3 Page views by hour of the day by organisational affiliation of the user

In terms of hour of day those entering via a commercial and net/ISP organisation were more likely to access the service in the evening and night (UK time) about 46% to 54% did so. This may reflect US usage as well as evening UK usage.



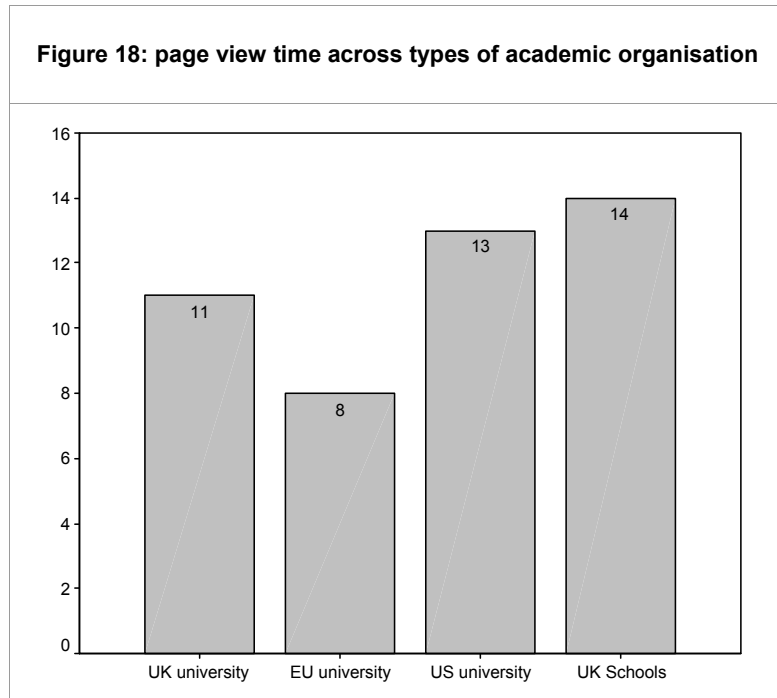
4.2.4 Page views by hour of the day for type of academic organisation

Figure 17 breaks down the share of hourly (grouped) page views by academic group. US universities mainly (57%) used the BL Learning service in the evening (7 to 10pm) and night (11pm to 5am) UK time. US users are on average about 6 hours behind and this puts their usage on a similar pattern to the UK. UK universities appeared to use the service through out the day with a noticeable peak (29%) in the morning (9 to 11am). This was also true of school use with over a third (36%) of usage occurring between 9 to 11am.



4.2.5 Page view times by various user characteristics

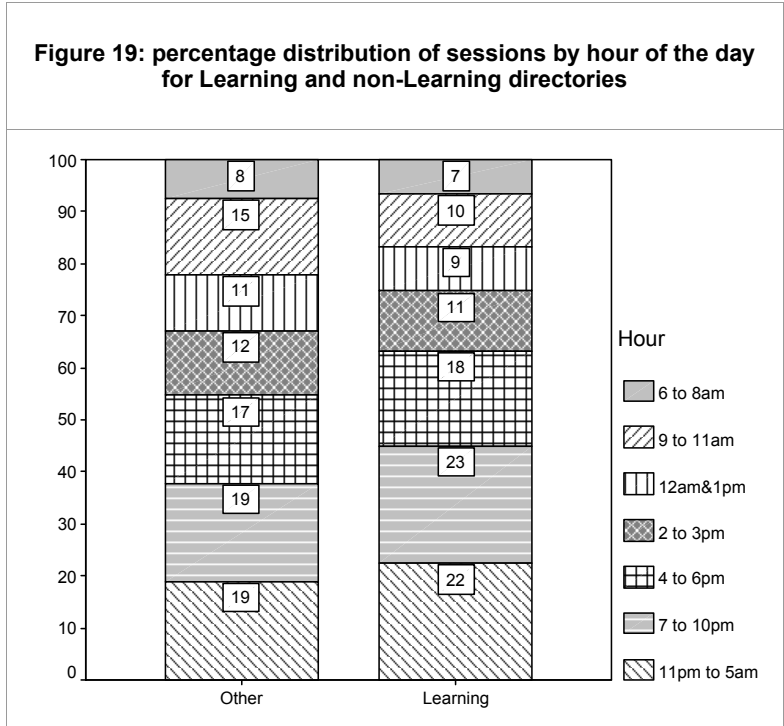
There was quite a difference in view times between types of academic organisation with schools generally recording a high view time of 14 seconds. EU universities recorded a low page view time of 8 seconds.



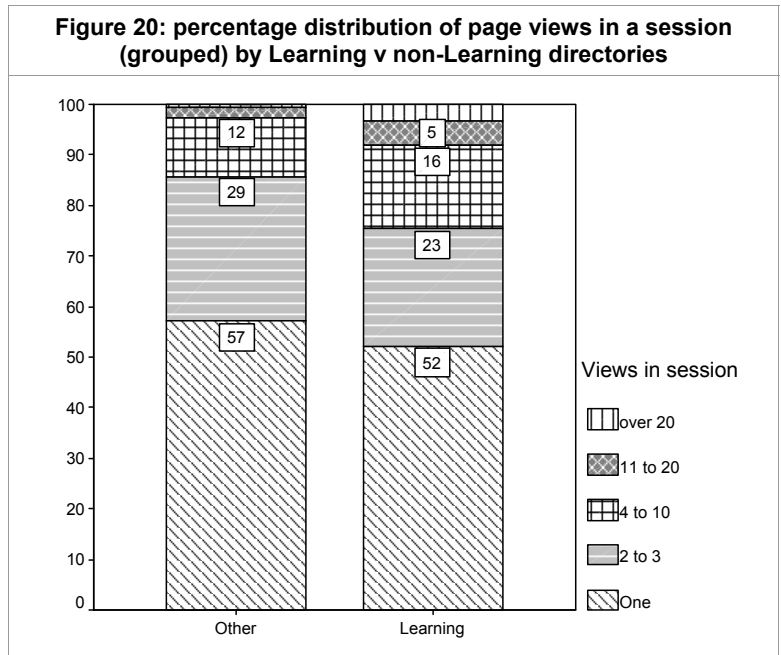
4.3 Session analysis

The following section looks at sessions, first comparing the Learning directory with non-Learning (other) directories and then looking in detail at the Learning directory.

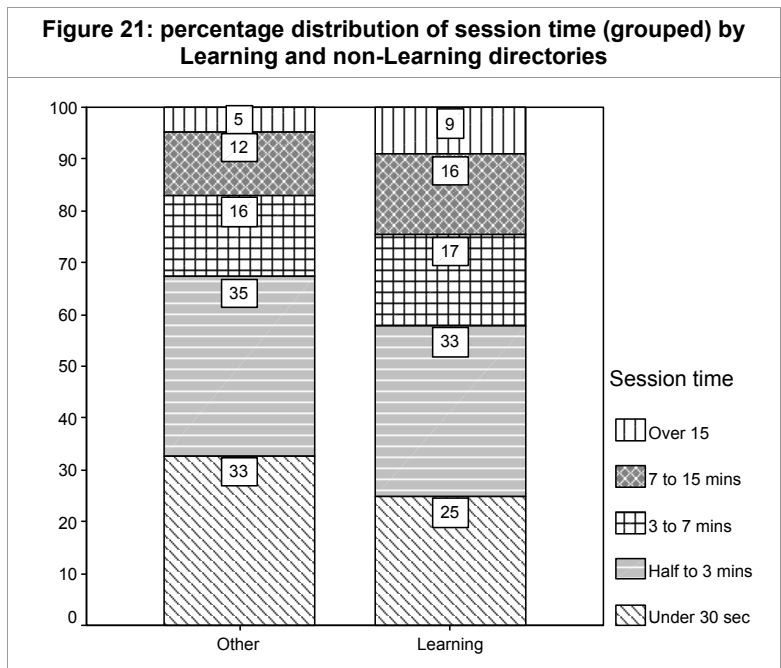
Just 10% of sessions included a view to at least one page from the Learning directory. In terms of sessions conducted over day of week there was little difference between the Learning and non-Learning (other) directories. With regards to hour of usage there was raised usage of the Learning directory between 7pm and 5am (UK time) - 45% of sessions compared to 38% for non-Learning (other) and a lower share of use between 9am and 6pm (UK time) 30% compared to 38%.



In terms of number of pages viewed most sessions saw just one view. Non-Learning (other) directories recorded a slightly higher percentage of sessions just completing a single view; 57% compared to 52%. There was a raised incidence of Learning sessions viewing 4 or more pages compared to non-Learning (other) directories: 25% compared to 14%, suggesting perhaps a higher level of research use? The high incidence of single page sessions is a result of the high incidence of users finding BL using a search engine. Search engine users rely on the search engine to directly access content and the user cycles through search engine returned matches picking up content as they do this.

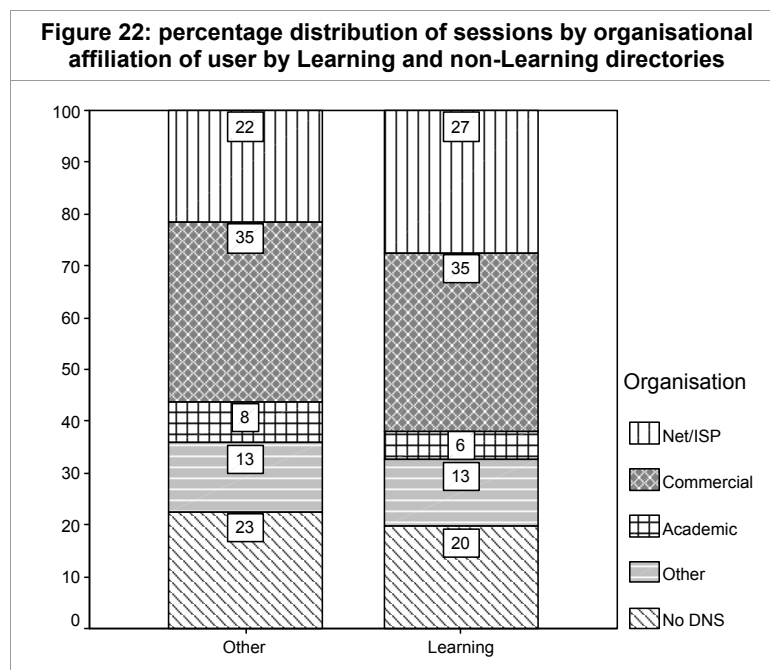


Sessions where more pages were viewed will record a longer session time and sessions viewing a Learning page did record longer session times. About 42% of sessions that viewed at least one Learning page recorded a session length of over 3 minutes and this was only true of 32% of sessions that did not view a page from the Learning directory.



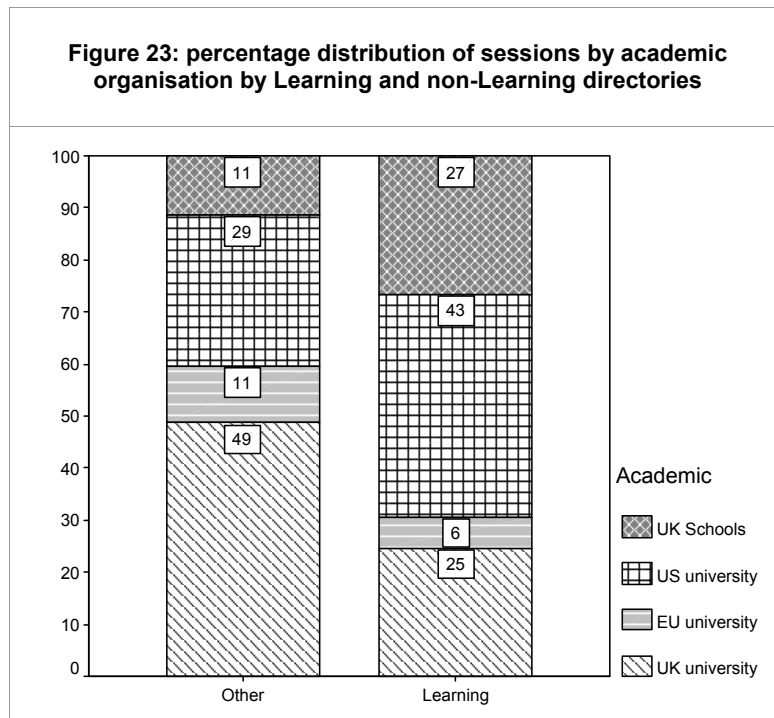
4.3.1 Sessions conducted by organisational affiliation of the user

Surprisingly, for this study, net/ISP organisations accounted for a greater percentage share (27% compared to 22%) and academic institutes a smaller share (6% compared to 8%) of sessions viewing at least one Learning page compared to sessions viewing none-Learning (other) pages. For both directories users coming in via an ISP (commercial and Net provider organisations) dominated and made up about two thirds of sessions.



