E-statistics – are we comparing apples and oranges? Getting a grip on e-statistics to measure our performance: a University of Queensland Cybrary perspective

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Abstract:
It is critical to identify the most efficient and effective means to gather and compare e-statistics for a range of electronic services that libraries provide. Since the mid-nineties projects have been underway by the ICOLC, the D-Lib Working Group, the ARL, EQUINOX partners and many others to develop performance measures based on e-statistics. As scholarly communication in Australia is in crisis having relevant and comparable e-statistics to help manage collections is crucial. This paper covers the University of Queensland Cybrary's perspective on factors influencing successful use of e-resources, include user friendliness of systems, accessibility and promotion of the resources. The effectiveness of e-statistics measures is also covered.

Introduction

*"**Statistics:** In recent use, the department of study that has for its object the collection and arrangement of numerical facts or data, whether relating to human affairs or to natural phenomena." Oxford English Dictionary Online (2001)*

As librarians, are we obsessed with statistics? Speak to any library manager and they will reel off a string of statistics from the number of staff, floor size, number of patrons through the turnstile, the number of loans and even the number of items in the collection. Why are librarians so hung up on statistics? One reason is that traditionally they have used these indicators to measure library services. The traditional measure of a library was the size of the collection, for example, libraries were regarded as better if they had larger collections and a high number of staff. Today libraries are more concerned about output and outcome measures to indicate their performance and cannot rely upon traditional statistics alone. Is it now the case that the more public workstations, more hits on the website, and more e-resources the better the library?

Electronic statistics not only refer to the statistics on the use of electronic information resources such as the number of times and duration an online journal or database has been accessed, but also a range of electronic services that the library offers. For example, the number of times the library website is accessed and the number of information requests received using online reference services such as the University of Queensland 'Ask a Cybrarian' service. Whilst we recognize the importance of e-statistics as a means to improve library services, it is also critical to identify the most efficient and effective way to gather and compare statistics. Some effort in Australia has commenced with the Council of Australian University Libraries (CAUL) now including electronic resource measures in their annual statistics. With this work CAUL has taken measures so that libraries are all gathering the same data, to ensure we are comparing the same "apples" (CAUL 2001).

Since the mid-nineties major projects to develop performance indicators to evaluate and compare electronic resources have been under way. Bodies such the JSTOR Web Statistics Task Force, the International Coalition of Library Consortia (ICOLC) and the D-Lib Working Group's Digital Library Metrics, have been responsible for many initiatives to develop meaningful performance indicators. These projects commenced the effort to "achieve a common set of basic use information requirements that are an integral and necessary part of any electronic product offering." (ICOLC 1998).

Why gather e-statistics?

In an environment of no growth budgets, information abundance, evolving IT environments and increasing demand for more services, libraries are looking towards the statistics from e-resources as one tool to assist them in determining how best to manage their collections. Academic and research libraries are part of the global economy and scholarly communication in Australia is deemed to be in crisis; the current situation is best summed up on the CreateChange website.

"In 1993, Australia's 38 university libraries purchased a combined total of 200,666 scholarly journals. In 1998, total subscriptions had dropped to 112,974, a decline of 43.7%. During the same five-year period, the average unit cost for journals increased from A$287 to A$485, a jump of 70%.

Malcolm Gillies, Chairman of Australia's Coalition for Innovation in Scholarly Communication and Executive Dean of the Faculty of Humanities and Social Sciences at the University of Adelaide estimated that about 60% of the cancellations were in the sciences, technology, and medicine. Gillies further suggested that Australia's place in the world research community was at grave risk because of the declining resources available to scholars." (Association of Research Libraries et al. 2000). The effect of the crisis on Australian researchers is also detailed in the Batterham Report, *Chance to Change* (Batterham 2000).

