



Joint, N. and Ashworth, S. and McLellan, E. and Barton, J. and Kemp, B.
(2001) GAELS Project Final Report: Information environment for engineering.
Project Report. Universities of Glasgow and Strathclyde, Glasgow.

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GAELS Project Report

June 2001

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Introduction

The GAELS project is a collaboration between Glasgow University Library and Strathclyde University Library with two main aims:

- to develop collaborative information services in support of engineering research at the Universities of Glasgow and Strathclyde
- to develop a CAL¹ package in advanced information skills for engineering research students and staff

The project is funded by the Scottish Higher Education Funding Council (SHEFC) from their Strategic Change Initiative funding stream, and funding was awarded initially for one year, with an extension of the grant for a further year. The project ended in June 2001.

The funding from SHEFC paid for two research assistants, one based at Glasgow University Library working on collaborative information services and one based at Strathclyde University Library developing courseware. Latterly, after these two research assistants left to take up other posts, there has been a single researcher based at Glasgow University Library.

The project was funded to investigate the feasibility of new services to the Engineering Faculties at both Universities, with a view to making recommendations for service provision that can be developed for other subject areas.

¹ Computer Aided Learning

The GAELS Information Audit

1. Introduction

The information audit describes and evaluates the existing model of information in support of engineering research at Glasgow and Strathclyde, and investigates the information needs and information-seeking behaviour of engineers currently engaged in research at the two institutions.

2. Library services for engineers at Glasgow and Strathclyde

2.1 Local holdings

The engineering collections at Glasgow and more particularly at Strathclyde are substantial, based as they are on a long history of engineering research at both institutions. Despite higher levels of resourcing overall, Glasgow's collections cover a broader range of disciplines with an emphasis on humanities and, to a lesser extent, social sciences; at Strathclyde, the emphasis lies in the scientific disciplines and engineering attracts a far greater proportion of the overall resource. As a result, the resources allocated to engineering at Strathclyde are currently about 50% higher than those at Glasgow and Strathclyde's collections in this discipline are recognised as nationally significant.

A detailed study of current journals holdings, not just at Glasgow and Strathclyde but at all HEIs in the Glasgow area, was carried out in 1996 with funding from SHEFC's Regional Strategic Initiative. The data from this study was made available to GAELS and further analysis of the subset of data relating to engineering was carried out. The results of this exercise reveal some interesting differences between the engineering collections and the collections as a whole. These results are presented and discussed in Section 4.

Usage statistics for monographs and bound journals were derived from library automation, but data on in-library use of these materials, and of current issues of journals and reference material, are not available at either Glasgow or Strathclyde. However, some data on user perceptions of levels of in-library use were collected at Glasgow as part of a library use survey earlier this year. Again, these data were made available to GAELS and the results are presented in Section 3.

2.2 Electronic access to information held locally and remotely

Both Glasgow and Strathclyde now provide a wide range of electronic journals, CD-ROMs, databases and other electronic resources. Increasingly, these are available beyond the library, in many cases via a Web-based interface. Both libraries, and UK academic libraries generally, are moving towards a more integrated approach to locating and accessing electronic resources, although a single integrated interface is still some way off. It should be noted, however, that the approaches that have been adopted by Glasgow and Strathclyde are not compatible at all levels, and this may have implications for future developments in this area.

Despite the potential problems in providing joint electronic access, Glasgow and Strathclyde are already laying the foundations for a joint electronic library, through consultation on the selection of services and service providers and through the extension of collaborative collection development to include electronic journals. In engineering, this was applied to the choice of service provider for the INSPEC database; both libraries selected the BIDS service and the need to facilitate joint information skills training was a key factor in this decision.

The results of a library use survey conducted at Glasgow in 1997/98 suggest that engineers are less likely to make use of traditional library services than other user groups, and more likely to make use of access-based and electronic services. (See fig 2.1) Levels of borrowing and in-library consultation of hard copy books and journals among engineers is low in comparison to those among other user groups, whilst the level of use of document delivery is fairly high. Taking into account their relatively limited availability in engineering at the time of the survey, the level of use of electronic journals is also high.

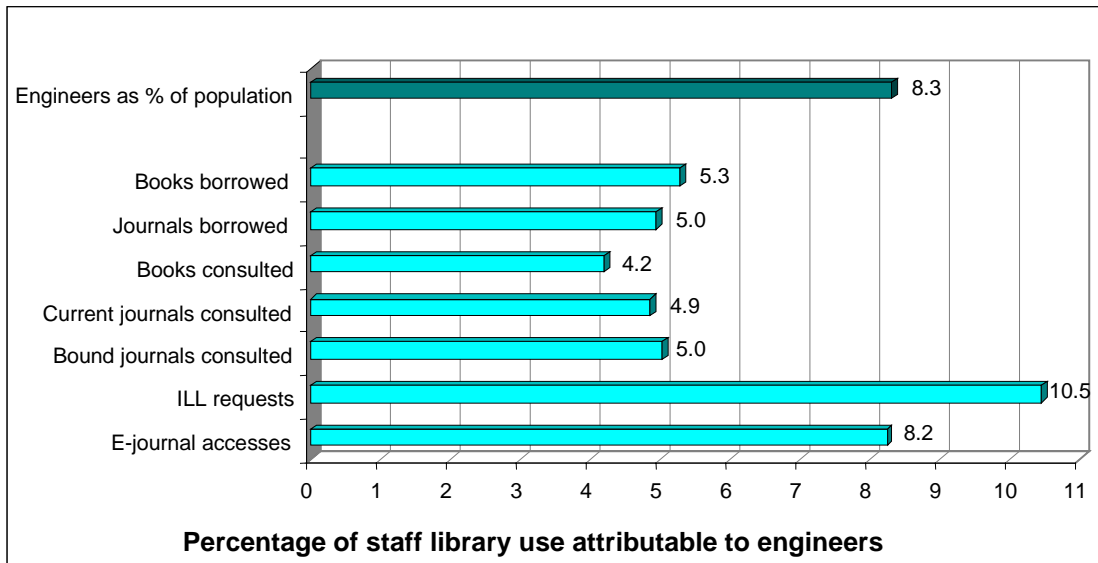


Figure 2.1

Figure 2.2 shows the pattern of usage of a number of databases relevant to engineers, namely INSPEC, BIDS ISI and BIDS Compendex. The data is from Glasgow; comparable figures are not readily available from Strathclyde as the data is not collected in the same way, but the pattern of usage is broadly the same.

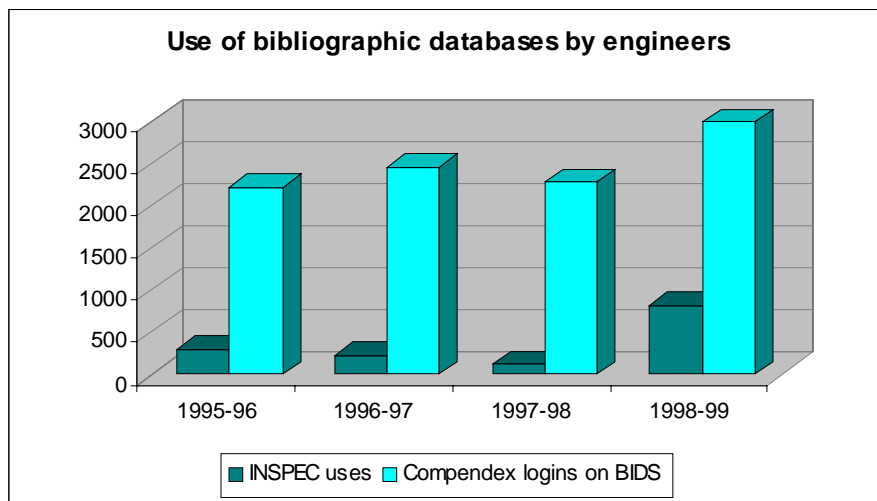


Figure 2.2 Use of bibliographic databases by engineers at Glasgow

The data show that use of INSPEC, which had only been available as a stand-alone CD-ROM in the library, was minimal, despite being a key database for electronics and electrical engineering. In contrast, use of the BIDS ISI citation index, which was available over the network with a Web interface, caught on rapidly after its introduction and was very heavily used, especially by the Department of Electronics and Electrical Engineering, despite being of limited use to this group. BIDS Compendex, which has been available over the network for some time, is receiving fairly consistent levels of use.

This pattern of use suggests that engineers tend to select information resources on the basis of accessibility rather than content, and that while they are quick to adopt new forms of access to information, they are equally quick to reject old forms of access. There is other evidence to suggest that engineers prefer materials and services which can be accessed remotely to those which are only available

in the library, and in particular that they make relatively high use of electronic journals. This evidence is discussed in more detail in Section 3.

2.3 Document delivery services

The inter-library loan service at Glasgow is available to all staff and students of the university, although students require the signature of their supervisor. At Strathclyde, the service is restricted to academic and academic-related staff and to postgraduate and final-year Honours students with the signature of their supervisor. From the point of view of GAELS, therefore, these services are available on the same basis to staff and research students at the two institutions.

There has traditionally been no charge for ILL provision to this group of users at either institution, nor has there been any restriction on the number of ILLs per user. However, Glasgow decided in 1999 to 'reconsider the implications of providing a free, demand-led service' in the face of increasing demand and pressure on resources. As an interim measure, any charge over and above the standard charge made by the British Library will be passed on to the user. In addition, the budget allocation to academic planning units now includes an amount for ILLs, and any use of the service which exceeds this allocation must be borne by planning units rather than by the library. A similar restriction has recently been imposed at Strathclyde.

Glasgow also offers a photocopying service to staff and research students. This is charged at 10p per sheet, via a direct debit system in which participating departments set up an account and issue authorized members with an identification code. This system is not suited to first-time and occasional users, as it takes some time (and the co-operation of the department) to set up an account.