4.3.2 Sessions conducted by type of academic organisation

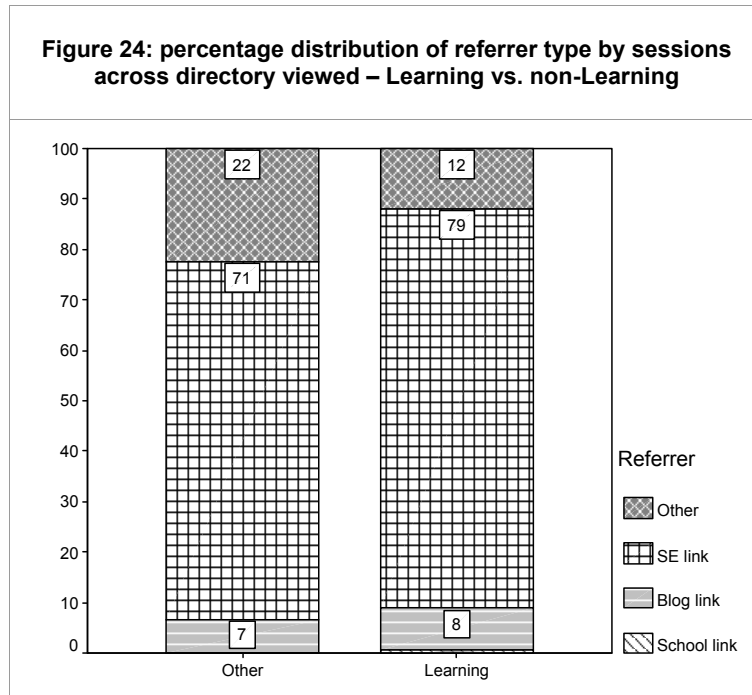
The following Figure gives the academic share breakdown between directory session use. In terms of academic use over a quarter (27%) of sessions that viewed at least one Learning page came from schools. US universities sessions were more likely to feature in the distribution of sessions that had viewed at least one Learning page (43% compared to 29%). UK universities were more likely to feature in those academic sessions not viewing a Learning page (49% compared to 25%). It is unsure why this should occur however the following two hypotheses could be explored. Firstly, a navigational hypothesis, which is that US universities are using search engines to find the learning pages while UK university users are somehow getting lost and not finding the Learning pages. Secondly a brand hypothesis which is that the BL has a better brand image for this type of information in the US than in the UK, perhaps, rather like the BBC has.



4.3.3 Sessions conducted by referrer link used

Figure 24 gives the breakdown of referrer categories broken down by whether the user had accessed a Learning directory page. Four referrer groupings were considered SE link refers to a link to the BL site served up to the user by a search engine; a Blog is a link in a user updated database and includes Wikipedia, Facebook, Myspace as well as blogs; a school link is a link on a UK school website or a link where the word school features in the URL (i.e. www.mhschool.com). The Other category covers all other referrer links. Popular referrer links in the Other category include catalogue.bl.uk (2.9%) and www.direct.bl.uk (2.6%) both of which offer advanced access features to BL resources as well as nature (2.2) and nationalarchives (0.9%).

In terms of referrer link information, those sessions that viewed at least one Learning page were more likely to have entered via a search engine link (79% compared to 71%) or a blog link (8% compared to 7%). A blog link here is defined widely to include any user updateable link (Wikipedia, Facebook or blog).

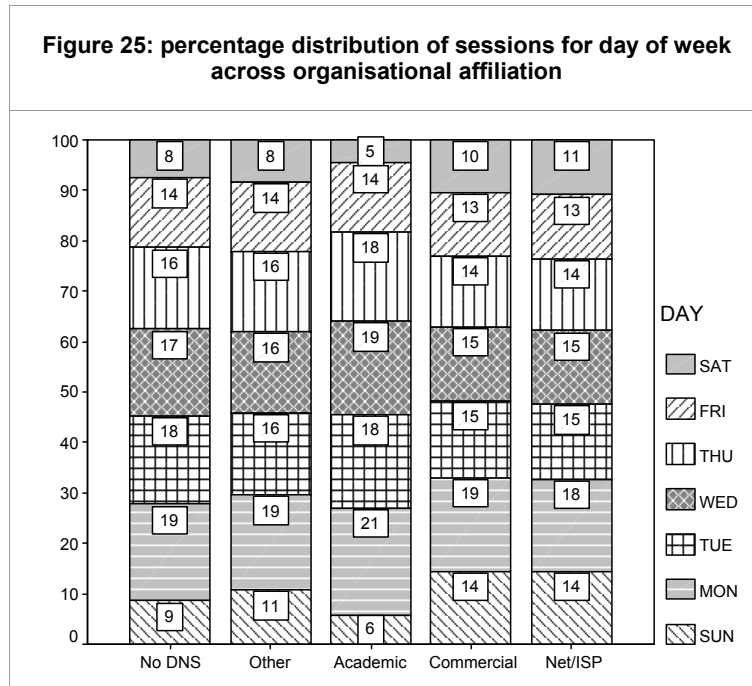


4.4 Sessions viewing a Learning page only

The following section restricts analysis to sessions that have viewed at least one page from the learning directory.

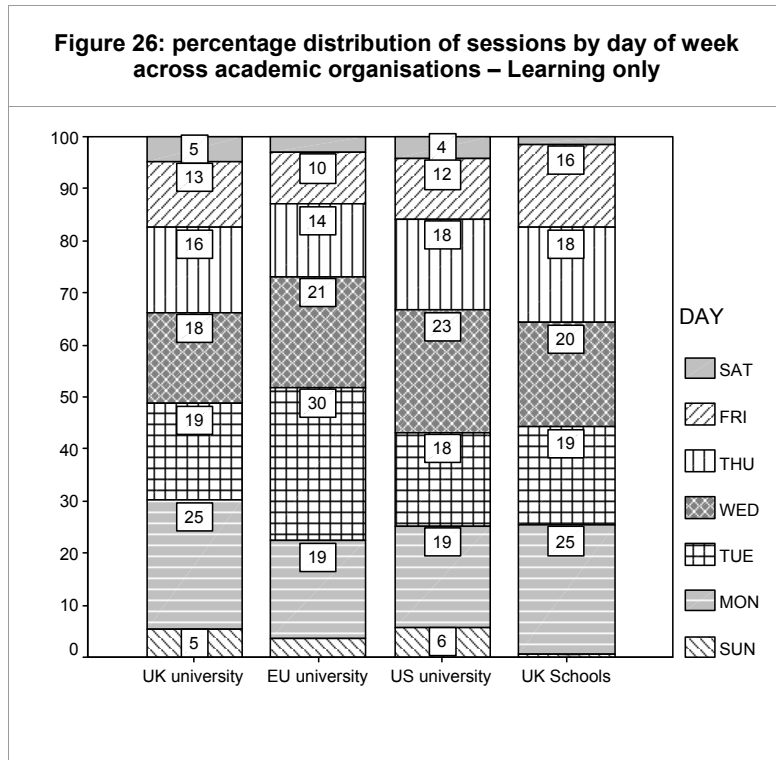
4.4.1 Day of the week by organisational affiliation

The following Figure looks at the session share distribution over day of week across organisational type. There appears to be a reduced number of academic sessions at weekends about 11% compared to 24 to 25% for commercial and Net/ISP organisations.



4.4.2 Day of the week by type of academic organisation

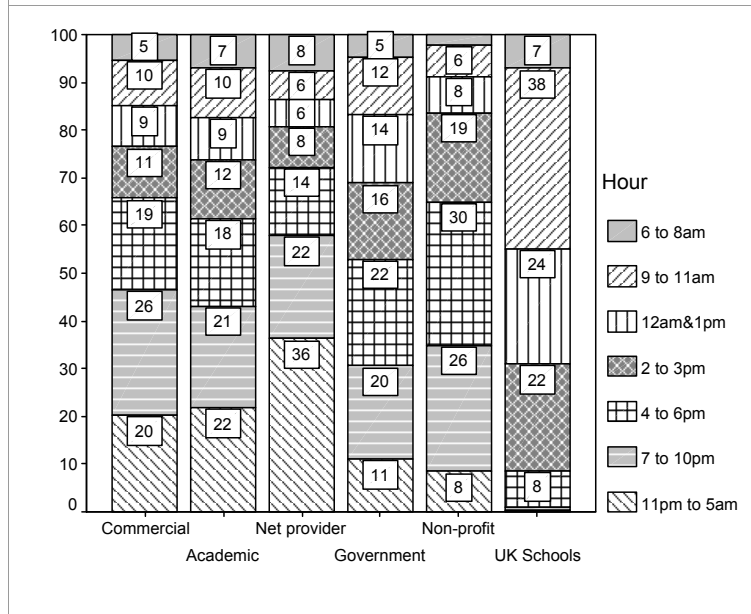
The following Figure looks at day of the week session distribution for academic organisations only. There is not a lot of difference here except that there were few session visits from schools at the weekend (they were probably closed then).



4.4.3 Hour of the day by organisational affiliation

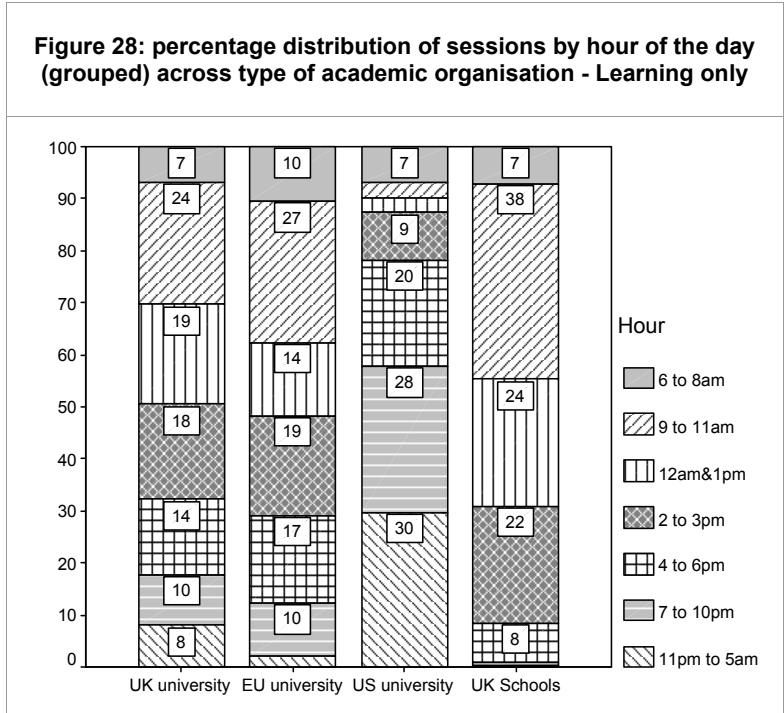
Figure 27 shows there was a raised usage between 7 pm and 5 am (UK time) for Net/ISPs (58%) compared to academic usage (43%).

Figure 27: percentage distribution of hour of sessions by hour of the day (grouped) across organisation affiliation - Learning only



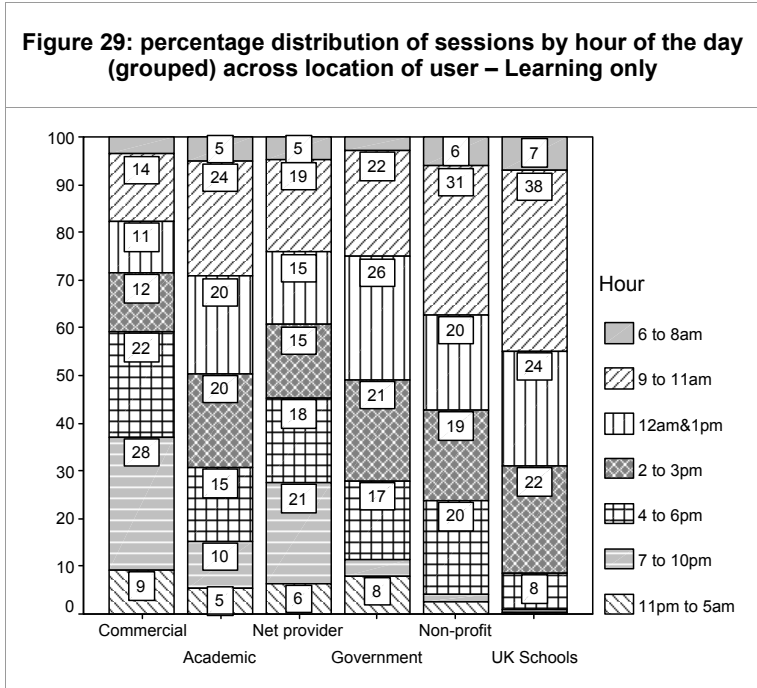
4.4.4 Hour of the day by type of academic organisation

Figure 28 shows that the largest proportion of school sessions (38%) was recorded in the morning between 9 to 11am (UK time). Most US sessions were undertaken between 7pm and 5am (UK time) about 58% did so. EU university usage was marginally raised (27%) in the morning 9 to 11am (UK time).