Australia is a net importer of information. A recent study shows that the Australian contribution to the international scientific literature has increased from 2.2% to nearly 2.8% during the 1990's (Richardson 2001, p.25). In 1999 Australia imported A$795 million worth of information (40% from the US, 37% from the UK, 11% from China and 7% from Singapore) while it exported A$135 million (Houghton 2001, p.7). The dramatic increase in the cost of books and serials are illustrated in the following graphs from the Association of Research Libraries (2001).

Monograph & Serial Costs ARL Libraries 1986-2000
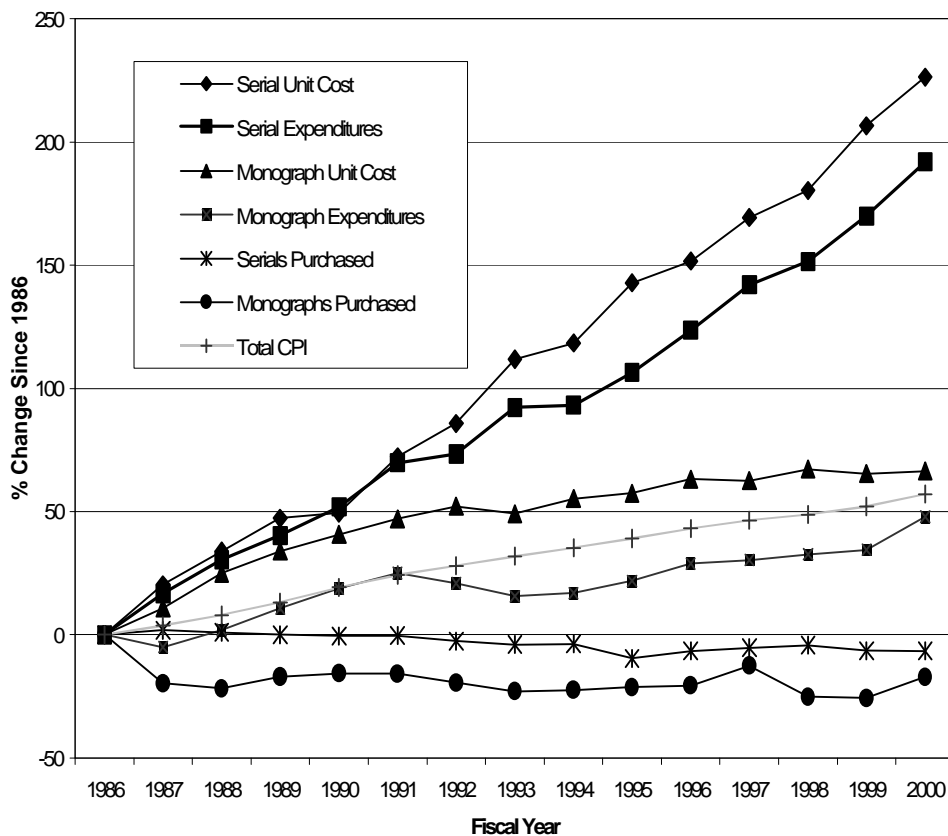
Expenditure Trends ARL Libraries 1986-2000
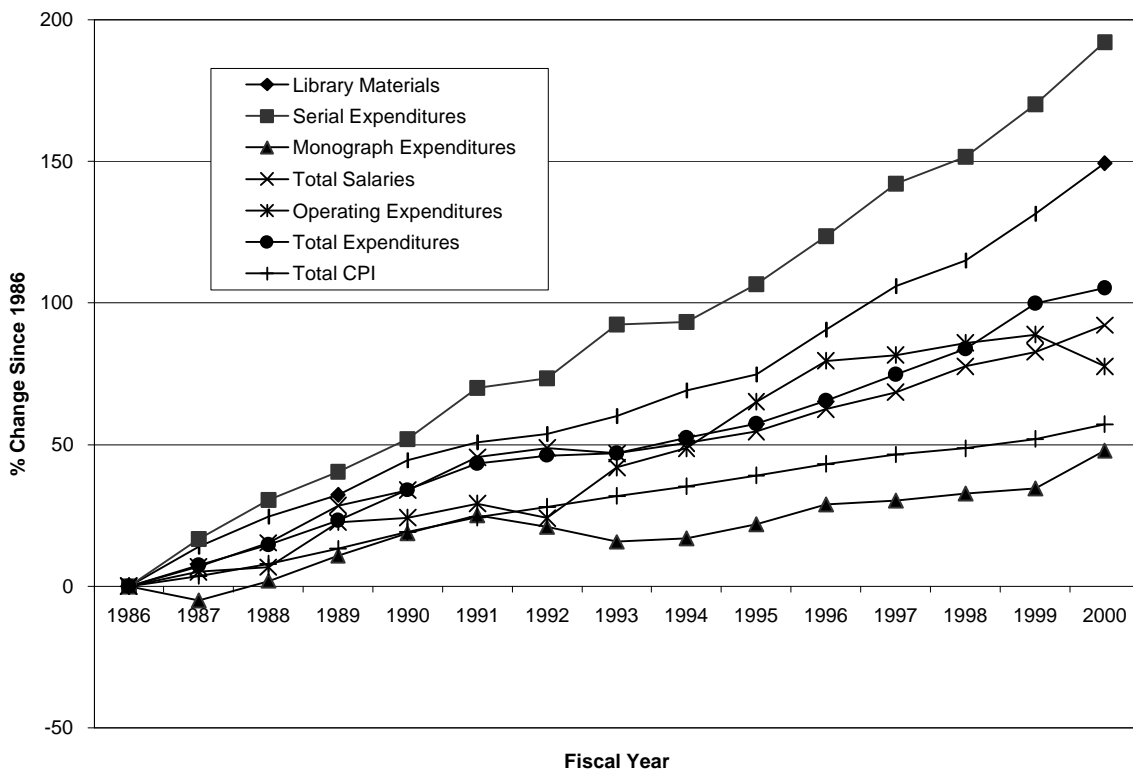
E-statistics in a networked environment