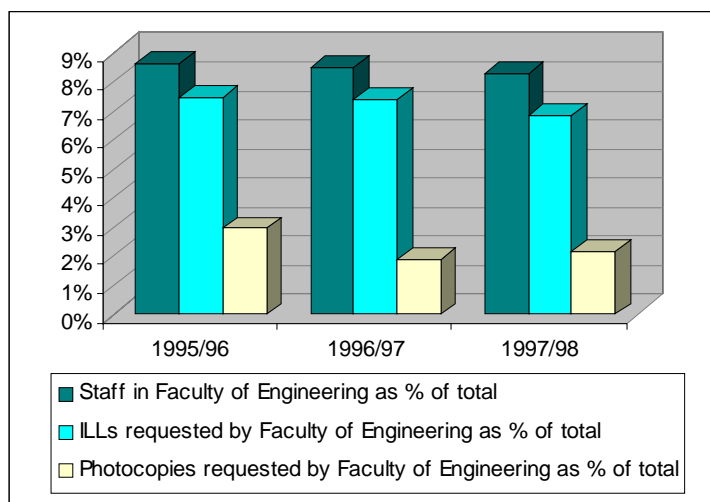


Figure 2.2 Use of document delivery services by engineers at Glasgow

The number of ILL requests from engineers at Glasgow rose from about 2000 in 1995/96 to over 2500 in 1997/98, an increase of 21.5% over two years. However, the number of ILL requests across all subjects showed an increase of 32.4% over the same period, and Figure 2.2 illustrates the extent to which the proportion of use of the service by engineers is lower than might be expected given the proportion of engineers within the total user population. The photocopy service statistics show a similar pattern of low and declining use by engineers, who account for less than 3% of the total number of requests.

The ILL service at Strathclyde has also seen a sharp increase in usage over the same period, with requests up by 16.2% for engineers and by 15.8% for the user population as a whole. The different subject coverage of the two institutions makes direct comparison difficult, but it is clear that demand for document delivery services is increasing at an unsustainable rate in both cases.

Partly in response to this pressure on resources, both Glasgow and Strathclyde have been actively involved in various document delivery trials, including SALSER², the RLG Shares³ programme and the COPAC⁴ inter-lending service.

2.4 Current awareness services

Glasgow offers a range of current awareness services, including basic keyword searches, advanced keyword searches on commercial databases via online hosts, and contents page services. The basic and contents page services are available to academic staff and research students free of charge, while the advanced service costs from £25.

Strathclyde offers a similar range of services to those at Glasgow, but only on a full cost recovery basis. Consequently, users are encouraged to carry out their own current awareness wherever possible and the service is not actively promoted. As a result, very few services are currently running and there is insufficient data to warrant detailed analysis.

Glasgow, on the other hand, is running several current awareness services on behalf of members of the Faculty of Engineering. Compared to the user population as a whole, engineers make relatively little use of keyword search services, but relatively high use of contents page services, as shown in Figure 2.3.

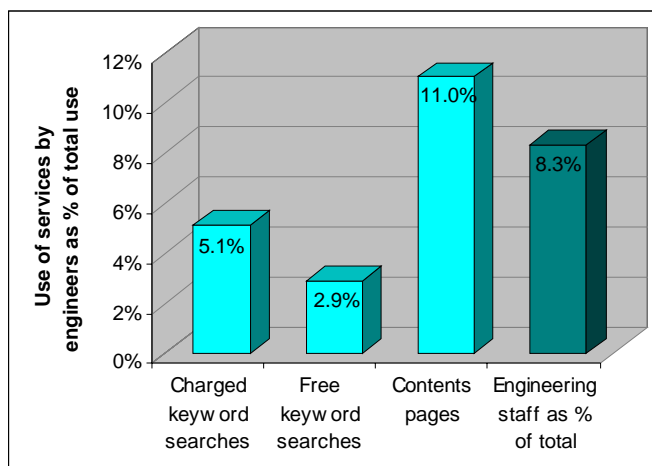


Figure 2.3 Use of current awareness services by engineers at Glasgow

The contents page services span a total of 75 journals in engineering, physical sciences and management. A closer examination of the 55 engineering and physical sciences titles reveals that 44% of these are held by both Glasgow and Strathclyde, a further 15% and 16% are held by Glasgow and Strathclyde respectively and the remaining 25% are not held by either library. This demonstrates the value of the service in alerting users to recently published material which is not immediately available locally.

² SALSER (Scottish Academic Libraries Serials) is an online information service about journals held in Scottish academic and research libraries, including all the University Libraries, the National Library of Scotland, Edinburgh City Council, the Mitchell Library in Glasgow and some Union Lists.

³ Research Libraries Group SHARES programme is an interlending facility which gives access to the holdings of SHARES member libraries (83). These include Columbia, Cornell, Getty Research Institute, the Library of Congress, Pennsylvania State, Princeton, Rutgers, Stanford, Yale as well as many of the large museum libraries.

⁴ COPAC is a union catalogue which gives free access to the merged online catalogues of members of the Consortium of University Research Libraries (CURL).

The efficiency of this service has brought to light an inefficiency within the document delivery service at Glasgow, namely that users are alerted to material which is so recently published that it is not yet available from BLDS; this is especially true of material published overseas. Requests for such material are often returned as unavailable in the first instance, and as there is currently no system to deal with failed requests of this type, they can be subject to long delays. This is understandably seen as poor service by users.

There is some anecdotal evidence that engineers are making use of current contents services other than those provided by the library. It has also been suggested that engineers are more likely to conduct their own keyword searches than some other user groups, and that they tend to be reasonably effective in doing so. However, their low use of the library generally and of the document delivery service in particular does not necessarily support this view.

3. Glasgow's Library Use Survey

3.1 Background to the survey

This survey was carried out in April 1998 to establish relative levels of use of the library between different groups of users, to inform the development of the mechanism by which the library materials budget is allocated to Planning Units. Staff and research students were asked by means of a questionnaire to estimate their usage of a range of library materials and services.

Note that the results are not reliable as absolute measures of levels of use, as there is an in-built element of subjectivity in the method of collection; it is known that respondents tend to overestimate in this type of survey. Similarly, the responses will tend to over-represent active library users and those with a particular interest in the library. However, these in-built distortions might reasonably be expected to apply equally to all user groups. This assumption was checked against actual library usage statistics where possible; for example, the survey results for percentage use of ILLs by Faculty correlate well with the actual percentage use.

The survey results give us an indication of levels of use by engineers relative to those of users from other Faculties, and of differences between staff and research students. The results also provide an overview of the pattern of use of the library by engineers, prior to a more wide-ranging investigation of their use of information in general.

3.2 Original survey results

The results for the Faculty of Engineering, shown in Figure 3.1, give mean estimated use for the Faculty, based on responses from 72 academic staff and 55 research students, and Faculty use as a percentage of total use, weighted by the size of the Faculty. From these two pieces of information, it is possible to make some general observations as to whether the Faculty's estimated use of a particular service or type of material is relatively high, low or average; these observations are also shown in Figure 3.1.

	Academic staff			Research students		
	Faculty mean	Faculty use as % of total use	Relative use	Faculty mean	Faculty use as % of total use	Relative use
3a Books currently on loan	6.88	13.71	High	7.04	12.98	Average
3b Periodicals currently on loan	0.31	13.34	High	0.55	19.58	Average
4a Books borrowed per month	2.64	5.28	Low	3.87	9.01	Low
4b Periodicals borrowed per month	1.13	4.96	Low	2.45	12.93	Average
5 Book consultations per month	4.79	4.21	Low	5.49	8.91	Average
6 Current periodical consultations per month	4.91	4.85	Low	4.57	12.85	Average
7 Bound periodical consultations per month	4.86	5.04	Low	5.79	9.73	Low
8 Photocopy requests per month	1.62		Average	1.86		Average
9 ILL requests per month	2.85	10.46	High	2.85	8.34	Average
10 E-journal accesses per month	5.53		Average	4.42		Average

Figure 3.1 Library use survey results for the Faculty of Engineering

The results for academic staff show low overall levels of use of the library's holdings relative to other Faculties. The high numbers of items currently on loan and low numbers of loans per month suggest that the same material is kept for long periods of time. The low numbers of consultations of the library's holdings suggest relatively few visits to the library; the numbers of requests for photocopies and e-journal accesses are not high enough to compensate for these low levels of personal consultation but show a clear preference for this approach to information access.

This relatively low use of holdings may be explained by the high number of ILL requests, which suggests that local holdings are not meeting the needs of the engineers. However, despite the high number of ILL requests, overall use is still low relative to other Faculties. Furthermore, the absolute number of ILL requests from the Faculty of Engineering in 1997/98 was 2512, or 2.22 per *member of staff* per month, significantly less than the 2.85 requests per *user* per month claimed in the survey.

The results for research students show limited use of the monograph collection, again with the same material kept for long periods of time. The low numbers of consultations of bound periodicals suggest either poor usage or little demand for retrospective information among these users. Their pattern of use is otherwise unremarkable.

Comparisons between the results for academic staff and those for research students show that the use of local holdings tends to be higher amongst research students, use of current periodicals and electronic journals tends to be higher amongst academic staff and that they make roughly equal use of document delivery services.

3.3 Late results

Concern within the Faculty over poor response rates generated a significant number of late returns. Of these, 35 returns, 24 from academic staff and 11 from research students, were too late to be included in the original analysis but were made available to the GAELS team for analysis. The results are shown in Figure 3.2.

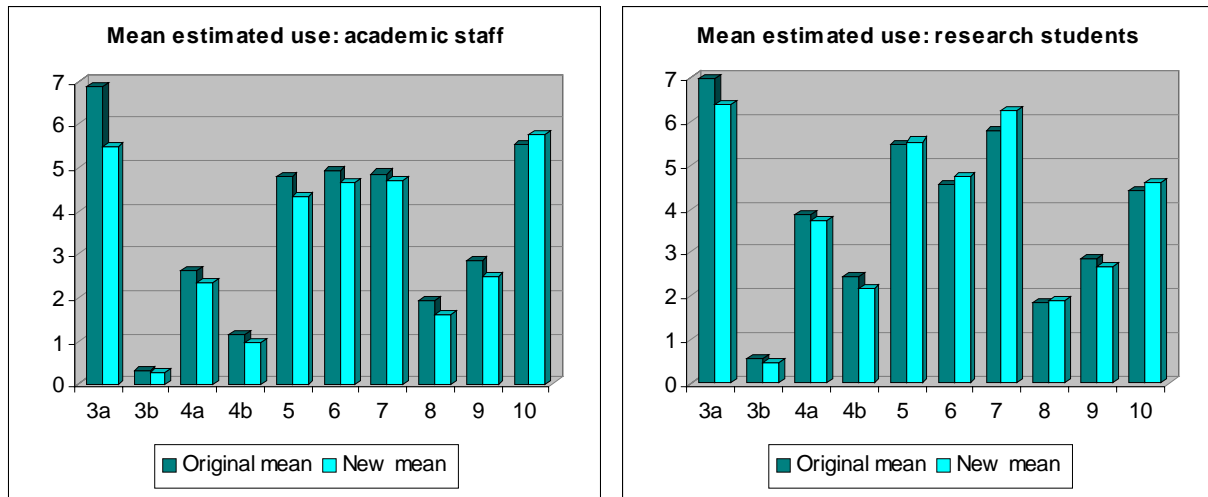


Figure 3.2 Effect of extra returns on mean estimated use of library materials and services

The revised results for the academic staff follow an identical pattern to their original results, but with slightly lower levels of use. The exception is the mean use of electronic journals, which is slightly higher with the late returns. This substantiates the claim that the original survey contained a bias towards active library users, and further supports the argument that engineers are using remote forms of access in preference to personal visits.