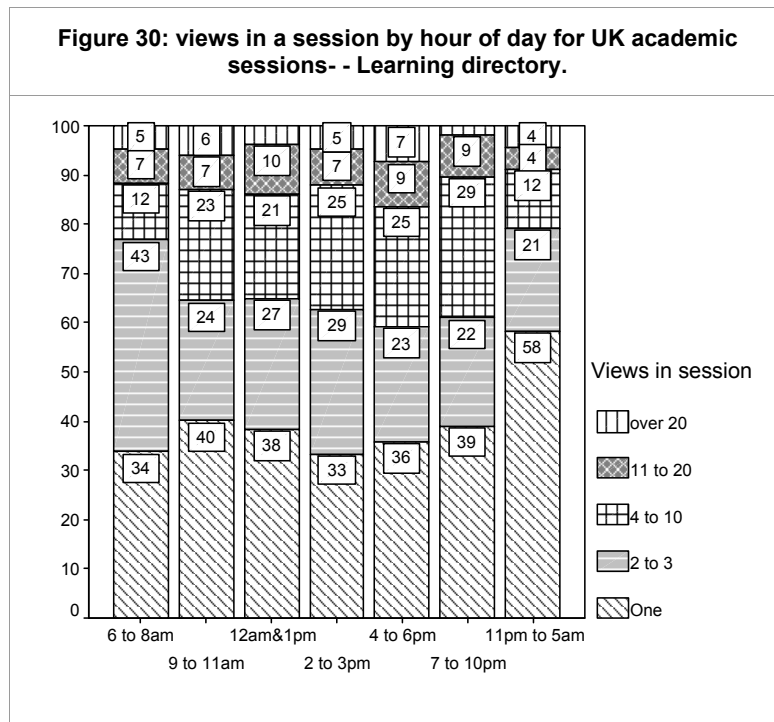
4.4.4.1 Hour of the day by organisational affiliation for UK user only

Figure 29 shows UK sessions viewing Learning distributed across organisation type. Commercial users and Net provider, both of these groupings are IP providers, have a raised use, compared to other groups, in the evenings after 7pm about a quarter to a third did so. UK schools and academic organisations recorded a higher use, compared to commercial users, between 9am and 11am. About 38% of schools and 24% of Academic institutes recorded use between these times compared to 14% of commercial users.



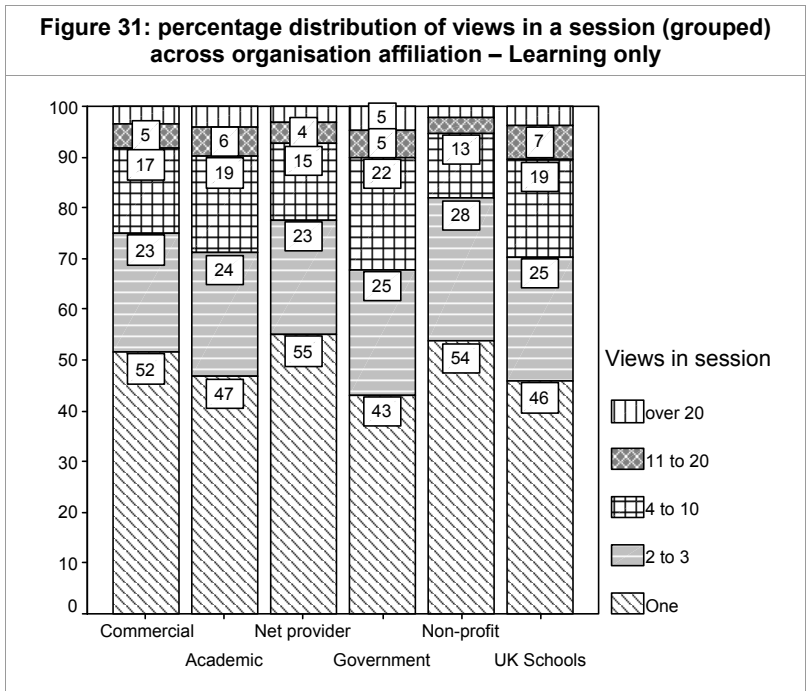
4.4.4.2 Views in a session by hour of the day of UK academic sessions only

Figure 30 looks at the views in a session by hour of day for UK academic sessions only making views to the Learning directory. There are marginally more active sessions between 4pm and 6pm. The period between 6 to 8am recorded a high percentage of sessions just viewing 2 to 3 pages nearly half (43%) of sessions at this time recorded sessions just viewing 2 to 3 pages. Perhaps academics are checking for updates before the start of the day.



4.4.5 Site penetration (number of views in a session)

Sessions conducted at academic organisations recorded the greatest number of views in a session with 53% viewing 2 or more pages while net/ISP sessions viewed the least, only about 45% of this group viewed two more pages in a session. UK schools performed very similarly to academic institutes in general and about 54% of UK schools viewing Learning viewed two or more pages in a session.



Looking at academic sessions only, 61% of UK users viewed two or more pages in a session. US universities viewed the least number of pages and just 49% of these sessions viewed two or more pages. About 54% of school session just viewed one page.

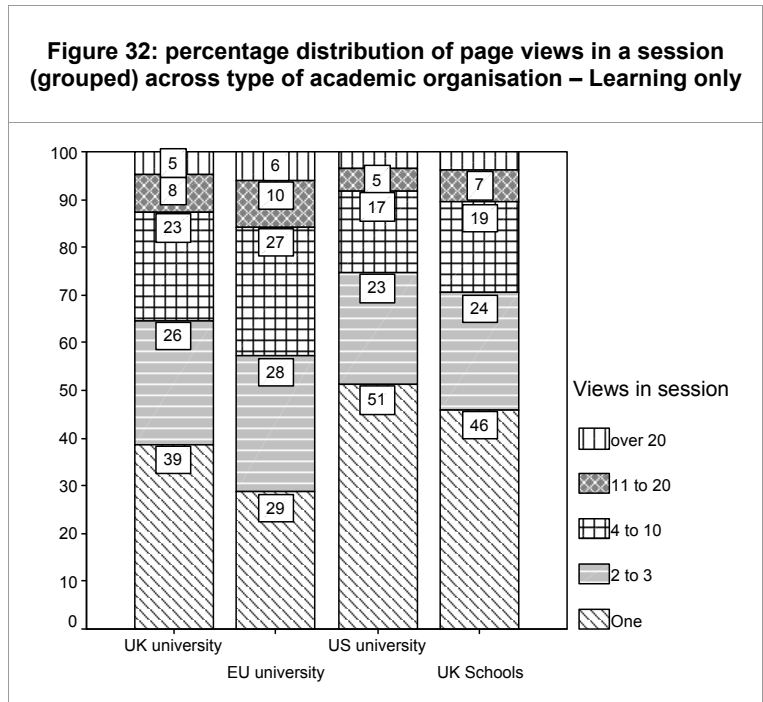
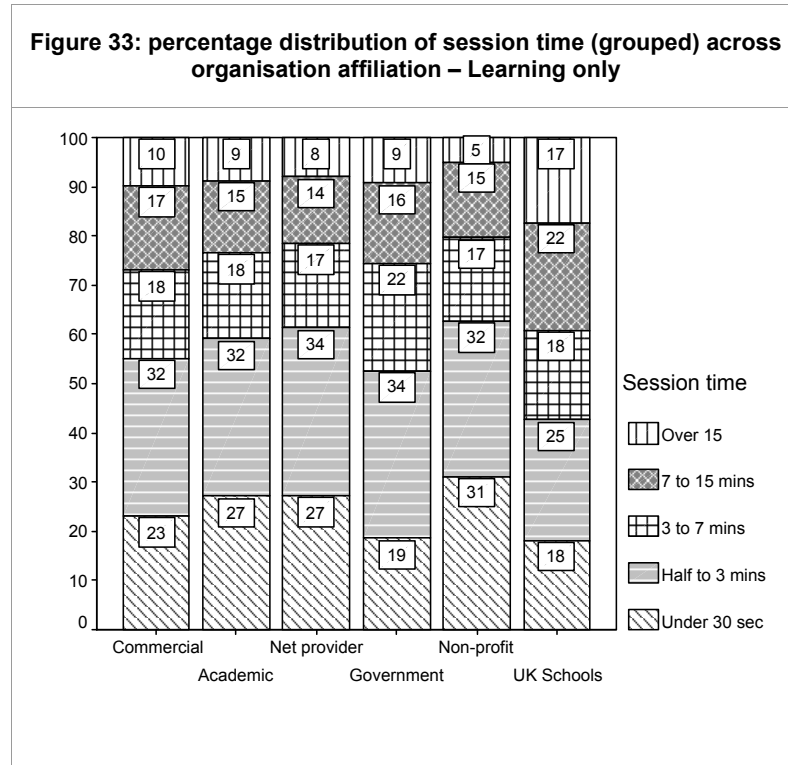
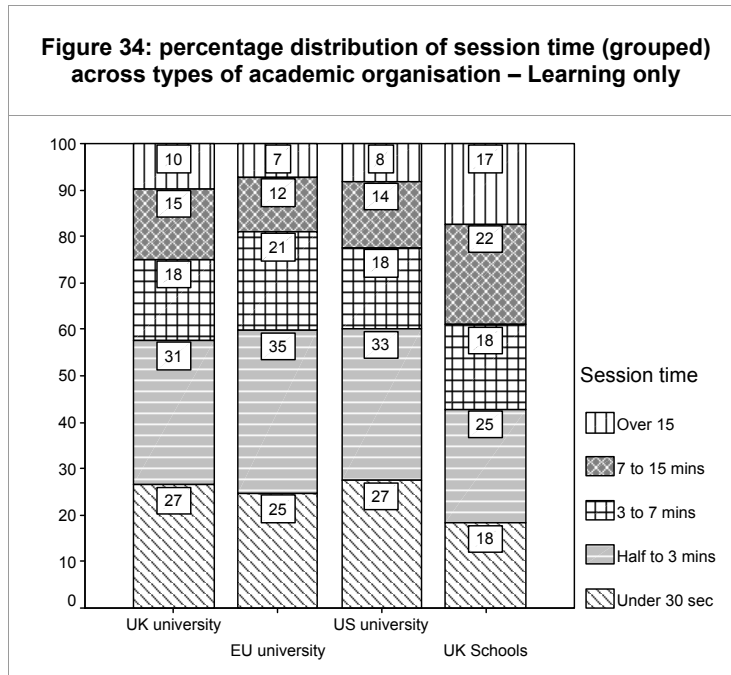


Figure 33 gives the distribution of session time across organisational groupings. UK schools recorded longer sessions, compared to other groupings, and 39% recorded sessions in excess of 7 minutes.



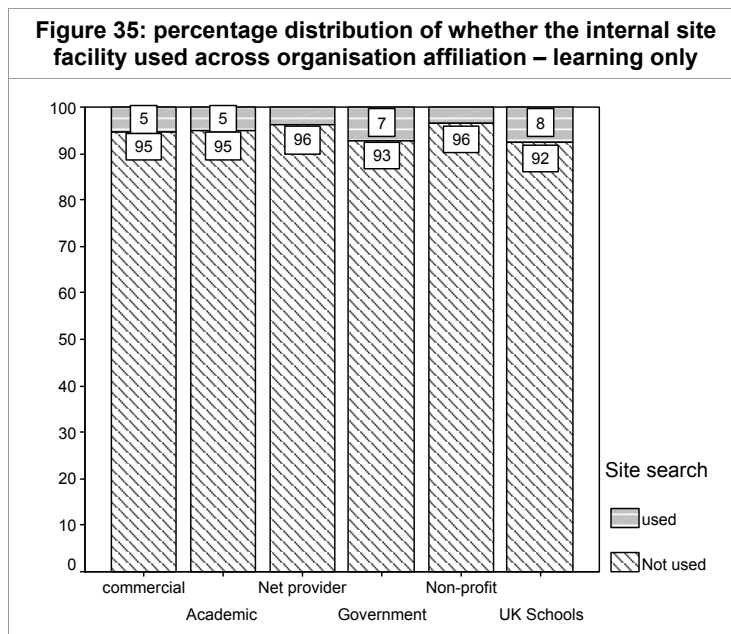
4.4.6 Session length by type of academic organisation

In terms of session length across academic organisations, again UK Schools recorded the longest session times and 82% were 30 seconds or longer, compared to 75% for UK University sessions.