As well as using e-statistics to determine the use of our electronic resources, e-statistics are also being used in a broader sense to measure performance in libraries in a networked environment. For example, the EQUINOX Project (Brophy 2000) has established a list of Electronic Library Performance Indicators to address how to measure library services in the new-networked environment. A list of the EQUINOX indicators is listed in **Attachment A**. Currently it is not possible to use all of these indicators, as many of the vendors do not provide such data to their library customers.

NISO (National Information Standards Organizatation) has recently announced that a committee has been formed to revise ANSI/NISO Z39.7 - 1995 (Geller 2001) the Library Statistics Standard. This standard was first established in 1968, and revised in 1983 and 1995. In 1995 the committee acknowledged that it did not address the emerging areas of measuring electronic resources and performance measures. The revision of the 1995 standard will include electronic network performance, vendor and publisher-based usage statistics as well as service quality measures.

In Australia a large number of libraries have embraced quality management processes in order to improve their services, and as part of this are taking part in a number of benchmarking projects. In the higher education environment improving our use of e-statistics as performance indicators will become increasing important when submitting information to the Australian Universities Quality Agency.

The Publishers and Libraries Solutions (PALS) Usage Statistics Working Group plan to establish a code of practice for vendor based e-journal and database statistics by early 2002 (PALS Usage Statistics Working Group 2001). It will be a major achievement if vendors apply this code of practice and standardization of available e-statistics is attained. Library managers will then have at their disposal quality data for performance analysis.

E-resources and their impact on collection development

Electronic "bundles" or 'packages" are now standard resources in many libraries and are having an impact on how collections are developed and maintained. In the print-only world, libraries selected and deselected individual journals on the basis of their relevance to the collection. Libraries are now often purchasing e-journal bundles as a means of providing e-access to their print subscriptions and to enhance their collection. Bundles, however, often increase in price as more titles are added to the bundle and so in order to maintain access to the original core titles, libraries now have to consider cancelling print subscriptions not in the bundles or transferring money from other funds in order to pay for such bundles. In these cases the usage statistics are essential in determining if the bundle is worth the cost (not just in monetary terms but also what has to be cancelled to pay for them) especially if a number of titles are also available in a competing bundle.