The revised results for the research students also follow a broadly similar pattern to their original results, but unlike the academic staff, the new mean level of use is as likely to be slightly higher than the original as it is to be lower. This suggests that response rates were not linked to levels of library use in this case.

4. The Serials Holdings Review: a re-evaluation

4.1 Background to the review

A review of serials holdings at the HEIs in the Glasgow area was carried out in 1996, with funding from SHEFC's Regional Strategic Initiative. The project report provides summary statistics for the extent of the overlap between the two institutions, which is shown to be relatively small. The report concludes that, although increased co-operation and consultation in collection management are likely to emerge as beneficial outcomes of the review, there is little opportunity for rationalisation of current subscriptions, since the majority of the overlap comprises core titles in particular subject areas.

However, the review did not include a detailed analysis of the data by subject, and there was a feeling among the staff at both libraries that the conclusions may not hold good in all subject areas. This was particularly the case for engineering, where it was felt that the overlap was far more extensive than in the collection as a whole. A separate analysis of the data which relate to engineering has now been carried out, and the original conclusions have been re-evaluated in the light of this analysis.

4.2 Methodology

This analysis used listings of engineering titles provided by the serials librarians at Glasgow and Strathclyde to identify a subset of the overlap data from the original review.

At Glasgow, engineering periodicals are defined to include all titles which are paid for from the engineering budget. Note that while most of these titles are classified in engineering, some are classified in disciplines such as computing or physics. At Strathclyde, there is no separate budget allocation for individual disciplines, so engineering periodicals have been defined as those titles which have been notionally assigned to engineering. Note that, while these are generally classified as engineering at Strathclyde, some are classified in other disciplines at Glasgow, notably in life sciences and geology.

It might have been possible to draw up a combined list of engineering periodicals, to include all titles relevant to engineering research at either Glasgow or Strathclyde, regardless of classification, budget allocation or location, but this was not been attempted.

Two subsets of data were therefore been drawn up, based on engineering titles held at Glasgow and Strathclyde respectively. Each subset of data was analysed to determine the number and percentage of overlapping titles, the cost of these titles, and their cost as a percentage of the total cost of engineering periodicals at that institution; the results are summarised in Figures 4.1 and 4.4.

Due to the very large number of titles in the dataset, the original review used title-matching software rather than manual checking and this was acknowledged as a source of error. Duplicated engineering titles have now been eliminated; additions and cancellations which have come into effect since the original study have also been taken into account.

Although GAELS is primarily concerned with the development of a joint information service for Glasgow and Strathclyde, we may also wish to consider potential levels of interest in such a service from Caledonian and Paisley, both of which have engineering departments. For this reason, the overlap between the collections at Glasgow and Strathclyde and those at Caledonian and Paisley has also been calculated.

4.3 Results

Results from the overlap data show a significant overlap in holdings between Glasgow University Library and Strathclyde University Library (see figure 4.1)

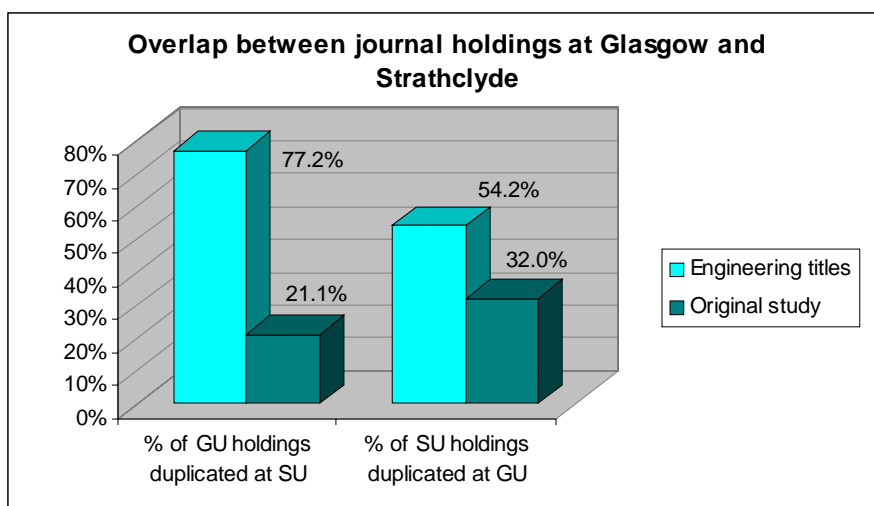


Figure 4.1

Results from the Glasgow perspective (see figs 4.2 -4.3) revealed that the percentage of engineering titles held at Glasgow which are also held at Strathclyde is about 77%, more than three times the percentage overlap for the collection as a whole.

The overlaps with Caledonian and with Paisley are about 25% and 55% respectively, again considerably higher for engineering than those for the collection as a whole. Note in particular the relative strength of the engineering collection at Paisley.

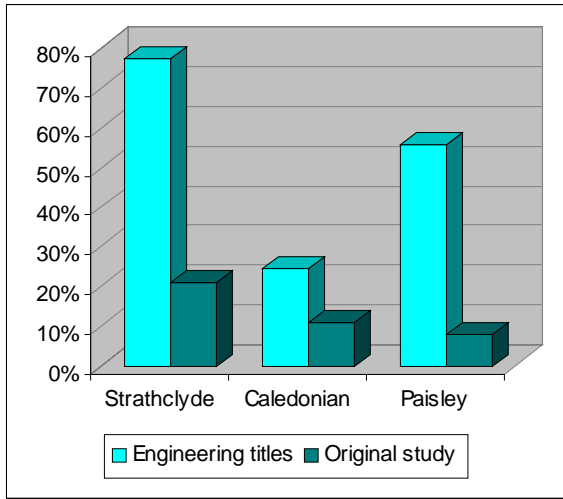


Figure 4.2 Percentage overlap between titles held at Glasgow and those held elsewhere

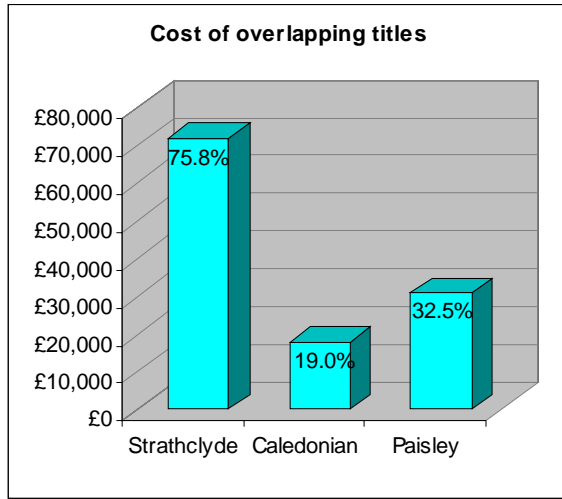


Figure 4.3 Cost of overlapping engineering titles, in real terms and as a percentage of total cost of engineering titles at Glasgow

The overlap can also be expressed in terms of the cost of overlapping titles, and again the results are considerably higher than might have been expected from the conclusions of the original review. More than three quarters of the expenditure on engineering periodicals at Glasgow is duplicated by Strathclyde, amounting to more than £70,000. About 19% and 32% of Glasgow's expenditure is also duplicated by Caledonian and Paisley respectively, and about 60 titles, costing almost £20,000, are duplicated in all four libraries.

Results from the Strathclyde perspective are shown in Figures 4.4 to 4.5, and the pattern which emerges is broadly similar, although less pronounced. The percentage of engineering titles held at Strathclyde which are also held at Glasgow is about twice the percentage overlap in the collection as a whole. Again, the figures demonstrate the relative significance of the engineering collection at Paisley. In cost terms, the overlap with Glasgow represents about 45% of the total expenditure on engineering periodicals at Strathclyde, or about £68,500.

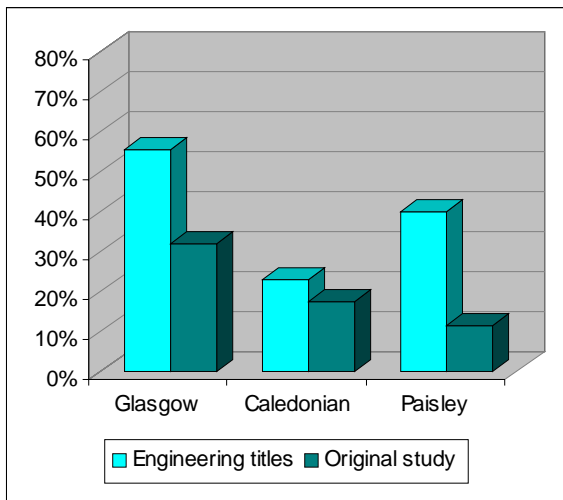


Figure 4.4 Percentage overlap between titles held at Strathclyde and those held elsewhere

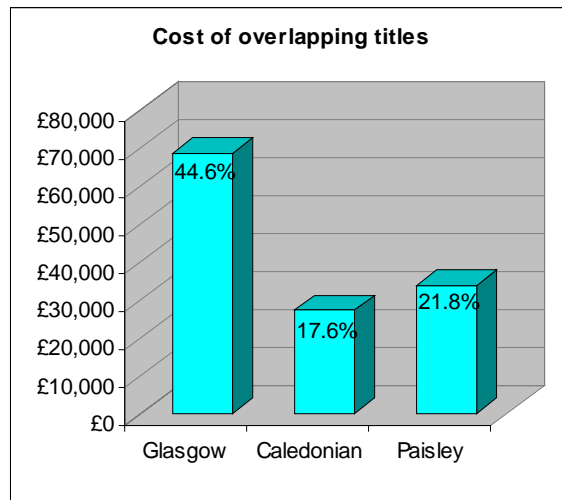


Figure 4.5 Cost of overlapping engineering titles, in real terms and as a percentage of total cost of engineering titles at Strathclyde

4.4 The combined holdings in a UK context

A comparison of the combined holdings of engineering journals at Glasgow and Strathclyde with the combined holdings at other metropolitan groupings of universities highlights the strength and significance of the local holdings in this subject area. For example, a comparison with the LAMDA (London, Leeds and Manchester) group of libraries (several of which serve large engineering departments) reveals that almost one fifth of the local holdings are not duplicated within LAMDA (see Figure 4.6).