4.4.7 Use of search facility

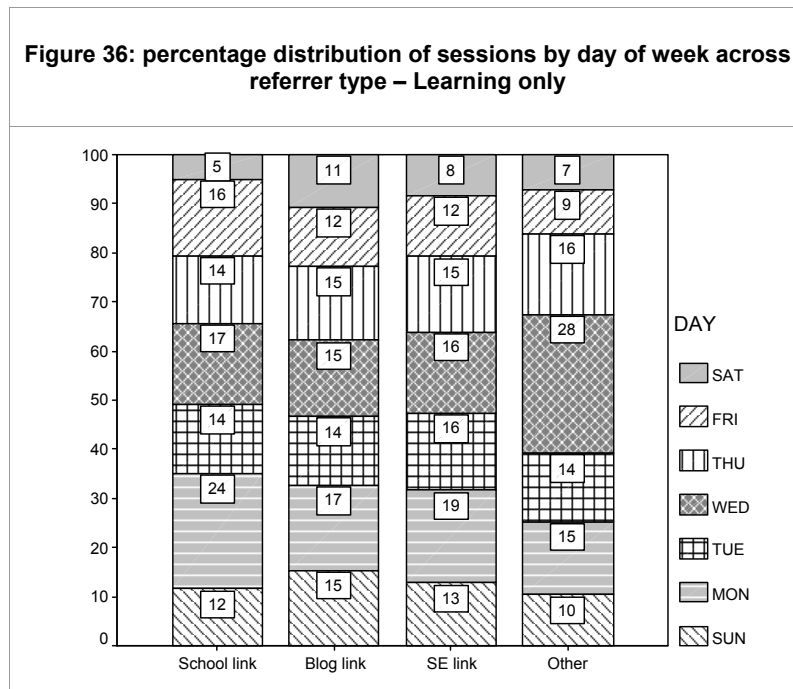
The search facility is prominent on the BL learning page (and BL Homepage) and about 10% of sessions saw the facility used and there was not much variation between organisation types.



The usage distribution of the search facility within sessions is repeated across academic organisations. Seven percent of school sessions did no use of this facility.

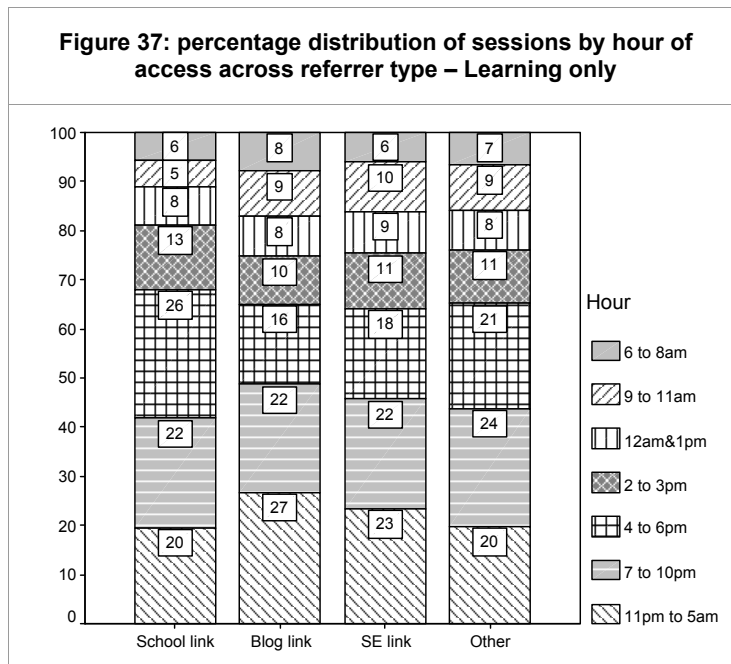
4.4.8 Day of the week page views by referrer link

Figure 36 shows that there is not a lot of variation, except a reduced use of school links on Saturdays and a relatively raised use of schools links on Mondays



4.4.9 Hour of the day page views by referrer link

There is quite a lot of variation in use by hour of the day between referrer links. Access via Blog (Wikipedia, Facebook and blogs) links tended to be accessed between 7 pm and 5am: 49% of sessions using this type of link were conducted between these times and suggests that this type of link is used predominately by US users. Perhaps BL does not have the same standing among UK blog type users or UK users are just not using this type of link as yet. School site links were used during the daytime with a raised use (26%) in the period 4 to 6pm and reduced use during the period 7pm to 5am compared to other groupings. The distribution for users using search engine links the percentages were 16% (4 to 6pm), 22% (7 to 10pm) and 27% (11pm to 5am).



4.4.10 Site penetration by referrer link

Figure 38 gives the number of pages viewed in a session by referrer link recorded in the session. Those coming in via a blog type link (Wikipedia, Facebook or blog) were the most likely grouping to view more than one page: 82% did so, with 59% viewing 4 or more pages. Those coming in via a search engine were most likely to just view one page, two thirds (66%) did so, and we know from previous research that people using a search engine are more likely to be bouncers. With regards to Learning pages those coming to the site from a blog type link or a school link were relatively “sticky” and went on to explore additional pages on the site.

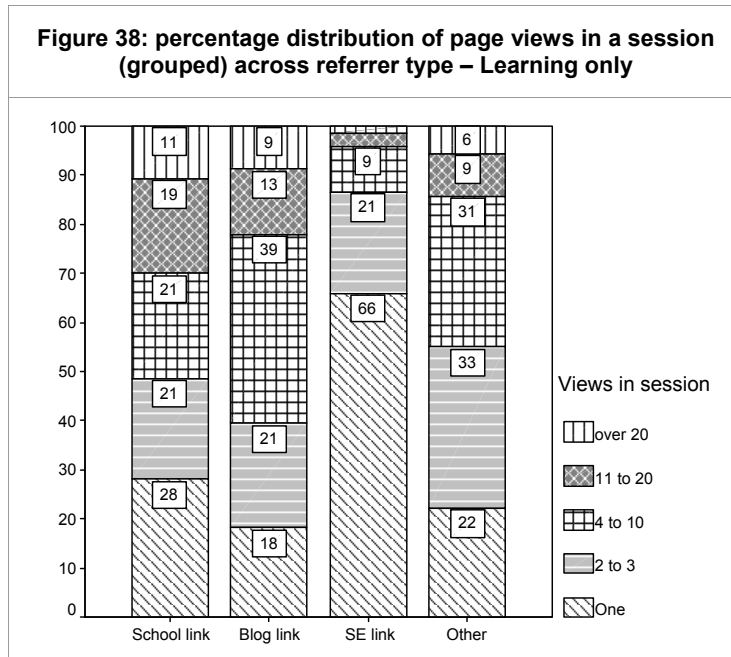
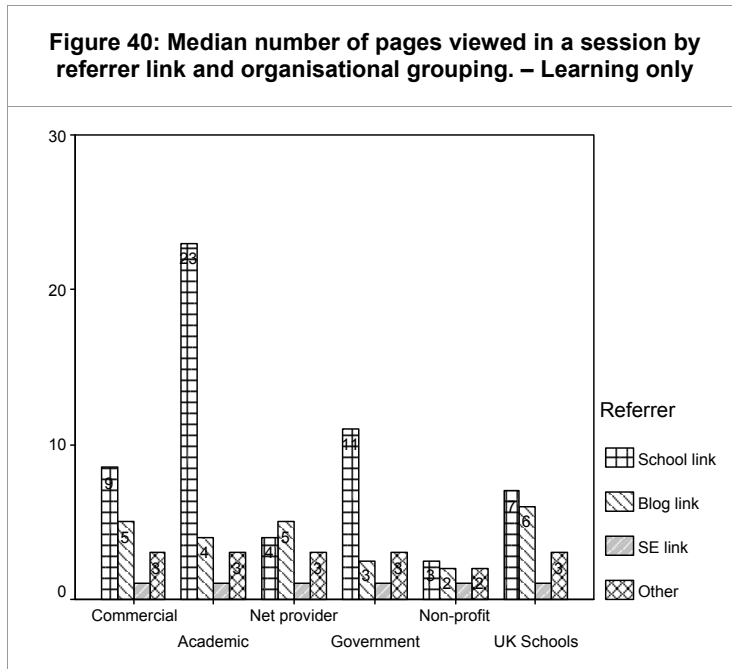
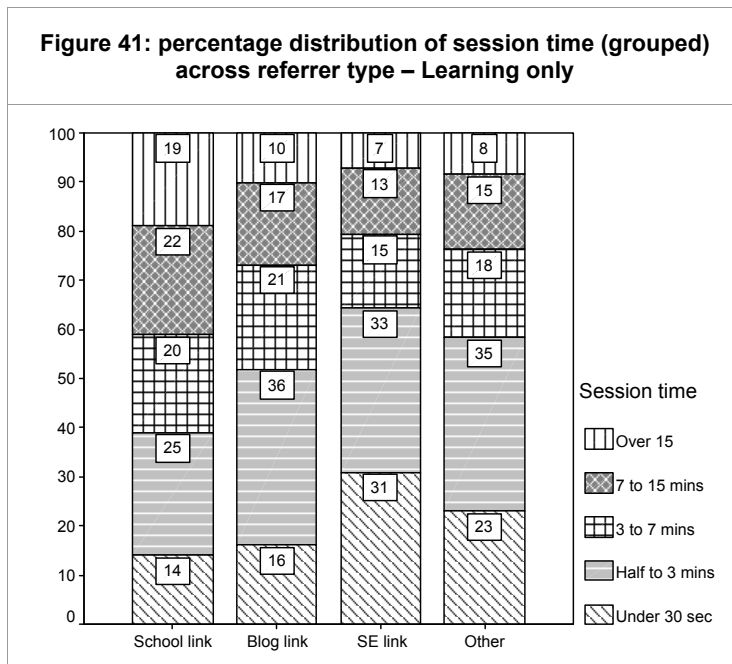


Figure 39 looks at the number of pages viewed in a session (median) across two groupings; referrer link and organisational grouping. In all organisational groupings those users that had found the site using a search engine were likely just to view on average just one page. And it seems likely that these users were feeding off the hits returned by the search engine and cycling through these hits to find the information they want. Those sessions coming in via a School link recorded the most hits and on average viewed 10 pages. In looking at UK schools those entering Learning pages either by a blog type link or a school link recorded a relatively high usage of about 6 to 7 views in a session.



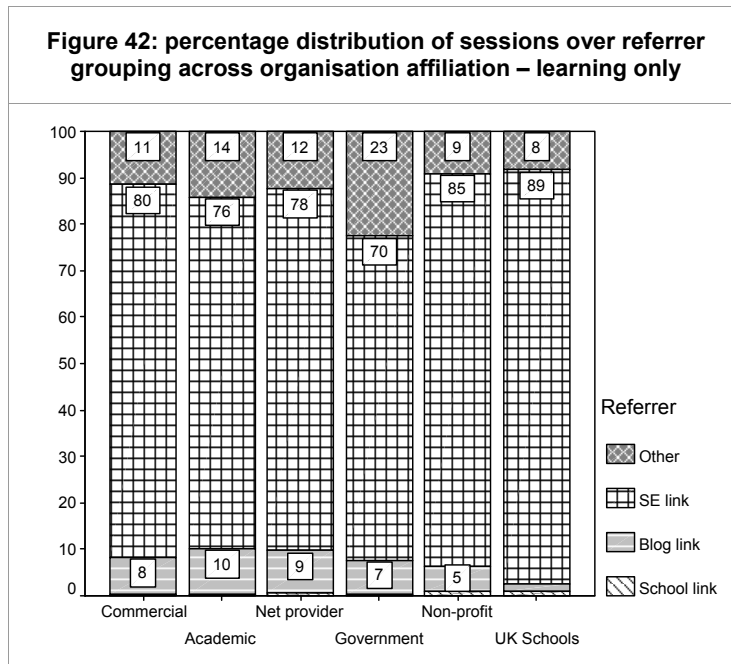
4.4.11 Session time by referrer link

Sessions generated by a search engine link recorded the shortest sessions, about a third lasted under 30 seconds and this compares to about a quarter (23%) for other referrer links. Links from schools recorded longer sessions and 19% lasted over 15 minutes.