In the current economic climate e-resource usage statistics have become a double-edged sword. One recent example is the change of electronic access by the *New England Journal of Medicine (NEJM)*. Prior to 1st October 2001, institutions were given electronic access for two simultaneous users as part of the print subscription cost. From 1st October 2001, the *NEJM* publishers changed this policy and initially recommended they would only give electronic access to five IP addresses (Okerson 2001).

Following many letters of complaint *NEJM* revised its decision and now offers e-access using either a password or five-IP models. It is interesting to note that "statistical evidence" was used as one of the reasons for the change, although no usage figures have ever been given to the UQ Cybrary. In this example, a publisher is using e-statistics to justify a major change to subscription arrangements.

Both Swets Blackwell and Highwire Press indicated they provide e-statistics based on their customers needs (personal communication, September 2001). These agents do analyze their e-statistics to ensure their customers optimize their services. The extent that information providers and publishers are using e-statistics to justify changes in their services and fees has not been ascertained.

Factors influencing successful use of e-resources

There are at least three major factors that influence the successful use of e-resources by library users and all of them impact significantly upon e-statistic levels.

The first is user friendliness of the system. For most libraries the website is the key to facilitating successful access to library services and resources. Users need to know how to access the information they want, when they want it, and from a place of their choosing. The UQ Cybrary website (http://www.cybrary.uq.edu.au) receives an average of 25,000 requests per day during semester, over a 24-hour period every day. The majority of requests are made via the Cybrary homepage to the following pages: 63% of requests to the catalogue, 79% of requests to the database page, 88% of requests to the course materials page and 76% of requests to the branch libraries opening hours page. The homepage must be user friendly, with e-resources placed prominently to allow patrons to optimize these resources.

The second factor influencing usage is accessibility. The ability to access the resource from outside the home or institutional network has a significant impact upon the level of use. For example, as most resources use IP authentication to restrict access to authorized users it has become necessary for many libraries to provide ways for their customers to legitimately access the resource from anywhere. The UQ Cybrary, (as does many other libraries) uses such an authentication system.

Another aspect of accessibility is the lack of restrictions on where the online resource can be accessed. For example, usage of electronic journals is not high if usage is restricted to a few dedicated workstations within a library. In mid 2000 the UQ Cybrary improved e- access to a particular title by subscribing to an institutional site licence. Usage has increased from an average of 40 full text downloads a month to over 1,000.

The third major influence is the active training and promotion of products. Detailed analysis of the statistics has revealed that usage increases dramatically when the resources are both actively promoted or made available via non-IP dependant authentication systems. Requests for remote access will only increase with the trend of globalized education and flexible learning.

Although successful usage is tracked through reports providing e-statistics, it is essential that libraries carefully analyze the data to ensure that they understand the pattern of usage. UQ Cybrary is using PURLs (Persistent Uniform Resource Locators) to link to full text articles, and to create and save predefined searches in some databases. Every click to the full text article will therefore generate usage data and so when PURLs are used for large undergraduate courses huge usage of some titles are generated. Vendors who justify increasing costs based on usage could misinterpret this data. Alternatively, if a journal article were to be hosted locally the usage reported from the vendor would be much lower.

E-statistics cannot be examined in isolation. The evaluation process suggested by McClure (2001) when assessing electronic networked resources involves using e-statistics in the context of extensiveness of access, efficiency of access, effectiveness and quality of the resources to satisfy user needs and, impact and usefulness of the electronic resources.

How well are e-resources measured?