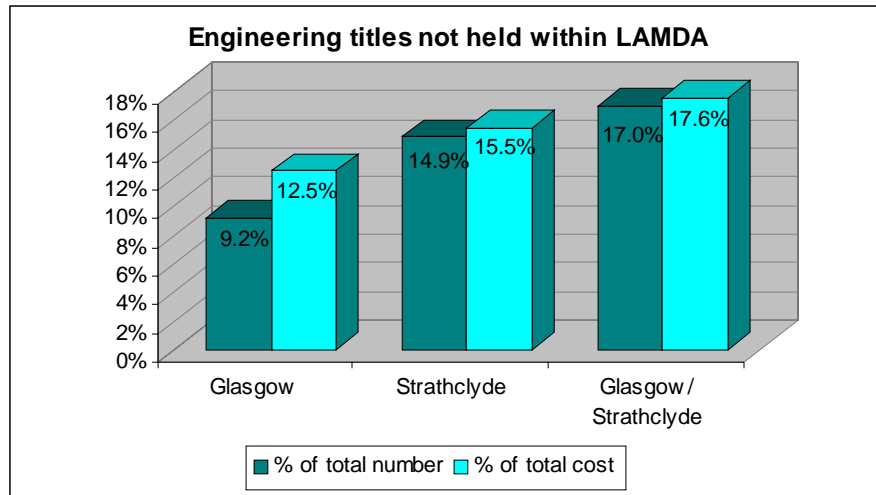


Figure 4.6

A detailed and current version of the overlap study can be found in Appendix 5.

5. User Needs Analysis

Analysis of statistical data was followed up by a series of interviews with individual engineers and focus group sessions. 43 engineering academics were contacted with the following letter:

Dear,

The GAELS Project aims to develop a joint electronic information service in support of engineering research at the Universities of Glasgow and Strathclyde.

As part of the development process, we will be carrying out a detailed assessment of:

- perceptions of the role and value of information within the research process*
- information and training needs*
- information-seeking behaviour and working practices*
- satisfaction with current provision of materials and services*
- preferred options for a joint electronic information service*

among engineers involved in research in both institutions. The needs of both staff and students, and of individuals and teams, will be considered.

The assessment will take the form of a series of one-to-one interviews with senior members of staff, followed by group discussions with staff and students.

Please could you suggest a time during the next four weeks when we might discuss the above issues from a management perspective. It is anticipated that interviews will take about an hour

Of the 43 senior academics contacted, 28 responded granting an interview. Focus groups were set up within the Department of Aerospace Engineering at Glasgow University, the Department of Civil Engineering at Glasgow University, the National Electronic Laboratory (a

partnership with the University of Strathclyde) and with a new intake of research students from both universities.

Interviews with both individuals and focus groups tended to support the analysis of the statistical data. Journal articles and conference papers continue to be a key element in the information needs of this user group, but clearly the preference is for access to and delivery of article-level information at the desktop, rather than ownership and consultation of the hard copy. Discussion with the Aerospace Engineering focus group led to the setting up of a document delivery trial using a commercial service, details of which are in the next section. The interviews also stressed the importance of information skills training both research students and staff in both Engineering Faculties and underlined the current lack of these skills. Other issues raised in the interviews centred around physical access to each institution's collections, with users frustrated at having to register annually to activate the existing reciprocal agreements and with the lack of support for joint courses and jointly matriculated students.

6. Conclusions

Analysis of the overlap data shows that the combined traditional collections represent a resource of national significance, which compares favourably with the combined engineering collections of other metropolitan groupings, but that a large proportion of this resource is duplicated across the two institutions. The duplication in current serial subscriptions amounts to approximately £70,000 per annum.

The statistical data and information from interviews shows that patterns of information-seeking behaviour among engineers at the two institutions indicate relatively low levels of use of these traditional collections, and a clear preference for electronic forms of access to and delivery of information. The existing model of information provision in support of engineering research at Glasgow and Strathclyde does not represent best value. The project concludes that an alternative model is needed to form the basis of an effective information service for engineers within both faculties. In order to investigate models of information provision three document delivery trials were set up. The next Chapter reports the outcome of these trials.

Document Delivery Trials

1. Introduction

In an audit of the existing information services - in support of engineering research at Glasgow and Strathclyde University Libraries, Phase 1 of the GAELS project identified that the traditional model of information provision no longer met the needs, expectations and preferences of engineering researchers. This traditional model of journal article provision via local holdings, supported by inter-library loan, was also seen to not represent best value across the two institutions.

Alternative models of information provision were therefore identified and resulted in trial services being gradually implemented over the Summer period 2000, to coincide with the second release of the Illos Inter Library Loans software system (Illos2⁵) at both libraries.

A trial web service integrating all resources available for engineering research, along with the facility to electronically request Inter Library Loan materials, was launched on August 24th 2000: "The GAELS Information Environment for Engineering" (<http://gaels.lib.gla.ac.uk> and http://gaels.lib.strath.ac.uk/info_services/index.htm).

Three document delivery trials were offered as part of this service:

- 1) library to library delivery of documents requested via the web - utilising the Illos2 system functionality
- 2) a commercial document delivery service offered to the CFD⁶ group within Glasgow University's Aerospace Engineering department
- 3) and an electronic document request and delivery service for Strathclyde University's Bioengineering department - utilising the Illos2 system functionality for the requesting of documents, and the Ariel ILL⁷ document transmission system for the delivery of electronic documents direct to the requester's desktop.

The interface through which these trials were offered is aimed at being 'task oriented', offering researchers the option to do a literature search, for example. The interface is designed to make information retrieval map more closely to the activities of researchers.

Ideally, the new GAELS engineering information environment will provide access to electronic journals, where those journals have been identified as being well used, supported by electronic document delivery, with documents being supplied from the institution's own holdings, holdings at the partner institution or the British Library - but with a single requesting mechanism so that the researcher will not have to make that decision. Commercial document delivery services will then be provided in areas where these document delivery services are not sufficient. The information environment is backed up by the wide range of abstracting and indexing tools offered to engineering researchers, and includes contents page and current awareness services to offer an electronic alternative to hard copy browsing.

⁵ Illos: Inter-Library Loans Open Systems - an automated Inter-Library Loans management system, on the UNIX platform, developed and maintained by Lancaster University Library Services Ltd.

⁶ Computational Fluid Dynamics Group

⁷ ARIEL transmission system: developed by the Research Libraries Group (RLG), allowing libraries to scan articles and photos directly and transmit the electronic images over the Internet to other Ariel workstations using File Transfer Protocols (FTP). The system also allows for Multipurpose Internet Mail Extension (MIME) E-mail transmissions allowing end-user delivery of Tagged Image File Formatted (TIFF) attachments.

2. Pilot Services

2.1 Online Requesting Service with Library to Library Document Delivery

(24th August 2000 – 30th March 2001)

- Service Detail

This service was made available to staff and researchers from the Faculties of Engineering at both institutions. The Service itself enabled desktop requesting of Inter Library Loan (ILL) materials via an ILL Online Request Form, with delivery of materials, where possible from, local holdings at each institution as if the collection were one. Users were required to input a unique user identification number and a personal password to gain entry to the requesting environment. Authorised users could thereafter proceed to an options screen whereby they could choose to request a variety of materials (see Figure 1), as well as view and update their own record or check the progress of any existing requests.

To fulfil requests received via this system, local holdings and partner institution holdings were checked for availability – the Glasgow ILL staff checking each library catalogue separately, with the Strathclyde staff either checking both catalogues or utilising the CAIRNS⁸ customised mini-clump searching facility - allowing simultaneous searching of both the Glasgow and Strathclyde University Library catalogues. If a request could not be satisfied via the home institutions' own holdings, but could be filled by the partner institution, the request would be routed to the partner for fulfilment and delivery. If the request could not be filled in this manner, then the request would be submitted to the British Library Document Supply Centre (BLDSC) for processing – as if it were a traditional ILL request (see Appendix 1).



Figure 1

Glasgow University Library's ILL Online Requesting Environment

⁸ CAIRNS: one-stop-searching of Scottish library and information services facility.
URL: <http://cairns.lib.strath.ac.uk>.

- Total Requests Received

Request turnover at Glasgow University Library equated to approximately 82% of the traditional ILL requests over same period - 525 Engineering requests using the online requesting system (see Figure 2) as opposed to 642 using the traditional system (see Figure 3). Please see Appendices 2 and 3 for complete breakdowns of the following statistics.

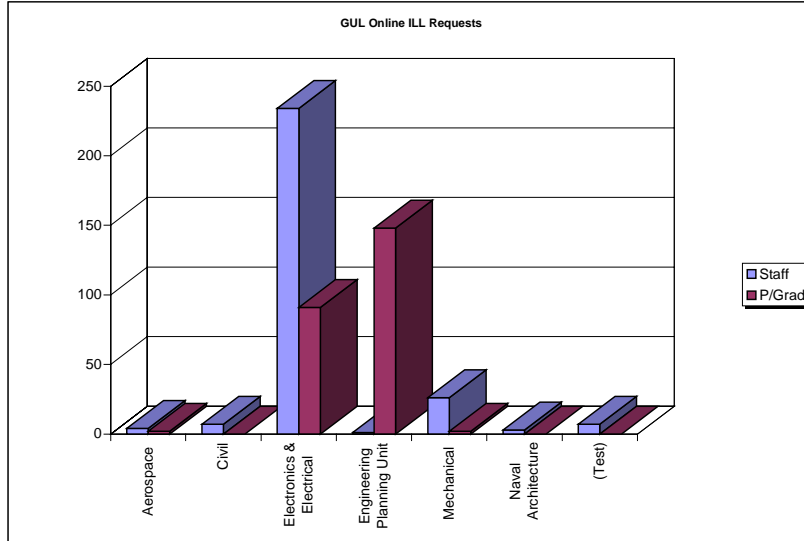


Figure 2

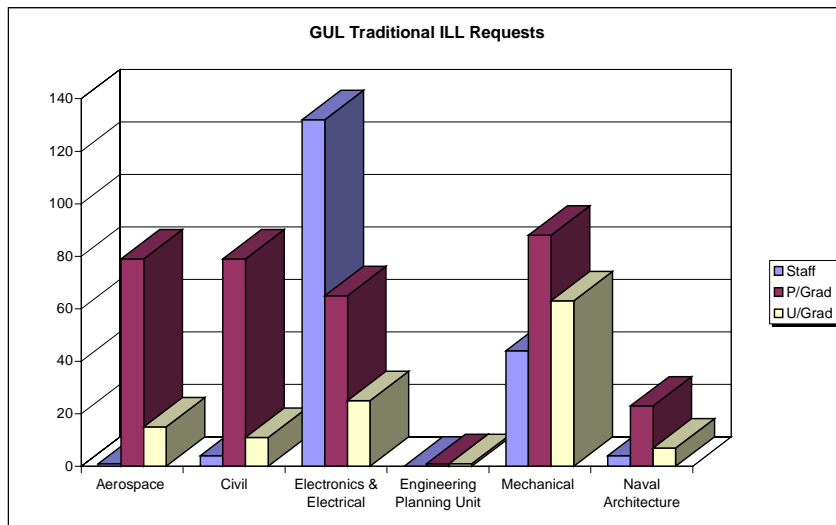


Figure 3

Turnover at Strathclyde University Library equated to 45% of the traditional number of requests over the same period - 375 Engineering requests were received via the online requesting system (see Figure 4) as opposed to 834 traditional requests (see Figure 5).