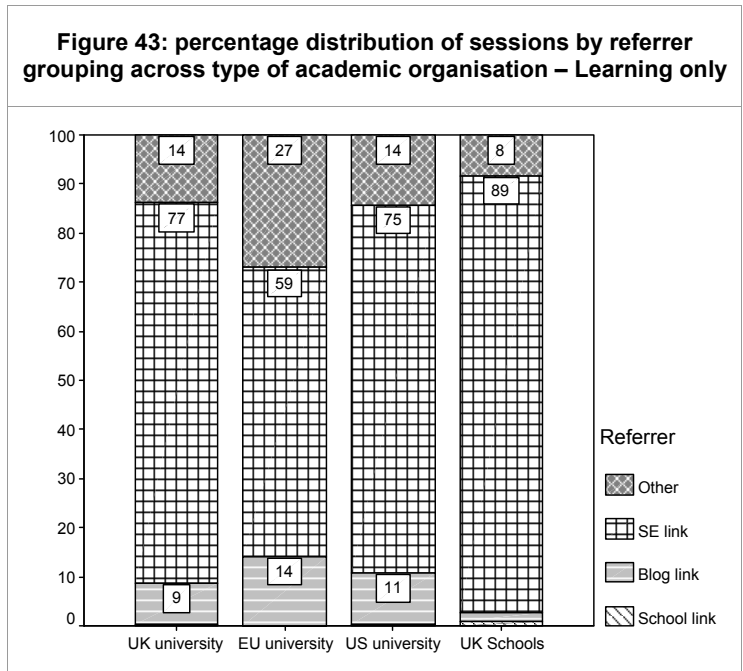
4.4.12 Referrer link across organisational affiliation

Figure 42 looks at the distribution of referrer link across organisation type. Usage of search engine links is high for all groups and 89% of school sessions found the learning directory via a search engine.



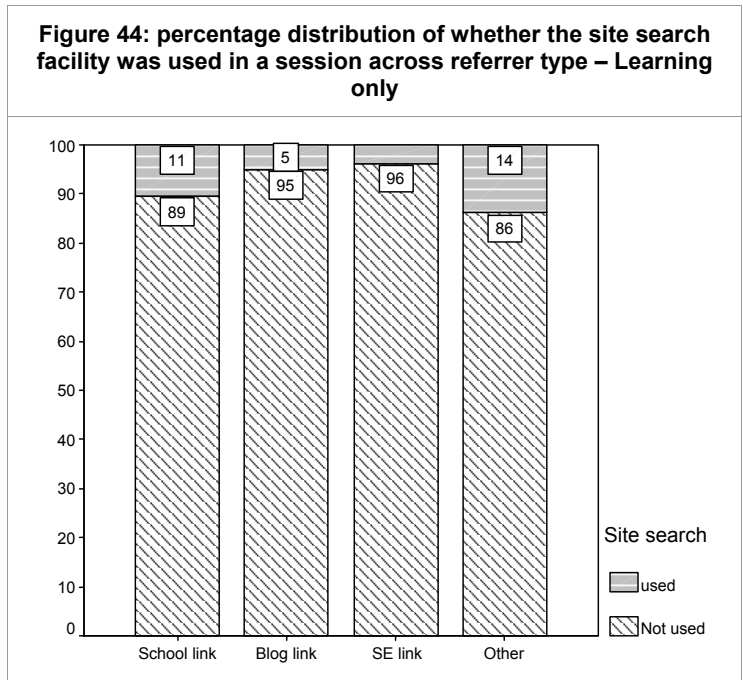
4.4.13 Referrer link across type of academic organisation

Figure 43 gives the referrer grouping by frequency of sessions for types of academic organisation. UK schools were likely to enter by a search engine link, about 89% did so. EU universities were least likely to find the BL site using a search engine link; just 59% of EU university based sessions did so and were the most likely, among academic institutes, to use a blog type link (14%). UK universities did rely on search engine links (77%) but also used other links (14%) that included university links. US university users were also likely to access via a search engine link (75%).



4.4.14 Search facility use by referrer link

About 10% of sessions featured the search facility. Those finding the learning directory via a search engine were least likely to use the internal search facility, just 4% did so.



4.5 *Micro-analysis: schools*

Micro analysis is a qualitative method of analysing log files and looks at the log entries of an individual user's session. Use of three school users were selected from the log file and their session information analysed. It should be pointed out that the user could be either a student or a teacher.

User 1

This user accessed the BL service on the 30th of April at about 2pm. The DNS of the user was XXX.tameside.sch.uk. The user arrived at the service from a Google link. Their search expression in Google was 'Britain in the 1970s' and the Google link took the user to the page 'collections/british/modbrichron_70'. The user did not go on to view any additional pages. An example of a specific search

XXX.tameside.sch.uk

<i>Date time</i>	<i>View</i>	<i>Access</i>	<i>Search expression</i>
30-APR-07 13:59:38	Collections/british/modbrichron_70	Google search	Britain in the 1970s

User 2

The DNS of the second user was XXX.pocklington.e-yorks.sch.uk. This user accessed the BL service on the 18th of April at about 1.30pm. The user came into the service via a Google images link. The search expression of Google images is not recorded in the logs. The use of Google image searching is novel and previous studies by the CIBER team have not found this type of searching. However image or picture searching may well appeal to under 14 year olds. The user viewed first one page 'Learning /histcitizen/appeasement' then returned to Google images and subsequently viewed a second page 'Onlinegallery/features/frontpage/peace'. There was approximately a 10 second gap between the first and second page. The user did not go on to view any additional pages.

XXX.pocklington.e-yorks.sch.uk

<i>Date time</i>	<i>View</i>	<i>Search engine used</i>	<i>Search expression</i>
18-APR-07 13:33:45	Learning /histcitizen/appeasement	Google Images search	n/a
18-APR-07 13:33:54	Onlinegallery/features/frontpage/peace	Google Images search	n/a

User 3

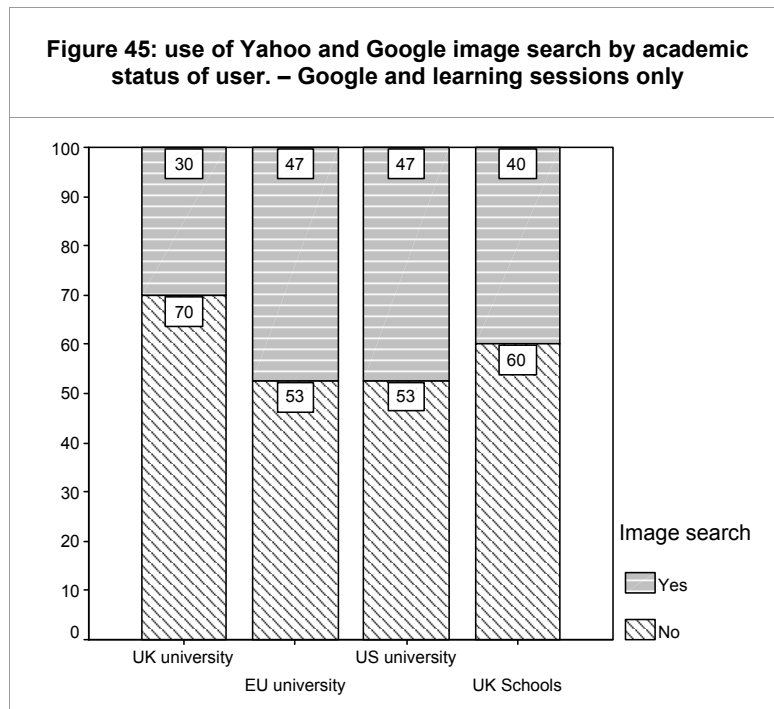
The DNS of the user was XXX.tameside.sch.uk. This DNS was recorded as having used the BL service first on the on the 24th of April at about quarter to three in the afternoon and then on the 30th at about 10.45am. On the 24th the user came into the service via a Google image link. The

search expression of Google images is not recorded in the logs. The user viewed the page 'Learning/images/medeval/patterns/large4390'. The user on the 30th did employ a Google search. Their search expression in Google was 'front page newspaper' and the Google link took the user to the page 'Learning/histcitizen/fpage/frontpagehome'. The user then navigated by a BL site link to the page 'Learning/histcitizen/21cc/citizenship'. There was approximately a half minute (34 second) gap between the first and second page viewed. The user did not go on to view any additional pages.

XXX.tameside.sch.uk

<i>Date time</i>	<i>View</i>	<i>Search engine used</i>	<i>Search expression</i>
24-APR-07 14:42:20	Learning/images/medeval/patterns/large4390	Google images	n/a
30-APR-07 10:45:00	Learning/histcitizen/fpage/frontpagehome	Google search	front page newspaper
30-APR-07 10:45:34	Learning/histcitizen/21cc/citizenship		n/a

As a consequence of the Micro research it was decided to examine and compare the grouping of those sessions that had used a search engine (either Yahoo or Google) to search for images to those that did not. About 40% of UK schools found content in the learning directory by using a Search engine image search (Yahoo and Google only) this compares to about 10% for other directories. Further about half of US (47%) and EU universities (47%) accessed the learning directory using a Search engine image search (Yahoo and Google only). This was true of about 30% of UK universities.



Sessions where a search engine image search was used were likely to be shorter and were more likely to view just one page in a session compared to Yahoo and Google sessions not using an image search. About three-quarters of sessions using an image search viewed one page this was true of just 57% of Google and Yahoo sessions not using an image search (Learning directory only).

4.6 Search expressions

What we were interested here was whether young people are different in the way they construct their searches express their information needs; in particular whether their searching is more Cavalier.

Search expressions present particular analytical problems in evaluating them. Thus a search phrase may contain a number of words where a primary search word, such as “beowulf”, may be placed in any position in the phrase. A user simply typing in the expression “beowulf” or “I am looking for beowulf” or “what is beowulf” or “poem of beowulf” may be looking for the same level of information. Though someone using the expression “manuscript image of beowulf” or “beowulf kennings” or “beowulf the hero pictures” is looking, perhaps, for a different level of information. A further question is whether all these expressions should be counted as searching for beowulf and if this is the case how should this be done. Out of the dataset of approximately two and half million page views, about one third of a million (380,432) were found by using the internal or

external search engine - a number sufficiently large to rule out a visual inspection of each search expression.

Internal search facility

In all the internal search facility was used 21,513 times. It was not possible, at this point in time to extract numbers and individual percentages but popular search terms used here were Lindsfarne gospels, holocaust, cockney, bookbinder, Mozart, diamond sutra, Beowulf, Shakespeare, Liverpool etc.

Internet wide Search engine expressions

About a quarter (26%) of sessions employing a search engine used a search string with a variation of the service name: British Library. About 19% of search strings were just trying to locate the BL site, while a further 7% included British Library along with other search terms. As expected those users who had entered the term British Library (or a variation on the name) as part of a search string into a search engine were about twice as likely to have a session with about double the number of page views compared to users who had entered a search expression² that had not included the term British Library. An indication, perhaps, that those searching for the BL site were indeed keen users of the site. There is a wider conclusion in that these users may not be finding what they want by using an Internet wide search facility and sought instead to go to an information source that they trusted. However, previous studies by the CIBER team have indicated that users are poor at remembering site addresses and will use search engines to locate a known site.

Other popular search expressions, aside from the British Library, were magna carta, electoral register, gutenberg bible, john keats, newspaper archives, record labels, record companies, lindsfarne gospels, tooting, diamond sutra. The Table below gives some typical numbers. However, as discussed earlier tables of search expressions give only a partial distorted picture as there will be a number of variations in the terms used related to a particular string.

² Because of the way the data was processed for this, the result is classified as indicative and will be rechecked at a later date.

Search expression	Number of times used in the month
british library	66,737
bl	5359
magna carta	6910
electoral register	1341
gutenberg bible	1190
john keats	1155
british library london	977
newspaper archives	595
serials	544
record labels	529
record companies	507
www.bl.uk	443
british national library	440
lindisfarne gospels	383
bl.uk	372
amed	371
british library	363
tooting	342
major record labels	341
britishlibrary	340
diamond sutra	333
newspapers	329
british museum library	324
Beowulf	319

An alternative way of looking at search expressions is to list the first, second, third etc. search words in a single column. The advantage of this is that it furnishes words irrespective of their place in the search expression.