Although ICOLC (1998) issued "Guidelines for statistical measures of usage of web-based indexed, abstracted and full text resources" in November 1998, it is clear that these are not being adhered to by a number of information providers. While it is easy to use and compare statistics for locally mounted services, it can be more difficult when using statistics provided by vendors, as the statistical reports vary in terms of ease of use, regularity and content. The present collection of e-statistics available from publishers and vendors can best be described as a 'hotchpotch". According to the White Paper by Luther (2000, p.1) on Electronic Journal Usage Statistics, "less than half of the publishers who offer journals in electronic form today are able to provide statistics on the usage of these journals. What is available varies widely among publishers, and librarians are often unclear about what to ask for and how they will use the data."(ibid)

Vendor based statistics

An analysis of the statistics received by the UQ Cybrary for e-journals indicate that for every service there are different categories of statistics. The most common measure available is the number of searches. Other categories include: number of sessions/logins, number of searches, number of TOC searches, number of references, number of abstracts, per title full text, per title abstract, per title TOC, kilobytes, browses, views, access per domain, unique accesses and printing.

This is also the case for database statistics received by the UQ Cybrary, for example:
number of sessions/logins, number of searches, number of rejects, views, access per domain, downloads and zero hits.

E-books statistics also vary, for example it is difficult to compare the use of two major medical e-textbooks such as *Harrison's Online* and the *Stat-Ref* collection. The UQ Cybrary receives detailed

statistics from *Harrison's* each month and can track the usage by chapter or article type. In comparison, the statistics from *Stat-Ref*, although very easy to collect, provide information in seven groups such as sessions and bytes transferred but no details are given of the usage of the individual titles in the collection.

Locally produced usage figures

Warren Holder, Electronic Resources Coordinator, University of Toronto recently described some of the statistics that UT had generated (Holder 2001). The UT Library has loaded a number of electronic journals and databases on to local servers. For example, UT has found that e-access is normally 21 days before arrival of print version, and that 97% of use is from 50% of titles while 58% of use is from 10% of titles. While it is possible to generate some of this information from vendor statistics it would be very labour intensive to combine a number of vendor reports.

The CSIRO Electronic Journal Collection (EJC), launched August 1999, is a locally loaded system to support the research needs of this diverse organisation. A range of usage statistics are generated from this system including web server logs of the EJC usage which indicate date of access, ISSN, CSIRO Division using the source, location and type of access (such as PDF, ToC and Abstract)(Kent & Campbell 2001).

At the UQ Cybrary, to review the usage of locally loaded WebSpirs databases, a SilverPlatter utility BRL Admin is used to produce some raw statistics into two files. One file stores database usage while the other stores usage by user. PERT scripts are then used to convert files to a format that can be imported into an MySQL database, FTP the data and create a front end to allow library staff to easily query the database and generate reports.

Following is a BRL Admin report showing the concurrent users in relation to the license limit:
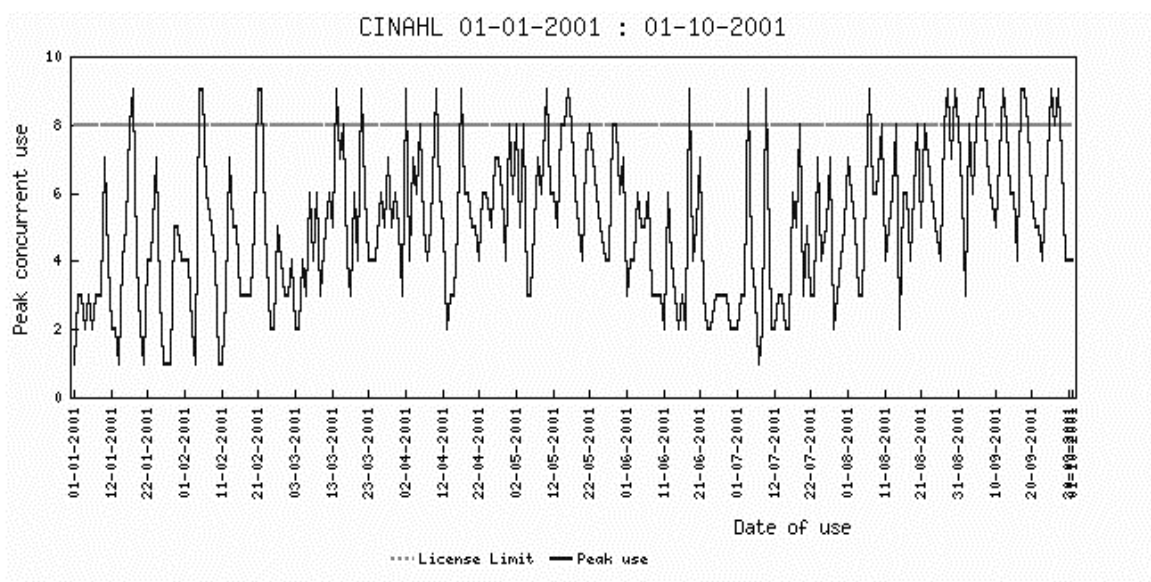
SilverPlatter database reports have been used in decision making to determine whether to renew the subscription or to increase the number of simultaneous users. In some cases the number of rejects over a time period is the critical statistic as this shows the level of demand for the product.