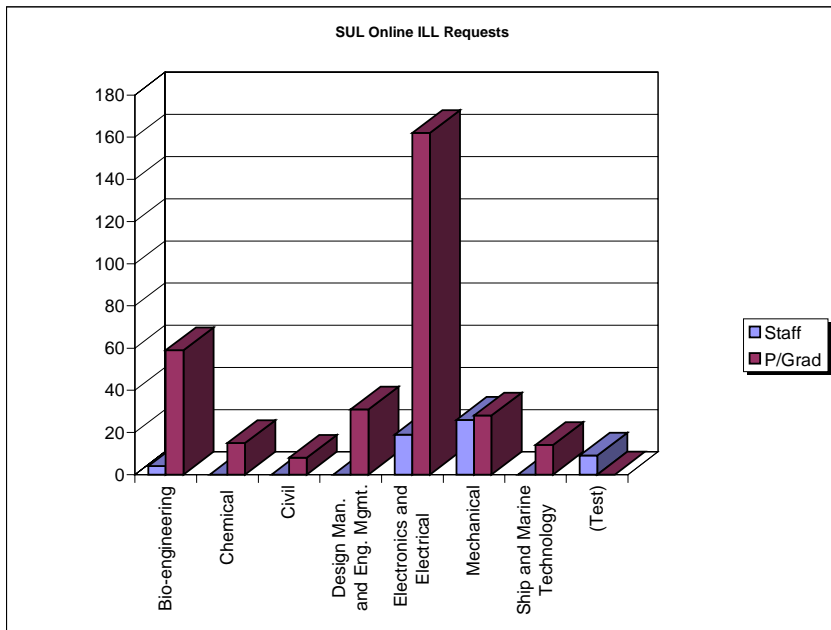


Figure 4

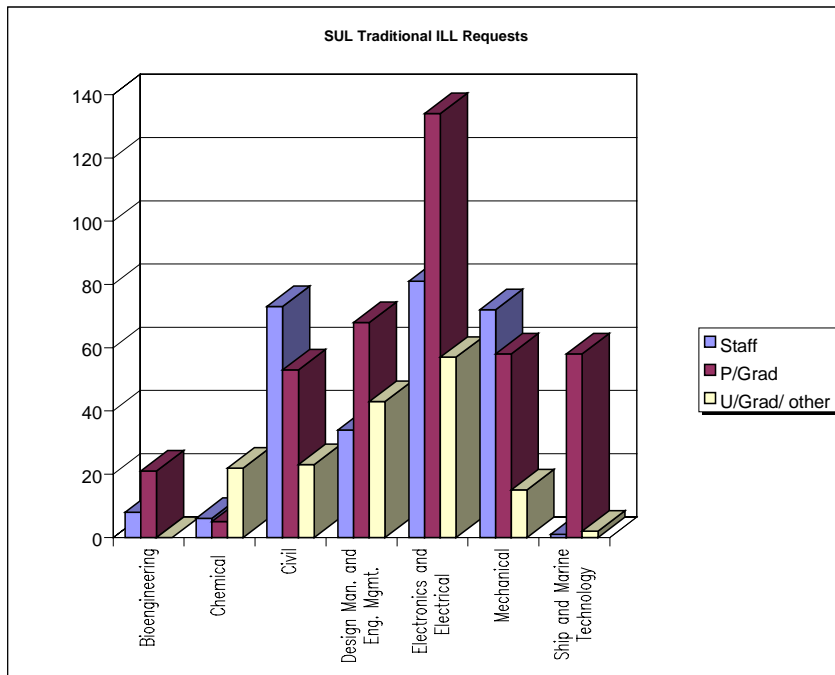


Figure 5

- User Profile

The requester profile at the Glasgow site indicated a 54% to 46% split between Engineering Staff and Postgraduates respectively utilising the service, whereas the user profile split at Strathclyde saw a corresponding 15% to 85% Staff/Postgraduate split.

The split of Glasgow University requester type using the traditional ILL requesting method over the same period saw the following split: 35% Staff; 45% Postgraduate, and 20% Undergraduate users. The split at Strathclyde being 33% Staff, 48% Postgraduate, and 19% were Undergraduate/Other users.

- Number of Users

Comparing the actual number of requesters who used the traditional requesting method, as opposed to those who used the new online service, at the Glasgow site 126 users requested ILL material in the traditional manner (see Figure 7) – 36% were Staff requesters, 39% were Postgraduate and 25% were Undergraduate/other users. 56 users utilised the new service – 46% were Staff requesters and 54% were Postgraduate users (see Figure 6), with 16 patrons using both services.

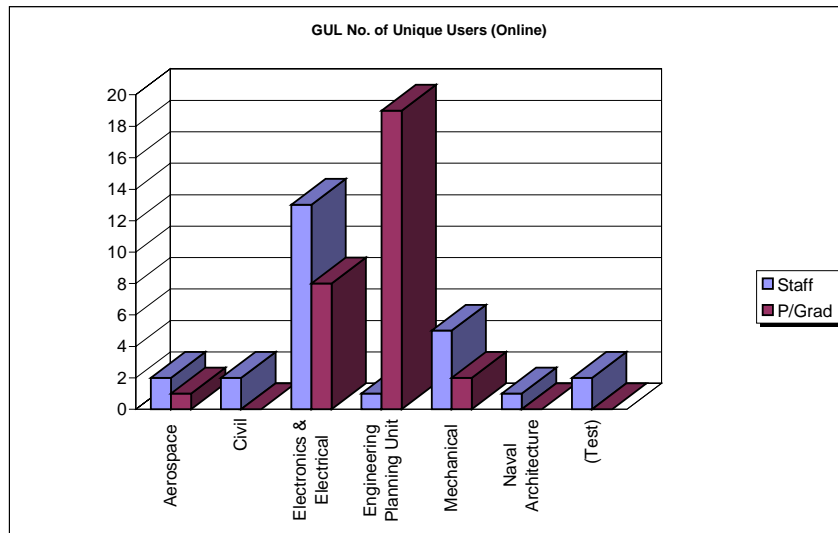


Figure 6

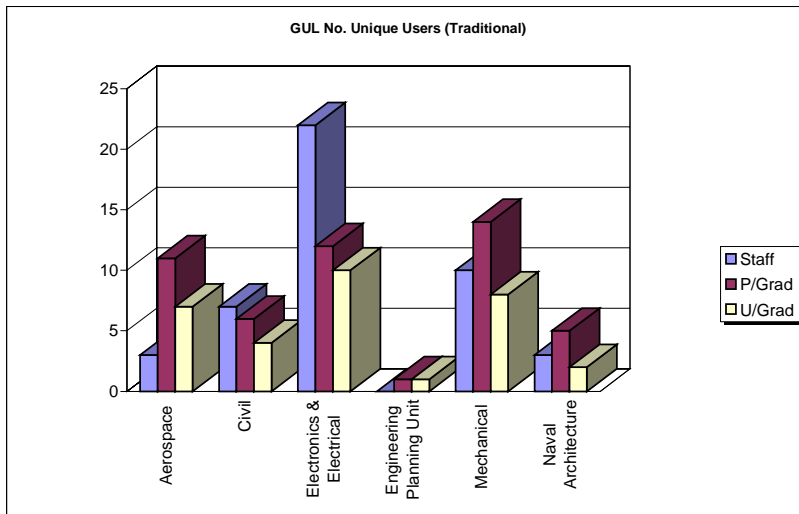


Figure 7

At Strathclyde we saw 162 requesters using the traditional method to request ILL material - 30% were Staff users, 48% were Postgraduates and 22% were Undergraduate/other users. 46 requesters utilised the new service - 30% were Staff users and 70% were Postgraduate users, with 19 patrons using both services.