Search expression	Number
british	94,719
library	92,360
the	9111
magna	7894
uk	6209
carta	5850
bl	5218
london	4756
industry	3940
newspaper	3824
record	3770
shakespeare	3415
uk	3169
newspapers	3140
sound	3089
william	2898
tooting	2785
electral	2746

Learning Directory

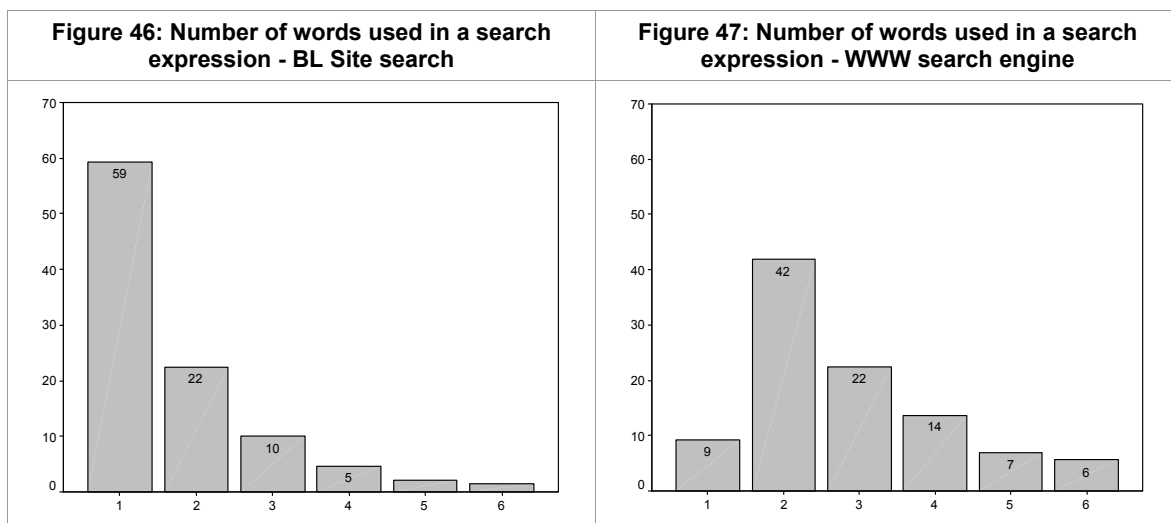
For those arriving at the Learning directory, popular search expressions used were: suffragists, medieval realms, sounds familiar, medieval food, beowulf, research ideas, medieval foods,

medieval patterns, research ideas, muscle men, viking words, causes of youth crime, emily davison, shorthand alphabet, information on anne frank etc.

Most search expressions are unique and are rarely repeated for example british nobleman hung in united kingdom for treason (it should be pointed out that this is not a typical search expression). Though clearly individual words will be repeated in a number of different search strings hence the word medieval will appear in a variety of search strings.

Number of words used in an expression

Figures 46 and 47 provide the number of words used in a search expression, first for the BL internal search engine and then for expressions used to find the BL site via a WWW search engine³. The number of search words used does not necessarily tell us how complicated a search expression is. Wordy expressions may just include a large proportion of common words such as “the”, “of” and so on. However it is a metric that can relatively easy to generate and hence is provided here.

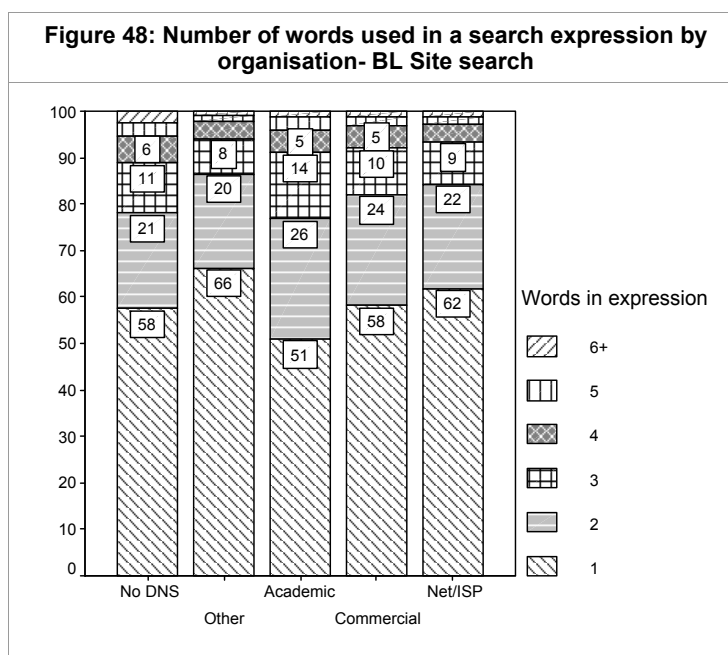


The most apparent difference is the higher levels of single word searching used for searching internally, between half to three quarters of search expressions were composed only of a single word as compared to just 10% for WWW search engine expressions. The most probable reason for this is the number of WWW search expressions that just had British Library (19% of WWW search expressions) or expressions that included BL in the search phrase (8%). Many users (26%) were using an Internet wide search facility to find the BL site by using variations of the search expression British Library, this being a two word search string will inevitably push up the

³ For this analysis Google and Yahoo only.

percentage of two search string searches. A question remains as to why users are including or are just searching for the BL site. Perhaps users are finding that search engines are not listing BL links in response to a search query

Figures 48 and 49 give the number of words used in a search expression by organisational affiliation first for the BL internal search engine and then for expressions used to find the BL site via a WWW search engine⁴. The Figures also show differences between user groups. For example academics appear to use fewer words in a WWW search engine query but are likely to use more words when using the internal search engine. The reverse was true for net/ISP users.



⁴ For this analysis Google and Yahoo only.

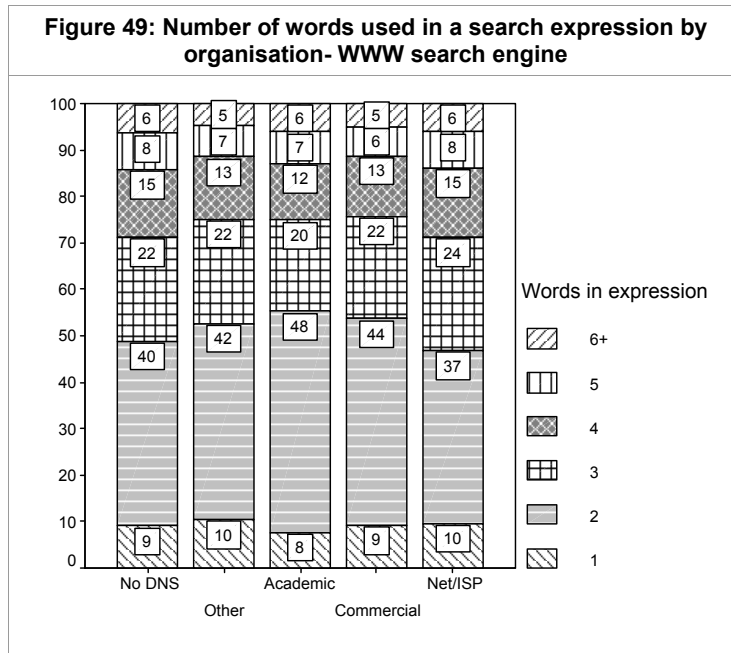


Figure 50 and 51 gives the same information broken down by type of academic organisation. The UK schools figure looks high in terms of the number of words used however this was influenced by one user trying out different variations of the same search query. These were: what does medieval means; medieval; what does medieval mean; what does medieval realms means; what does medieval means; what does medieval mean. Because there were so few users this would have a bias impact on the data.

Users from US universities were more likely to use a greater number of words in a search query. This was true for expressions entered into a WWW search engine but not for the BL search facility. UK academic based were more likely to use a greater number of words on the BL on site search facility compared to other groups; 56% used two or more words compared to about 40% for other groups. However UK academic users were no different to EU users and used fewer words than US users when using a WWW search engine to access the BL. Further research showed that US academics were more likely to search the WWW using a search expression variation around British Library compared to either UK or EU academics. Clearly US academics are seeking out accredited British Library information. This is, perhaps, an indication of the standing of the British Library among US academics compared to UK or EU academics.

Figure 50: Number of words used in a search expression by type of academic organisation – BL Site search

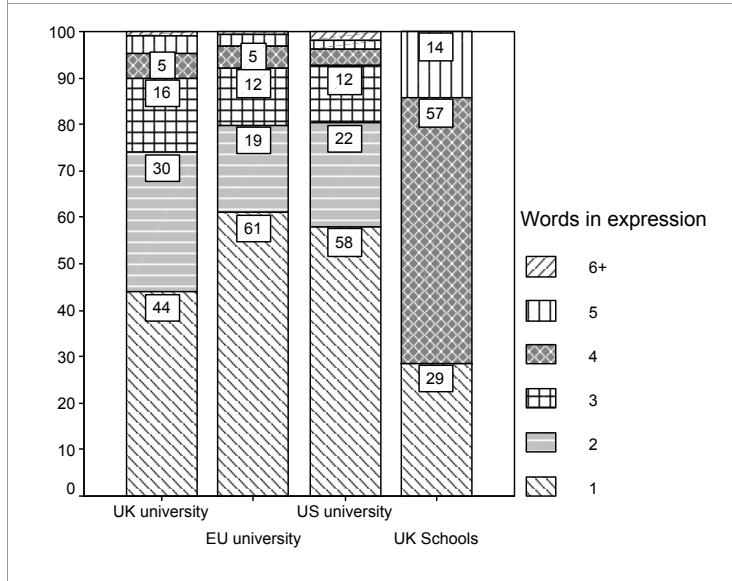
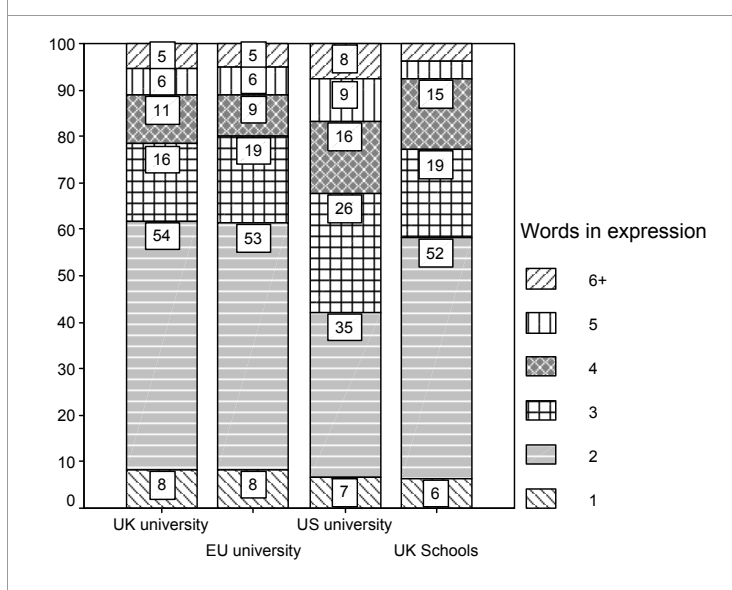


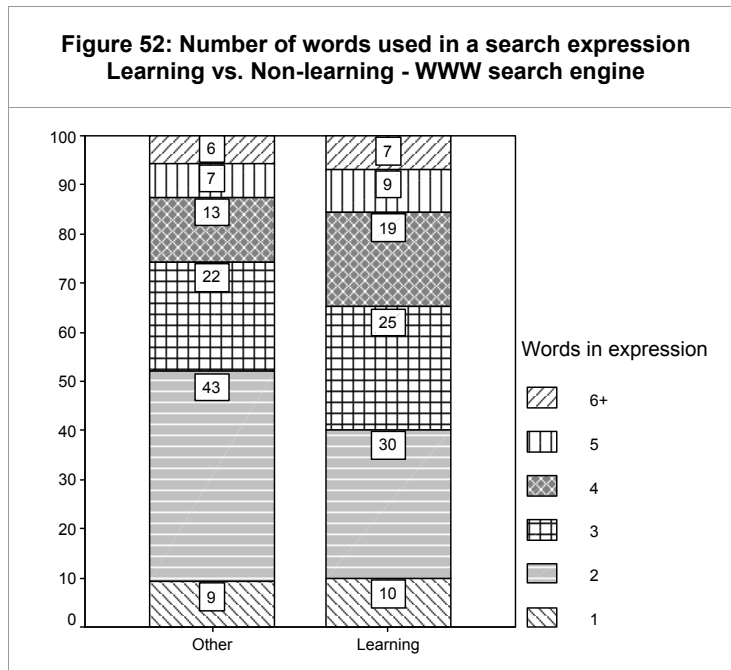
Figure 51: Number of words used in a search expression by type of academic organisation - WWW search engine



Learning and non-learning comparison

In terms of the number of words used (WWW search engine) between Learning and non-Learning directories this is given in Figure 52. There appears to be some evidence of a greater number of

words being used to find a Learning page. However further research is needed to clarify if this is a result of greater use of common words such as “and” “the” “of” etc.