Extending library services

There is no doubt that electronic services can extend library services beyond opening hours of the physical library, though not many vendors provide information on when the services are being used. JSTOR is an exception and provides reports detailing the breakdown by hour of access. This, together with analysis of usage of the library website, will give better information about the information gathering habits of its customers. It is interesting to note that UQ customers do use the service 24 hours a day and although the heaviest use is during the afternoons there is a substantial use in late evenings and very early mornings. Such findings have led to the introduction of services such as "Ask a Cybrarian" (an online support service that provides help within 24 hours or less to patron queries) and input by library staff to the development of e-learning course materials. At the University of Toronto 25% of electronic services are used when the library is closed (Holder op cit.).

ICOLC has issued a December 2001 revision that provides vendors with a practical framework to deliver statistics. Has this started to have an effect? A press release in late October 2001 "Enhanced Usage Reports now available on EBSCO Online" states that *Talking with administrators, we found a need for more complete patron electronic usage reporting within a library. These enhanced reports will allow administrators to more completely and easily track electronic journal usage in their libraries and be more informed about what resources patrons are using. This will allow library administrations to make better purchasing decisions for electronic resources in their library."*

The work of world bodies outlined in **Attachment B** provides a chronology of developments aimed to improve the means to compare disparate electronic resources that libraries throughout the world provide for their customers. "Metrics are required that can be meaningful to all stakeholders, reproducible and inexpensive."(ICOLC 1998). Whilst the work of a range of bodies such as the ICOLC, the D-Lib Working Group, the ARL, EQUINOX partners, National Commission on Libraries and Information Science (NCLIS), the Publishers and Libraries Solutions (PALS) group and the National Information Standards Organization (NISO) has been significant, the real test will be in the future adherence by publishers of the codes and standards that are released. The challenge is also for the library profession to effectively incorporate these performance measures for the overall improvement of library collections and service delivery.

Conclusion

With the pressure of reducing budgets and the diminishing value of the Australian dollar we must ensure that our collections are relevant and we are deriving value from our e-resources; e-statistics are a means to help achieve this. In libraries we now conduct a huge percentage of our operations in a network environment. It is critical that we can effectively measure our performance during such operations and have the means to compare such data with other libraries. We are "clutching at straws" as we desperately analyse our e-statistics in order to negotiate for fairer deals with aggregators for bundles of journals and databases. As e-resources are accessed twenty-four hours a day outside of the physical library we need to modify our services to accommodate such changing use. Regardless of the huge amount of effort major world groups have undertaken to provide librarians with effective e-statistics performance indicators, currently in the workplace we spend our time comparing data that is akin to comparing "apples and oranges." We are positive that the ongoing work of international library groups will break through the present challenges and provide us all with common measures to report upon our performance.