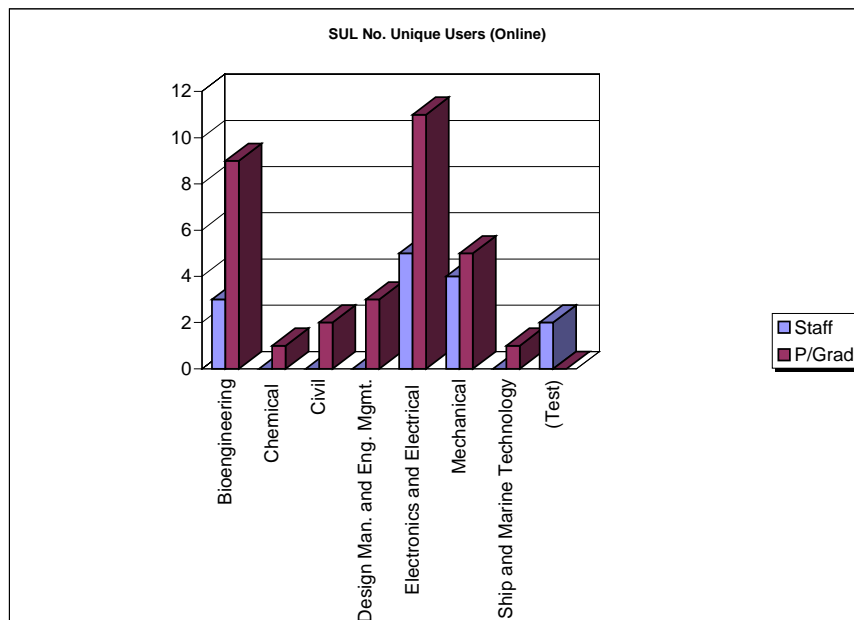


Figure 8

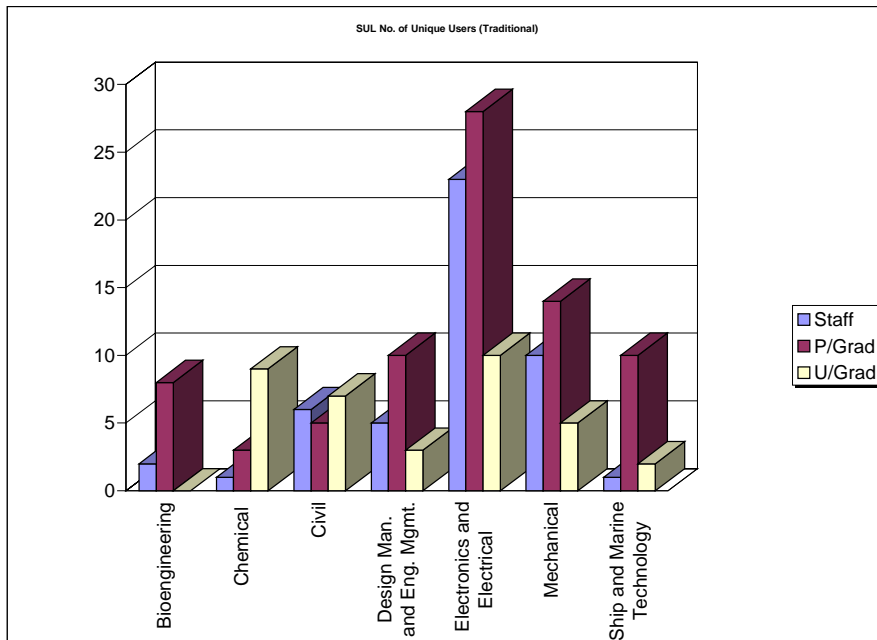


Figure 9

- How fulfilled

Analysing the requests supplied within this period we see 4% of Glasgow Engineering requests fulfilled from SUL holdings, 71% of requests fulfilled by the British Library Document Supply Centre (BLDSC) and 14% fulfilled from Glasgow University Library's own holdings. 7% were cancelled, 2% were supplied from other libraries, 1% of requests were outstanding at the end of the trial period and 2% were test requests (see Figure 10).

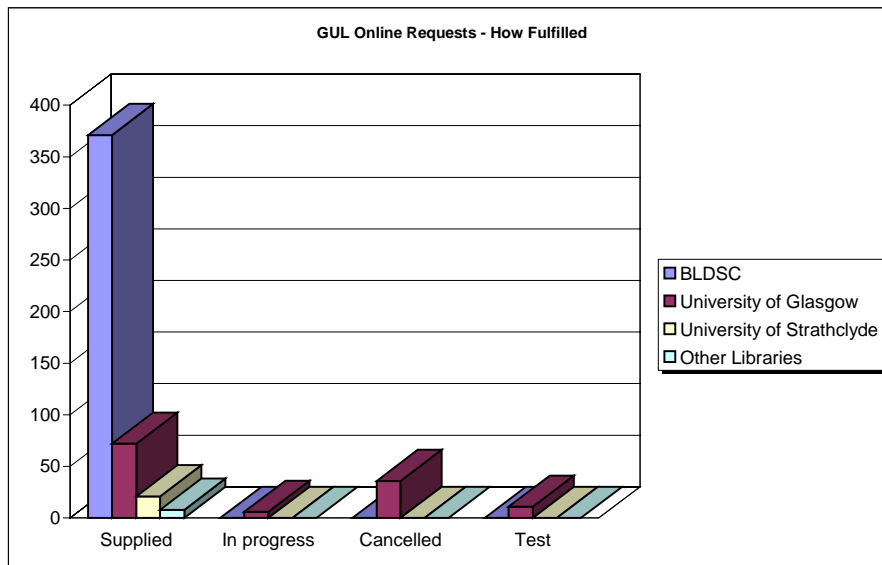


Figure 10

At Strathclyde we saw 16% of Strathclyde Engineering requests fulfilled from GUL holdings and 66% of requests being fulfilled by the BLDSC. 13% were cancelled, 1% were supplied from other libraries, 2% of requests were outstanding at the end of the trial period, and 2% were test requests (see Figure 11).

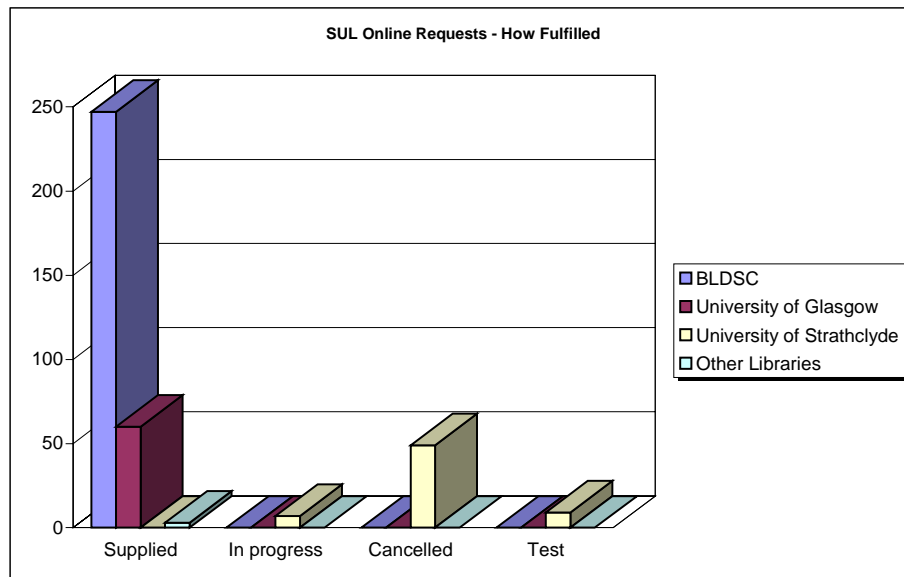


Figure 11

- Cost to Fulfil Library to Library requests

The average costs to fulfil requests (photocopied articles/loans) received from the partner institution was as follows⁹:

Where requests originated at Glasgow University and were fulfilled by Strathclyde University Library holdings:

GUL Cost:	£0.36
SUL Cost:	£2.01
Total Cost:	£2.37

Where requests originated at Strathclyde University and were fulfilled by Glasgow University holdings:

GUL Cost:	£1.23
SUL Cost:	£0.40
Total Cost:	£1.63

These costs take into consideration the staff time¹⁰ cost in processing, fetching and delivering the request, as well as the paper¹¹ required for printing/photocopying the request. The costs also take into consideration the cost to envelope¹² and post the request by first class mail. The costs do not take into consideration photocopying costs.

⁹ The average cost values noted at this juncture are rounded up to the nearest pence.

¹⁰ Staff billing rates were calculated on a 'Cost to Institution' basis on the 2000-2001 salary scales for Secretarial/Clerical Grades 2, 3 and 4 rates, and Manual/Ancillary Grade 2 rate.

¹¹ Paper costs were calculated as being 0.01p per 80g A4 page

¹² Envelope costs were calculated as being 0.03p per A4 9x12^{3/4} inch Manilla envelope.

These costs represent a significant saving from the BLDSC Standard Service prices, as indicated from the prices detailed below (prices correct as of April 2001 and are exclusive of VAT):

Articles	£3.91 (One article - first class or Ariel delivery)
	£5.71 (One article - fax delivery)
Loans	£6.39 (One item on loan - first class post)
Microform	£6.39 (Loan of microform)
	£3.91 (Retention microform)

- Request Delivery Times

Where possible requests were processed and posted within the same day, with next day delivery via first class post direct to the users specified address - in order to mimic the BLDSC delivery service. The average processing times for delivery are noted below and take into consideration peaks and troughs within the normal workings of university ILL departments as well as occasional staff shortages due to illness.

Table 1 indicates the average total number of working days it took to process requests, spread across both the receiving library and the fulfilling library.

Receiving Library	Filled @ BLDSC (Copy)	Filled @ BLDSC (Loan)	Filled @ Partner (Copy)	Filled @ Partner (Loan)	Filled @ Partner (Ariel)
GUL	3.4	11.3	2.5	13.5	N/a
SUL*	5.2	8.9	9.4	14.7	5.3

Table 1 Total Processing Time across both libraries (Working Days)

* please note the Total Processing times for SUL requests take into consideration a lag time for the receiving of Copyright Declaration forms, please see Table 3 for a more detailed breakdown of these times.

Table 2 details specifically how long on average Glasgow and Strathclyde University Libraries took to fill partner requests at their particular site.

Fulfilling Library	Average Time to Fulfil (Working Days)		
	Copy	Loan	Ariel
GUL	3.3	13.3	4.0
SUL	1.9	14.0	N/a

Table 2 Average Time to Fulfill requests at each Library (Working Days)

Looking at the average results as indicated in Table 2 above does not however fully represent the time to fill partner requests at particular sites since the dataset is small and is affected by infrequent and exceptional results. It is therefore beneficial to look at the mode¹³ values, where they occur, when analysing the time to fulfil partner requests - please see table 3 below.

¹³ The statistical measure mode returns the most frequently occurring or repetitive value in an array or range of data.

Fulfilling Library	Mode Time to Fulfil (Working Days)		
	Copy	Loan	Ariel
GUL	1.0	N/a*	4.0
SUL	2.0	8.0	N/a

Table 3 Mode Time to Fulfill requests at each Library (Working Days)

* the dataset for analysis of the mode time to fulfil a loan was too small, incorporating only three datum, which did not contain a most frequently occurring value. The datum in this case were 1, 29 and 10 working days. The time to fulfil a loan depended on whether the item was available in stock and could therefore be processed immediately, or if the item was already on loan and a waiting period had to be incurred before the item could be loaned thereafter.

Table 4 details how long Strathclyde University patrons would take on average to return Copyright Declaration forms¹⁴. These timings represent the lag period between the Document Delivery Unit receiving a request before it could then be routed to the fulfilling library, in this case Glasgow University Library, for delivery.

Request	Average SUL Lag pre-routing to GUL	
	Receiving Declaration (Copyright)	Other Lag
Delivery of Copy	3.3	2.8
Delivery via Ariel	1.3	N/a

Table 4 Average SUL pre-routing to GUL Lag times

- Request Details

The requests filled by the partner institution sees Strathclyde University Library supplying journal titles to Glasgow requesters including:

- Journal of Vacuum Science & Technology
- Water Resources Research
- Systems & Control Letters
- and, Applied Optics

Glasgow University Library supplied journal titles to Strathclyde requesters including:

- Journal of Geophysical Research
- Pattern Recognition
- Journal of Operations Management
- and, Biosensors and Bioelectronics

For a full Request Detail summary see Appendix 4.