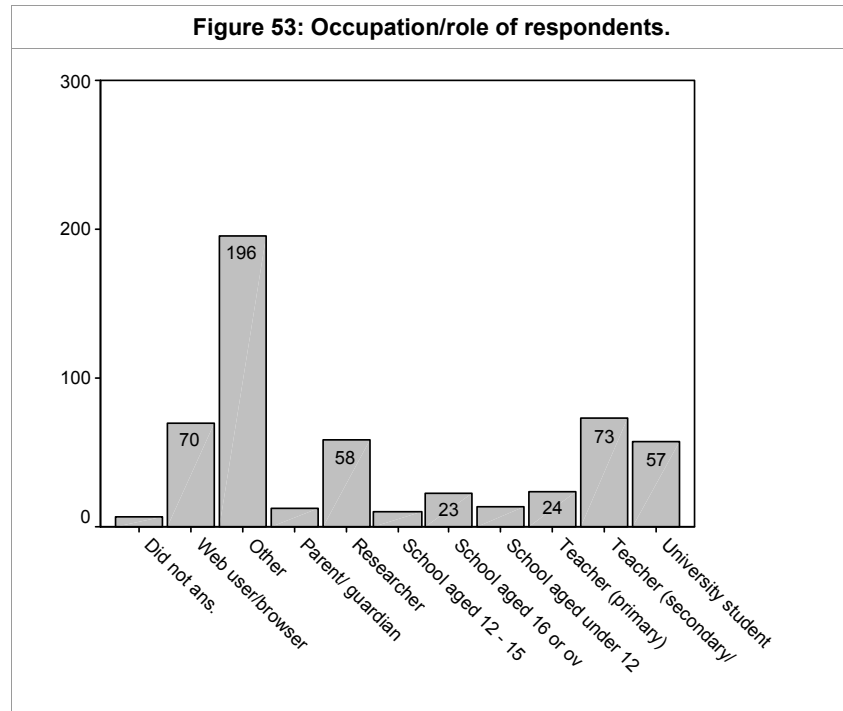


4.7 Questionnaire survey

Characteristics of respondents

The survey was conducted over the period 12 September to October 24 2007. In all 543 people responded over this period. Unfortunately – we really wanted to target younger people, the modal group, about a quarter of the respondents (136), were aged 45 to 55. About 10% were aged 24 and under and 24% were aged 55 and over. What we do not know is whether children are less likely to fill in a questionnaire or whether they are indeed a minority user group for BL learning.

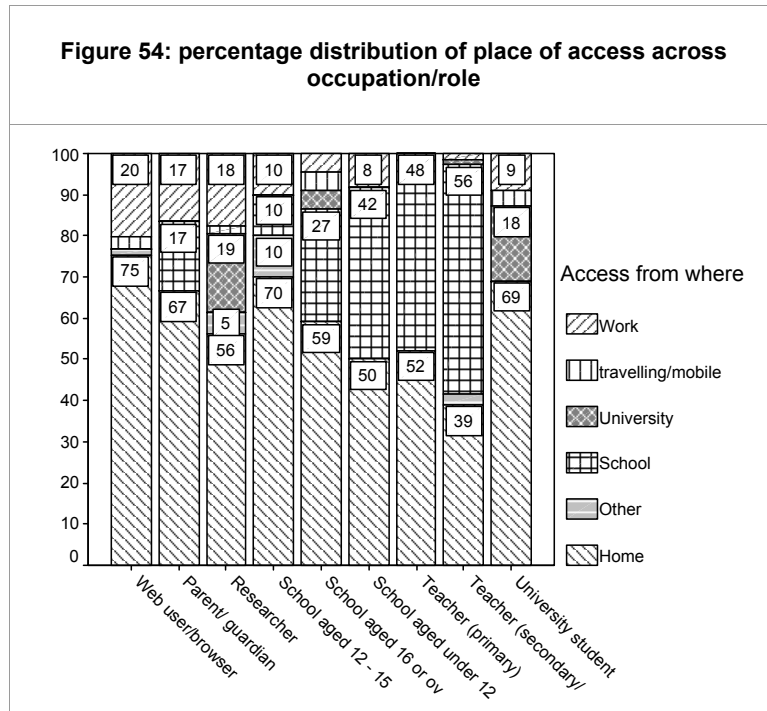
The occupation/role of respondents is given in Figure 53. Interestingly, most (36%) classified themselves as Other, which suggests that they were adults who were not teachers. Indeed about half of the other category described themselves as librarians. The next largest group was teachers (both secondary and primary), accounting for 17% of respondents. Thirteen percent were general web users/browsers. As confirmed above few were children.



There are questions over the reliability of the demographic data as it was found, for instance, that some people who said they were schoolchildren under the age of 12 in one question said they were aged over 25 in another question.

Point of access

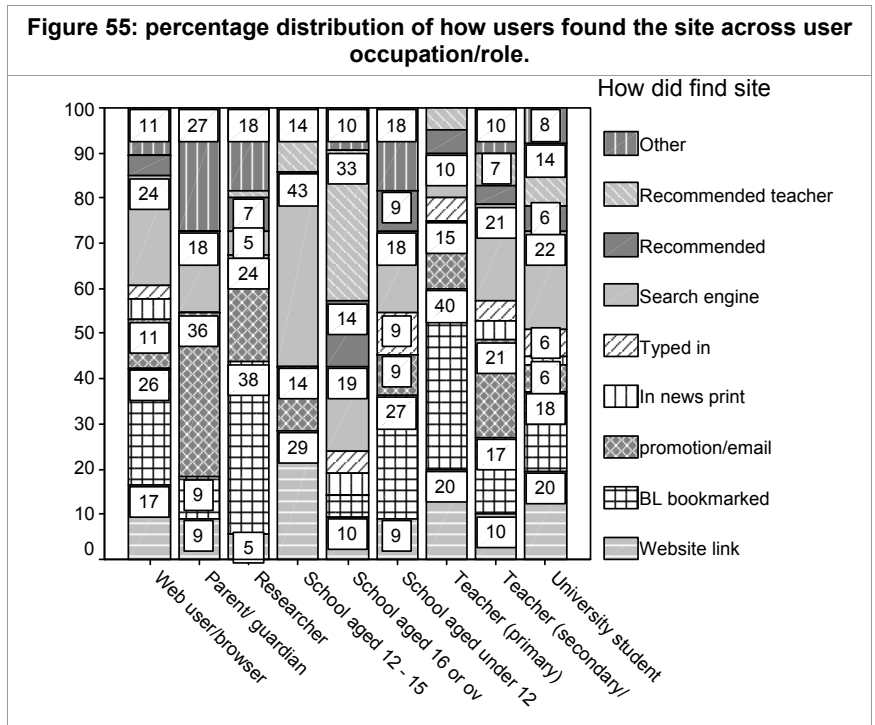
Approaching half of respondents (44%) said that they were accessing BL Learning from home, 27% said from school, 16% from work and 6% from university; 3% did not answer the question, a further 3% responded other and about 1% said "While travelling/ mobile/ Via wifi". Figure 54 gives the percentage distribution of place of access across user occupation/role. For all groups, except Secondary teachers, over half of access was from home. About half (42%) of school students aged under 12 used a school computer.



How found out about BL Learn

Respondents were asked how they found the website: 22% said they used a bookmark, 15% promotional email, 14% a search engine, portal or directory, 14% said other and 10% followed a link from another website. Just 6% mentioned they were recommended the site by a friend or colleague and 5% said they were recommended the site by a teacher.

Figure 55 gives the percentage distribution of how users found the site across user occupation/role. There are some big differences here, most notably: a third of parents and guardians responded to promotional material/ e-newsletter; over a third of researchers said they had the website bookmarked; 43% of school students aged 12 to 15 found the site via a search engine, portal or directory; a third of school students aged 16 and over were recommended the site by a teacher.



Type of material sought

Responses to the question “If you have been to the site before, what kind of material do you generally look for?” were analysed for three groupings for School children, those attending University and Other (non students/children) respondents.

Figure 56 looks at the data for non students children. Users could answer more than one question. The most important reasons for visiting the site were General interest (42%), Visits (36%) and Collections (29%).

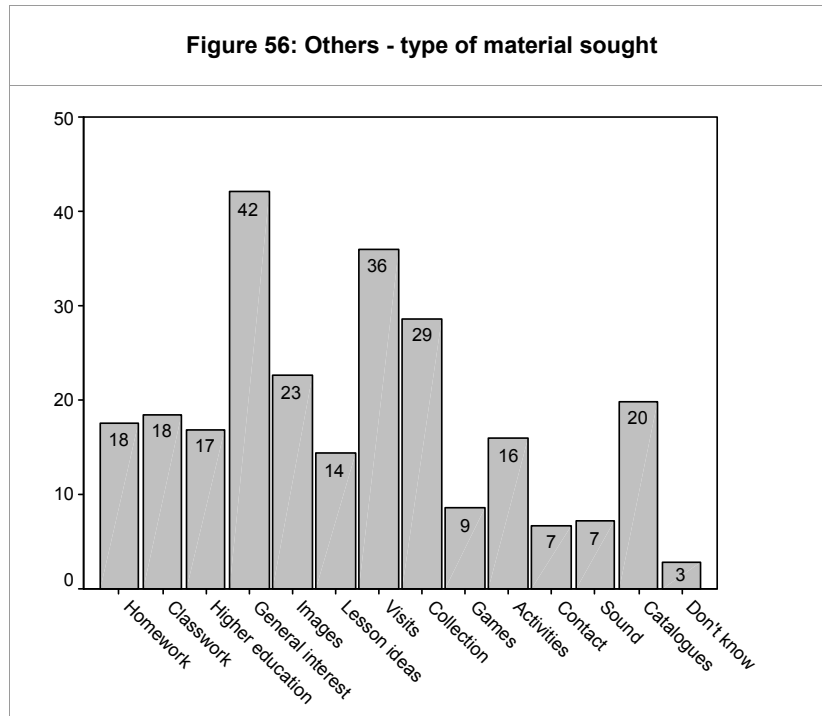
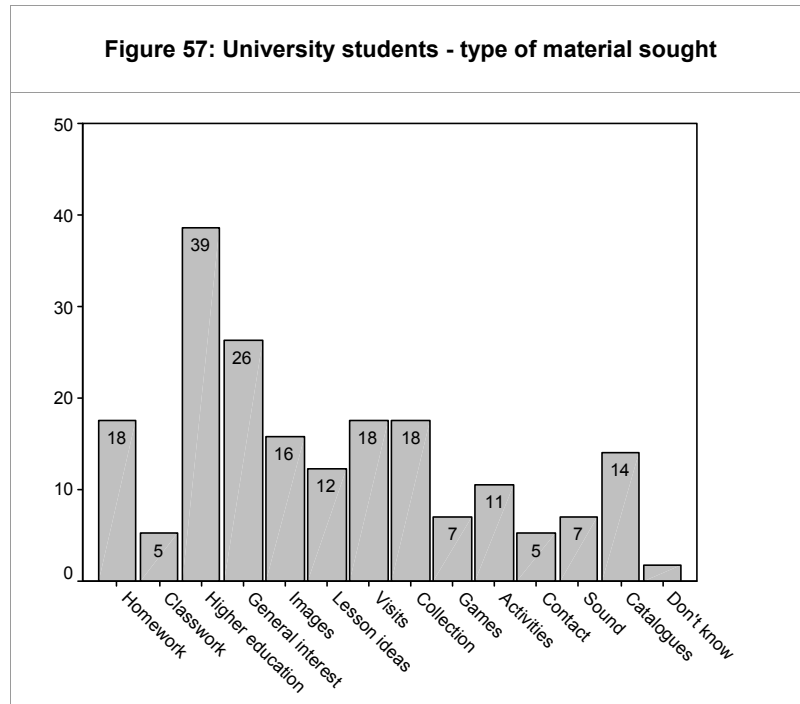
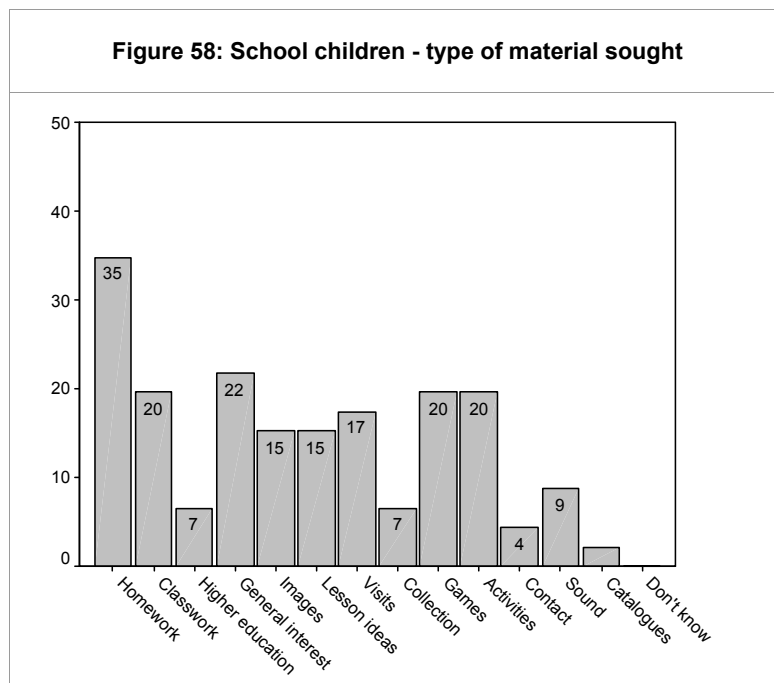


Figure 57 gives the reason for visiting for University students. Important reasons were for Higher education purposed (39%) and General interest (26%). University students interested in collections were also interested in visits, contact, catalogue and images. Those interested in lesson ideas were also interested in games, activities and images. Those interested in class work were also interested in sound and lesson ideas. Those interested in higher education were also interested in general interest.