EQUINOX Electronic Library Performance Indicators

1. Percentage of the population reached by electronic library services
2. Number of sessions on each electronic library service per member of the target
3. Number of remote sessions on electronic library services per member of the population to be served
4. Number of documents and entries (records) viewed per session for each electronic library service
5. Cost per session for each electronic library service
6. Cost per document or entry (record) viewed for each electronic library service
7. Percentage of information requests submitted electronically
8. Library computer workstation use rate
9. Number of library computer workstation hours available per member of the population to be served
10. Rejected sessions as a percentage of total attempted sessions
11. Percentage of total acquisitions expenditure spent on acquisition of electronic library services
12. Number of attendances at formal electronic library service training lessons per member of the population to be served
13. Number of library staff developing, managing and providing ELS and user training as a percentage of total library staff
14. User satisfaction with electronic library services

Consolidated list of datasets

[ELS = Electronic Library Services. LCW = Library Computer Workstations.]

1. Total number of persons in the target population
2. Total number of persons in the population to be served
3. Number of persons in a sample who have used ELS during a specified time period
4. Total sample size used to establish the percentage of the population reached by ELS
5. Total sample size for user satisfaction survey
6. Sum of the values for each ELS indicated by the users in the satisfaction survey
7. Number of sessions on each ELS by members of the target population during a specified time period
8. Number of sessions on ELS by members of the population to be served during a specified time period
9. Number of sessions on each ELS during a specified time period
10. Number of remote sessions on ELS by members of the population to be served during a specified time period
11. Proportion of total sessions which are remote for services where this information is available
12. Number of rejected sessions on a licensed ELS during a specified time period
13. Number of documents viewed from each ELS by members of the population to be served during a specified time period
14. Cost of each ELS for a specified time period
15. Acquisition expenditure on electronic library services
16. Total acquisitions expenditure
17. Number of information requests submitted electronically during a specified time period

18. Total number of information requests received during a specified time period
19. Mean number of LCW at a specific point in time
20. Number of LCW provided at a specific point in time
21. Number of LCW provided during a specified time period
22. Number of hours the library is open during a specified time period
23. Number of full-time equivalent library staff providing, maintaining and developing ELS and providing user training
24. Number of full-time external staff providing, maintaining and developing ELS and providing user training
25. Total full-time equivalent library staff
26. Number of attendances at formal ELS training lessons during a specified time period.

Development of e-resource performance indicators: chronology (date order)

Body	Project	Key features / outcomes	Work completed / ongoing
The University of Michigan	Pricing Electronic Access to Knowledge (PEAK)	Ten USA universities participated in a trial with Elsevier Science to test a new model for pricing the electronic delivery of journals. University libraries were given the open of purchasing a package rate for a set number of articles from anywhere in the Elsevier Science database, as well as the more standard choices of buying unlimited access to complete journals and the document delivery method of paying per article requested.	Undertaken 1996 - 1999
Web site: http://www.lib.umich.edu/retired/peak			
International Coalition of Library Consortia (ICOLC)	"*Guidelines for Statistical Measures of Usage of Web-Based Indexed, Abstracts, and Full Text Resources*" abbreviated as the *ICOLC Guidelines*	Priority measures include: • Number of queries, such as searches undertaken; • Number of menu selections; • Number of sessions measured by logins; • Number of rejections due to number of users exceeding license; • Number of items examined.	Based on the work of JSTOR in 1997, these guidelines were established 1998 and revised December 2001. Complementary work includes such as the *Guidelines for statistical measures of Web based information resources*.
Web site:http://www.library.yale.edu/consortia/webstats.html			
D-Lib Working Group based at the Corporation for National Research Initiatives	Digital Library Metrics	Project objective to achieve agreement on a set of metrics to evaluate and compare the effectiveness of digital libraries and related technologies in a distributed environment.	1998 +
Web site: http://www.dlib.org/metrics/public/index.html			
Association of Research Libraries.	Usage measures for electronic resources	Objective of the project is to develop, test and refine selected statistics and performance measures to describe electronic	May 2000 – December 2001