2.2 Commercial Document Requesting Service (May 1999 - June 2001)

- Service Detail

This commercial service is an electronic document request and delivery subscription service supplied by the American Institute of Aeronautics and Astronautics (AIAA). It was made available to registered users, within the CFD group of the Department of Aerospace Engineering at the University of Glasgow.

¹⁴ For the purposes of the Document Delivery Trials, Glasgow University Library did not enforce the Copyright and Thesis Declaration, however Strathclyde University Library upheld this process.

The service allows for the electronic delivery of documents direct to the desktop, through e-mail delivery of Tagged Image File Format (TIFF) and Portable Document Format (PDF) attachments. Glasgow University Library set up a deposit account for the pilot group to directly access and order AIAA technical reports. The turnaround delivery time for such requests are approximately 48 hours - this represents a significant time saving compared to the BLDSC service, which would normally take months to supply such requests. The CFD group has found the service of great use:

"Thanks for your efforts - the AIAA scheme has been of immediate benefit to us"
(Dr Ken Badcock, group head).

- **Total Requests Fulfilled & Costs**

There has been a steady flow of 31 (including 3 test) requests over the trial period. These have been fulfilled at a cost of \$11.50 per request for electronic delivery, with an additional four requests being supplied via airmail postal service, at a cost of \$3.00 per request.

2.3 Niche Electronic Document Delivery Service (October 2000 - March 2001)

- **Service Detail**

An enhancement to the existing University of Strathclyde's ILL service, providing electronic document delivery direct to the requester's desktop. This service was offered to staff and post-graduate students of the University of Strathclyde's Bioengineering department.

Journal article requests which could not be filled at Strathclyde University Library, but which could be fulfilled from Glasgow University Library holdings, were delivered electronically to the requester's desktop. These were sent by email to the users specified account in TIFF format utilising the Ariel document transmission system.

- **Total Requests**

The service was officially launched on Monday 23rd October 2000. This date was chosen to ensure new postgraduates for the academic year could be targeted for marketing purposes. Three requests were supplied in this manner, the low supply rate was as a result of departmental funding problems which curbed the number of requests which the Bioengineering department was able to fund early on in this trial.

The initial estimate on the cost¹⁵ of this service is as follows:

GUL Cost	£1.31
SUL Cost	£0.35
Total Cost	£1.66

3. Conclusions

The three document delivery trial services, implemented over the GAELS Phase 2 period, can all be said to have been very successful, all being successfully developed, rolled-out and utilised.

- Library to library delivery of documents requested via the web
 - Approximately 44% of the number of traditional Engineering ILL requesters utilised the service over the trial period, with 13% of users utilising both services.

¹⁵ Please refer to the costing information as detailed in section 1.21

- The Glasgow site were able to supply 16% of Strathclyde's requests, with Strathclyde fulfilling 4% of Glasgow's requests
- The Cost to fulfil the requests represented a significant saving from the BLDSC Standard Services prices.
- Commercial document delivery service offered to the CFD group
 - The turnaround delivery time for such requests represented a significant time saving compared to the BLDSC service - 48 hour turnaround compared with up to a couple of months to deliver via the BLDSC.
- Niche Electronic Document Delivery Service
 - Direct to the desktop delivery of Strathclyde University's Bioengineering department's ILL requests
 - The cost of this service's initial estimate again represents a significant saving from the BLDSC service costs.

Serials Overlap Study

1. Introduction

1.1 Collection Management

In an audit, undertaken by the GAELS project (session 1998/99), the combined print Engineering collections of the University of Glasgow and the University of Strathclyde were shown to represent a resource of national significance. This resource compared favourably with the combined engineering collections of other metropolitan groupings, however a large proportion of this resource was duplicated across the two institutions. The duplication in serial subscriptions at that time amounted to approximately £70,000 per annum.

As part of the GAELS project (session 2000/01), consideration was given to the feasibility of various options which might facilitate reciprocal use of periodical collections - by staff and research students in the Faculties of Engineering at both Glasgow and Strathclyde Universities, and would represent best value for both institutions. These options included the provision of local document delivery services, and a more radical approach to collaborative collection. GAELS research has shown that patterns of information-seeking behaviour among engineers at the two institutions indicated relatively low levels of use of these collections, and a clear preference for electronic forms of access to, and delivery of, information. It was therefore necessary to re-analyse and quantify the extent of the overlap between the engineering periodical collections at Glasgow and Strathclyde for the current session (2000/01), including electronic access overlaps, to enable these options to be fully explored. A number of external factors also made an assessment of traditional collections and an examination of alternative models necessary, these included the fact that periodical prices continue to rise each year, at levels above the annual rate of inflation, and that more new titles are published every year. Library budgets at both institutions are also increasingly subject to constraint.

1.2 Methodology

The 2000/01 serials analysis used listings of engineering titles provided by the serials librarians at Glasgow and Strathclyde to identify the extent of the overlap in holdings at both institutions.

At Glasgow, engineering periodicals were defined to include all titles which were paid for from the engineering budget (GEP1). At Strathclyde, those titles attributed to the faculty of Engineering for the 2000/01 session were included.

Two subsets of data were therefore drawn up, based on engineering titles held at Glasgow and Strathclyde respectively. Each subset of data was analysed to determine the number and percentage of overlapping titles, the cost of these titles, and their cost as a percentage of the total cost of engineering periodicals at that institution; the results are summarised in the following section.

2. Results

Results from both the Glasgow and Strathclyde perspectives are shown in Table 1 overleaf, with the overlapping title summary detailed in Appendix 5.

	Total
Number of engineering titles in SUL data-set	539
Number of engineering titles in GUL data-set	321
Number of overlapping titles	242
% of overlap titles at SUL	44.9%
% of overlap titles at GUL	75.4%
overlap = % of total spend on subs. at SUL	32.8%
overlap = % of total spend on subs. at GUL	63.6%
Average cost of overlapping subs (GUL/SUL)	£72,588.71
Number of titles in overlap data-set with an overlap in e-j access	71
% e-j overlap	29.3%
Average cost of overlapping e-j subs (GUL/SUL)	£36,441.66
Overlap e-j = % of average overlap cost	50.2%

Table 1 Results of the overlap study from the Strathclyde and Glasgow perspectives

The average overlap expenditure between both institutions amounts therefore to approximately **£72,500** (£72,588.71), representing a £2,500 (approximately 4%) increase in expenditure since the last time this exercise was run in session 1998/99. The breakdown of electronic journal subscriptions within this overlap data-set amounts to approximately **£36,500** (£36,441.66), equating to just over 50% of the total cost of overlapping titles across both institutions.

3. Recommendations

With respect to collection rationalisation across both institutions, the GAELS project recommends a shift from hard copy holdings to electronic holdings (e-journals) for core journals at both institutions.

These holdings should then be supported by an enhanced document delivery service with electronic requesting, and where possible, electronic delivery, with commercial services for delivery of information types not held by the British Library.

The GAELS project also suggests that consideration should be given to the rationalisation of the current and retrospective holdings in engineering in both libraries to make a single distributed collection.

The GAELS courseware project: training materials for information skills in engineering

The GAELS Information Skills courseware was developed to improve access to, and use of, engineering information at the Universities of Strathclyde and Glasgow. In particular the courseware was intended to facilitate the use of a new single Engineering journals collection between the two universities, created as a virtual entity out of the two hardcopy collections at both sites. The courseware uses the WWW to deliver training and information for post-graduate and staff engineers in information skills. It is based around a core module, which teaches specific techniques such as truncation, Boolean searching, and skills in managing information. Other modules give information about particular ways of finding information such as online databases and the Internet, and particular information types commonly utilised in engineering. The course can be used as part of a workshop in information skills for research taught by the engineering librarians, or on an independent basis by individual learners.

1. Rationale

The original interest in collaborative initiatives at Glasgow and Strathclyde arose because :

- The existing programmes for training post-graduate and research students were regarded as time-consuming and inefficient.
- It involved a lot of repetitive teaching that was frustrating for the staff delivering it, and the students listening to it.
- Programmes at Glasgow University and Strathclyde University were being needlessly duplicated.
- Information skills classes were frequently not available to users at the times when they would be most relevant and useful.
- Subject librarians at Glasgow and Strathclyde had already experimented with a traditional co-operative training programme in engineering information skills with some degree of success.
- Above all, the conjoint GAELS Information service would need training and support materials to ensure engineering researchers were confident of using the service.

These perceptions were supported by the growing sense that changes in learning and teaching practices and in the provision of information services were rendering traditional approaches out of date (Ottewill & Hudson 1997). Hence the rationale was that the existing programme could be usefully translated into CAL, which would give materials that could be accessed by users when it was most appropriate for them, rather than just when it was most easily fitted in with library and departmental schedules.

2. The target users and their tasks

For the first prototype the project team concentrated on post-graduates, as this was seen as the area with the most pressing need for training. This meant a mix of Masters' and PhD students. There was also some interest in using the materials as a basis for updating staff information seeking skills, and this is an area which we can expect to see becoming increasingly important as the other parts of the GAELS project are implemented.

The first phase of the project focussed on engineering post-graduates. The training materials were designed to relate to the kinds of tasks which students in these areas can expect to perform. Examples featured throughout are drawn from relevant subject areas, and there are many links to relevant information sources.