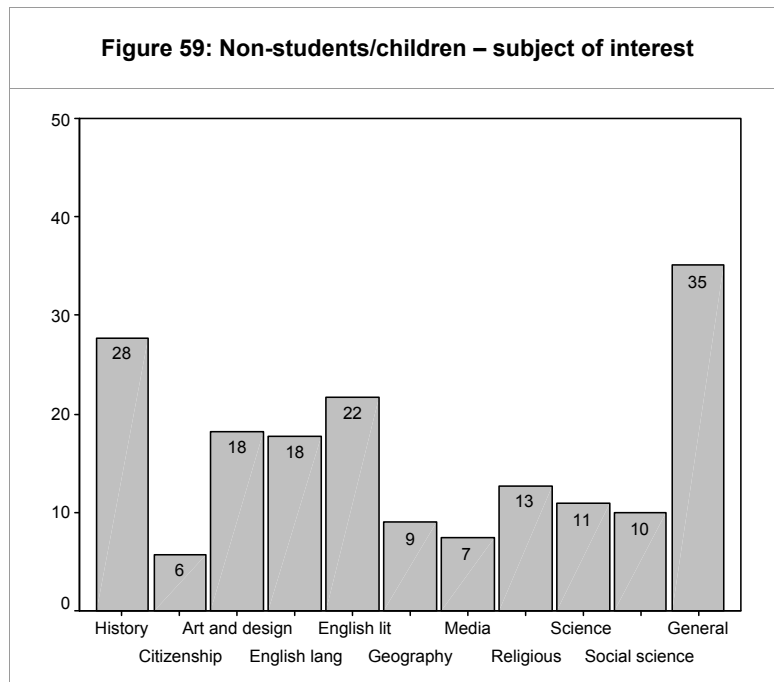


For School children (Figure 58) the important reasons for visiting included Homework (36%) and General interest (22%).



Subject of interest

Respondents were also asked about the subject they were interested the last time they visited. For respondents who did not describe themselves as students the important subjects were General (35%), History (28%) and English literature (22%).



For university students the subjects that appear of most interest were History (39%), English language (28%) and Science (21%). Those university students interested in Geography were also interested in Science and Media. Those interested in English language were also interested in Social Science and to a lesser extent English literature. Those interested in English literature were also interested in Citizenship. History formed a group on there own and did not seem much interested in other subjects.

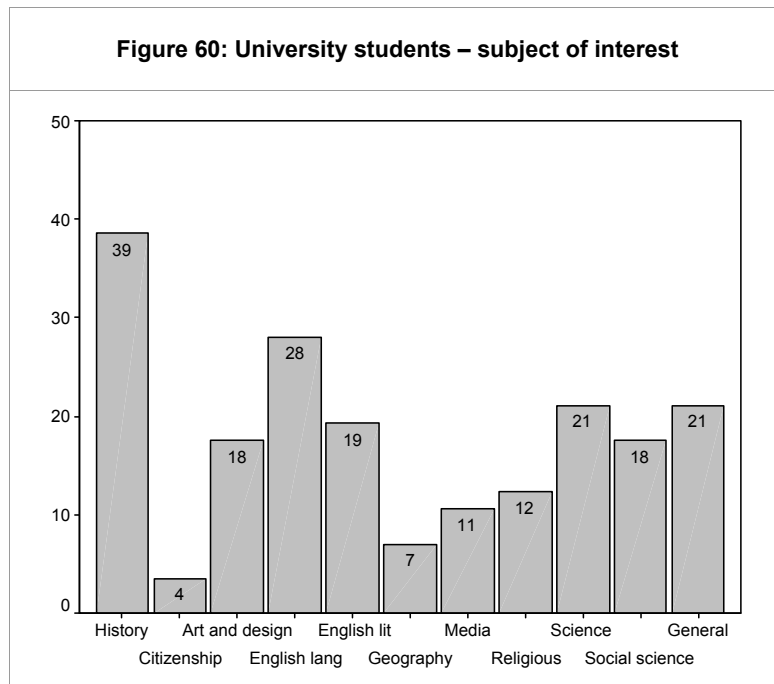
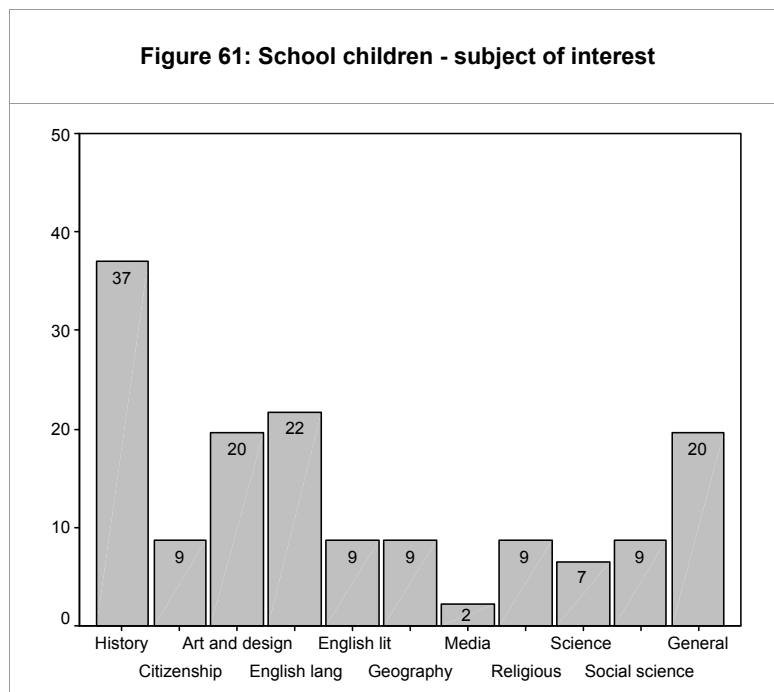


Figure 61 gives the subject interests of School children for this group History (37%), English language (22%) and Art and design (20%) appear important.



5 Conclusions

Characteristics of use

1. **Heavy use.** One month's (April 2007) of server transactional logs about two and half (2,451,271) million pages were viewed and half a million (563,238) separate Internet Protocol (IP) numbers identified. This represents the high use we are coming to expect with the usage of scholarly sites and it is good to see this is the case with a site aimed at a younger group of researchers/learners.
2. **Significant proportion of BL site usage.** The Learning site accounted for about 14% of page views to the entire BL site and about 10,000 page views were made a day. Given that the traditional strengths of the BL in collections and catalogues accounted respectively for 16 and 13% this shows there is a market here.
3. **High proportion of 'foreign' use.** UK academics accounted for 1 in 10 of page views and all UK users accounted for a third of views US users were more likely to access a Learning page from the BL site and UK users were less likely to. The explanation may be the adoption of different searching patterns. Nearly half of academic use of the learning site was made accounted for by US universities.
4. **Low levels of (direct) school use** Made up 2.5% of Learning and 1.6% of non Learning use. This data set included a holiday period and it might be expected that UK use in term time would make up about 5% of learning use. However, this percentage of use should be considered good in the light of the fact that usage on websites is biased towards "bouncers" that is users who come in via a search engine and drop out almost immediately. Questionnaire data confirmed that most people searched from home.
5. **Fast viewers.** Learning users spent less time on viewing a page.
6. **Strong subject preferences.** Language and literature was, by some margin, the most popular section according to the logs, but the questionnaire showed that for school children history was very popular.
7. **Busier users.** Proportionally more Learning sessions viewed 4 or more pages compared to non-Learning (other) directories.
8. **Search engine users.** Most people found the site this way and the questionnaire showed they were particularly popular with children aged between 12 and 15; however most did not go on to use the BL internal engine. The internal search facility is fairly prominent on the BL learning page (and BL Homepage) and about 10% of sessions saw the facility used.
9. **Brand awareness.** Large US use suggests the BL has a digital brand there. More generally, variations on the word string British Library occurred in one fifth of all search engine search expressions. This shows a degree of brand awareness and a keenness of finding the BL site.

- 10. Visual use.** There was suggestive evidence that the Google images search was attracting interest among the young scholar. About half (42%) of search engine (Google and Yahoo) users found the Learning directory using image search and this compares to 10% for the BL site generally. This may partly reflect the fact that learning has more images and hence attracted this type of user. The high proportion of US academics and UK schools using an image search may suggest that this might be a growing trend for the future. Further it draws attention to the importance of the appropriate naming of images. Image searchers were more likely to be “bouncers”. About three-quarters of sessions using an image search viewed one page this was true of just 57% of Google and Yahoo sessions not using an image search (Learning directory only).
- 11. Digital visibility.** It is always presumed that the home page attracts people into a site and things highlighted on that page will inevitably attract greater usage. However, this is not necessarily so. Thus we looked at the usage of two current highlighted items Food Stories and Sacred books and neither of these links were used. This could be because these links are only apparent if you go into the site via the homepage and that if 80% of sessions find the site using Google then users are not really landing on the homepage. In fact Google users do not want to land on the homepage as they are hoping to shortcut sites menus.

School use in detail

As we were interested in young learners we were most interested in use by school children and the only way we could tell this was whether the IP address of the user was a school, but of course we could not tell whether it was a teacher who was using the resource (but we did know that not much use was made of the teacher section, so this gave us a degree of confidence). Over 600 schools used the site during them month, with almost a third coming from the London area.

Schools did use Learning more than other BL directories, but not by much accounting for 20% of BL use, whereas Collections accounted for 15% and the Onlinegallery 12%.

95% of school use occurred on weekdays and about 60% occurs in the 9am to 1pm period, nothing 24/7 here.

About 40% of school search engine (Google and Yahoo) users found Learning using an image search. This may reflect the fact that Learning has more images than other directories?

User characteristics

- **Robots** the really big users. Accounted for well over half the use of the BL site, this suggests it is well indexed by search engines and social networks. Our usage figures exclude robot use.

- **Adults**, teachers and librarians constitute a sizeable group of users according to the questionnaire survey.
- **Search-engine driven**. Over three-quarters of user sessions, where a referrer link is identified, accessed the BL site via a search engine. Search engine users make use of about one site in ten. The impact of this is to bias use and user figures towards “bouncers” that is towards sessions that just view one page. Two-thirds of search engine users that landed on a Learning page left without viewing any more pages.
- **User diversity**. More people come into the BL site via Internet Service Providers than from academic organisations. Academic institute users make up a minority, less than one in ten of session use. This together with the fact that half of UK ISP use of the Learning directory occurred between 4 to 10pm suggests high levels of home use
- **UK universities not finding the site?** They were more likely to feature in BL sessions conducted by academic organisations NOT viewing a Learning page. It is unsure why this should occur however the following two hypotheses should be explored. Firstly, there is a navigational hypothesis, which is that US universities are using search engines to find the Learning pages, and in particular searching for images, while UK university users are somehow getting lost and not finding the Learning pages. Secondly, there is a brand hypothesis which is that the BL has a better brand image for this type of information in the US than in the UK.
- **Social network users**. Those viewing Learning via a blog type link (Wikipedia, Facebook or blog) were the most likely grouping to view more than one page: 82% did so, with 59% viewing 4 or more pages. This was also true of those accessing learning via a school link (72% and 51%). Links on blog type and school sites appear to work. This result was not repeated for the BL site in general. Access via blog links tended to be between 7 pm and 5am (UK time) and suggests: a) that this type of link is used predominately by US users (during there day time); b) a late learning pattern on the part of young people.

6 Recommendations

A questionnaire study should be hosted just for schoolchildren because the one undertaken was dominated by adults

The BL should think carefully when re labeling pages. Clearly a lot of BL pages are being featured in Wikepedia type information and if BL subsequently changes the name of a blog type linked page then the link on the blog end will become a dead link.

The BL needs to review its internal search facility and incorporate a facility to search for images, or to search sound recordings.

The BL should promote links on school and university pages where relevant. These links raise visibility and users coming in via such links are more likely to explore the BL resource.

1. Users coming in via a search engine often just view a single page. These users seem unwilling to use onsite navigational menus and rely on the search engine to select the most appropriate page. However user search strategies are poor and this inevitable leads to viewing a page that has little to do with the users request. Care must be taken in tagging and naming pages appropriately for robot indexing. Further pages might offer links to near proximity topics that is topics like the page landed at a kind of menu thesaurus to similar pages. Menus have traditionally been written for the user entering the home page however with search engines users can access the site from any page.