Body	Project	Key features / outcomes	Work completed / ongoing
Charles R. McClure (principal investigator) and John Carlo Bertot (co-principal investigator)		services and resources in ARL libraries. Another objective is to involve selected database vendors in producing required statistics on database use, users and services. The project also aims to develop recommendations for obtaining external funding to maintain the development and constant improvement of networked statistics and performance measures.	
Web sites: http://www.arl.org/ http://www.arl.org/stats/newmeas/emetrics/index.html			
EQUINOX: Library Performance Measurement and Quality Management System	Compile a set of indicators to enhance and complement the indicators for traditional library services presented in ISO 11620:Library Performance Indicators	The EQUINOX report includes: fourteen electronic library performance indicators; a listing of the datasets required to calculate the performance indicators; definition of key terms; and dataset collection and performance indicator methodologies.	Last updated November 2000
http://www.albany.edu/~imlsstst http://equinox.dcu.ie/reports/pilist.html			
John Carlo Bertot and Charles McClure undertook a study funded by the US Institute of Museum and Library Services and the State Libraries of Delaware, Maryland, Michigan, North Carolina, Pennsylvania & Utah.	Development of a core set of national statistics to describe public library and state library network of use Internet resources	From the ALA blurb: The publication, "Statistics and performance measures for public library networked services" is a manual that will show how to: • Establish a core set of performance measures that will capture and describe patron use of online resources. • Collect and organize hard statistics based on the measures you set. • Assess the services you are providing and identify potential areas of growth. • Understand how your library's services are being used by patrons. • Using the reproducible forms, develop a specific picture of your library's network service and usage that can be communicated to staff, community and new funding streams. • Develop financial reports and cost-benefit analysis to	The publication: John Carlo Bertot; Charles R. McClure & Joe Ryan "*Statistics and performance measures for public library networked services*" Chicago, American Library Association, 2000. (ISBN 0838907962) Available for purchase from: http://alastore.ala.org/

Body	Project	Key features / outcomes	Work completed / ongoing
		support budget increases and reallocate resources.	
Web site: http://slis-two.lis.fsu.edu/~cmcclure/			
National Commission on Libraries and Information Science	Testing National Public Library Electronic Use Performance Measures	Wide range of studies undertaken on measuring digital information services.	1999+
Web site: http://www.nclis.gov/libraries/lsp/statist.html			
Council on Library and Information Resources. Judy Luther	White paper on electronic journal usage statistics	Review of the statistics that are currently collected and how they are gathered, and the issues that need to be addressed before librarians and publishers are content and confident with the process.	October 2000
Web site: http://www.press.umich.edu/jep/06-03/luther.html			
Publishers and Libraries Solutions (PALS) group and organisation created by the JISC, the Publishers' Association (PA) and the Association of Learned and Professional Society Publishers (ALPSP) – set up the PALS Usage Statistics Working Group established Sept. 2000	Objective to establish a Code of Practice for vendor based e-journal and database usage statistics.	The Code of Practice will include: • Details on which data elements to measure; • Definitions of the data elements • Output report formats/frequency/granularity • Methods of delivery • Methods of merging usage reports from direct use and from use via intermediaries; • Means to measure remote usage of institutionally licensed products • Methods of measuring usage from caches and mirrors	2000 + (Code of Practice to be compiled by early 2002)
Web site: http://www.usagestats.org/			

Body	Project	Key features / outcomes	Work completed / ongoing
National Information Standards Organization	Standards Committee to revise ANSI/NISO Z39.7-1995 Library Standard	The Committee will recommend changes to the survey instrument that is used to gather U.S. library statistics. The review will also address methods of measuring electronic network performance, vendor and publisher-based use statistics, reporting methods, and service quality measures; and to advise NISO on how best to integrate new measures into Z39.7	2001+
Web site: http://www.niso.org			

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