3. Requirements

A number of key requirements were identified. These included requirements that the courseware should be:

- available via the WWW for easy and flexible access
- easy to maintain and update by subject librarians
- compatible with existing programs of post-graduate training at both Glasgow and Strathclyde
- capable of supporting a wide range of information seeking and information management tasks

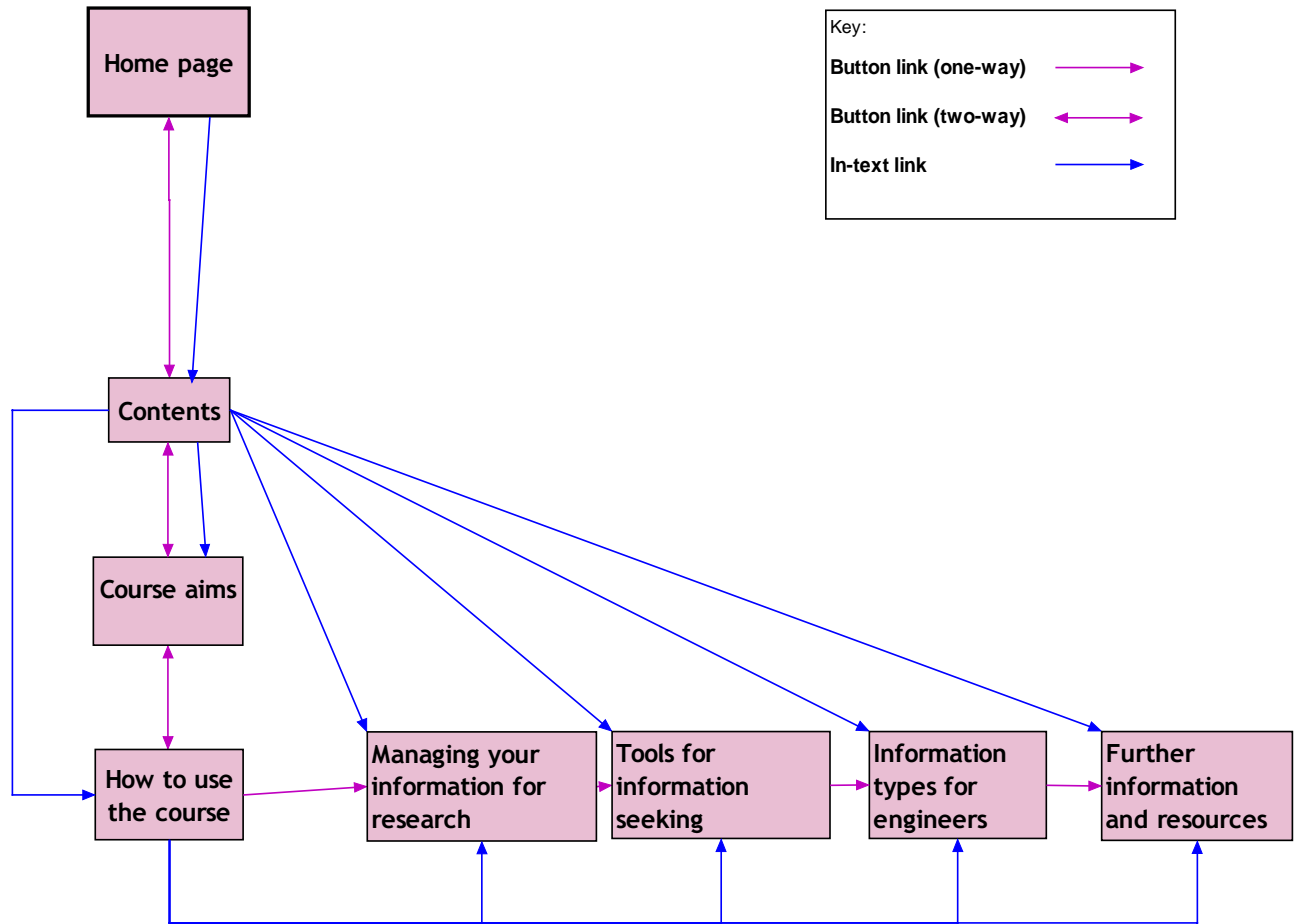
4. Method of design and construction

1. We began by compiling a detailed set of requirements based on interviews with the various stakeholders such as research students, academic staff and the subject librarians. This included mapping the knowledge that we thought should be included using concept mapping techniques (Lanzin 1996). This resulted in a model of the domain.
2. This formed a basis for a set of teaching aims and learning objectives which considered what post-graduates in engineering and architecture were likely to need to do, and the skills that the subject librarians felt that they needed to perform these tasks. These were evolved into definitions of what the courseware is supposed to do from the teachers' point of view, and of the behavioural outcomes which we would wish to see in the students.
3. This was finally translated into a course structure initially based around 4 modules.
4. To build the courseware we used a WWW authoring package, Microsoft's FrontPage, which allows Web authoring without using HTML. The choice of FrontPage was based on the existing use of FrontPage for the Library web pages at Glasgow University, and the resulting existing body of expertise.

5. The GAELS courseware: description

- The courseware is based round a shallow hierarchy. Introductory pages, which give information about the course, its aims, and how to use it are followed by four modules. The first module is the core module on managing information for research, which covers a range of skills in finding and using information. This works as an essentially linear course, which can be used as the basis of workshops or as a self-study package. There is a module on information resources and one on information types, both of which are intended for browsing and reference rather than as linear courses. We were concerned to make the course a rich resource that would entice users back.
- The rationale behind the course is one of simple; clear identification of teaching aims and learning objectives; task-oriented pages (e.g. Information Types, Boolean Searching); largely text based with few complex additions, to enable easy maintenance.
- There are no compulsory tests in the courseware. Instead there are a number of activities which typically involve the use of a range of online information sources. For instance users are invited to conduct Boolean searches in an online database, and this is followed by Comment boxes giving appropriate feedback.
- There are no compulsory assessment routines as yet, partly because nobody has yet asked us for these, and partly because of the requirement for easy maintenance.

Fig. 1: GAELS courseware structure.



6. Phase I evaluations:

6.1 Testing and evaluation

Evaluation has a key role, partly because it strengthens the value of GAELS as a piece of research, and partly because it is very difficult to design effective interactive systems of any kind without testing with users. Phase I evaluation has involved:

- Pre-and post-task questionnaires measuring confidence in users' ability to perform a range of search tasks
- Usability and usefulness questionnaire
- Expert review
- Observation of users
- Subject librarian opinions questionnaire

The results from this have been satisfactory, as we report below.

6.2 Evaluation results and improvements

Most of our measures showed a positive response from users. The Phase I confidence logs showed that users felt there was an increase in skill levels over most skill areas in Module 1.

Table 1: Comparison of before and after measures of confidence in information seeking skills

	Use of keywords	Use of truncation	Use of Boolean searching	Use of parentheses	Use of adjacency and proximity	Use of search limits	Use of thesauri and limits	Download and save results	Evaluate search results	Save search strategy
Mean Pre-task	3.71	2.67	2.77	2.42	1.97	2.42	2.50	3.71	3.46	2.84
Post-task	4.34	4.27	4.27	4.07	3.66	3.82	3.68	4.08	3.89	3.66
Sig. Level	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	0.006	0.002	<0.000
Mean change	0.63	1.59	1.5	1.66	1.68	1.39	1.18	0.37	0.43	0.82

N = 36 – 38

The other measures highlighted a number of issues, resulting in a range of changes. For instance we had to highlight the fact that users would need to use external databases to make sure they obtained passwords before they tried to use the databases. We had to colour code the activities to draw students' attention to them, and we had to put the comments into separate pop-up windows to emphasise them, otherwise students did not always read them. At this Phase I stage, not all problems were easily resolved, and there were clear problem areas. In particular we encountered problems when users linked into the online databases. Effectively we lost control of what happened when the users went into the databases – new browser windows opened which made it difficult for them to see the course; they got distracted and forgot where they were supposed to be. In theory this should not have been a problem with postgraduate students but such students may come from a wide range of backgrounds and cultures, with substantially different computer expertise, and in practice observations showed that there were difficulties. We considered the introduction of frames to help control the problem with links out to external sources although there are recognised disadvantages with this such as problems with book-marking and printing. However Phase II saw the problem dealt with by means of modified javascript routines for controlling the relationship between the courseware windows and the pop up windows (q.v. below). In general, the overall approach adopted in Phase I was deemed to be somewhat serious, text-based and information-rich. Moreover, the interface needed some modification to improve navigability. Further evaluation was necessary to clarify these questions.

7. Phase II

The second Phase of the project was characterised by four key features:

1. Success in addressing the technical problems identified in Phase I.
2. Successful use of the original courseware as a template for creating CAL packages in subjects other than Engineering.
3. Transfer of the responsibility for rewriting the courseware for other subjects from courseware developer to subject librarians.
4. Extending the evaluations to a much larger body of users as the courseware became established in common user education practice at both sites; evaluating the uptake of the GAELS information service in relation to the skills training supporting IT.

8. Technical advances

The navigability problems identified in Phase I were examined and dealt with in Phase II. We knew that users were getting lost when they moved from the courseware out into the external databases on which they performed set exercises. This was caused by users opening up links to external databases which then filled the whole of the existing browser window, obliterating the courseware pages entirely. We inserted new javascript routines around these hyperlinks which created small pop-up windows in front of the courseware pages. The user pulled the external databases into these pop up windows, which left the supporting pages visible around and behind the pop up. The user could thus read our commentary and complete set tasks at the same time.

This simple adaptation of a javascript routine meant that we did not have to impose a cumbersome frames-based structure on the pages. Frames would have easily enabled us to separate the databases on which exercises were completed from the commentary on the exercises, but at a considerable cost. The increased technical complexity of the courseware would have reduced its future maintainability in the hands of practitioners.

Given our commitment to involving practitioners in the authoring of the learning material, such a step was unacceptable. Further evaluation showed that these pop up windows eliminated the navigability problems identified in Phase I.

9. Extension of courseware to non-Engineering subjects

As we noted above, the overall approach adopted in Phase I was deemed to be somewhat serious, text-based and information-rich. When the courseware was adapted to other subjects the decision was made to revise the materials and present only the core first module of the course with some editorial excisions, together with highly selective additions of relevant material from the three other modules. These changes permitted use by Honours undergraduate students in shorter workshop sessions, in contrast to the original day-long workshops taken by research students and academic staff.

Because the technical requirements for authoring and adapting the courseware had been kept to an acceptable minimum, subject librarians managed to take over the creation of spin-off materials fairly easily. Their familiarity with the content of their own user education classes, and awareness of the learning requirements of their target students meant that adding new material and adapting of the original GAELS course was fairly easily achievable.

In addition, further evaluation took place to see if the adapted courseware was suitable for large-scale undergraduate user education programmes. Comparative evaluations were also carried out between courseware-based teaching techniques and classes taught with established user education methods.

It is fair to say that, although the courseware presentations were all done to a standard formula, the range and diversity of teaching method adopted by tutor librarians engaged in traditional user education activity made comparisons difficult. Where evaluative data was collected from established teaching practice but felt to be unsuitable for comparison (for example, some user education is delivered to enormous classes as a straight lecture), it was excluded. It would have been unfair to compare teaching done under such difficult circumstances with courseware workshops carried out under much more favourable conditions.

For the purpose of these evaluations, certain definitions of teaching method are adopted. The definition of the learning process itself is derived from Diana Laurillard (1993). Notwithstanding the difficulties of comparison mentioned above, we describe all teaching and learning activity in terms of a three-part structure to the educational experience: a) exposition of educational material, b) activity on the part of the student to demonstrate understanding of the exposition, and c) feedback to the student on their activity.

Given this definition, we further categorize the information skills teaching undertaken within the institutions as follows:

Traditional or established user education approaches may be understood as denoting teaching activity where the exposition of material is mediated, that is communicated in real time (synchronously) by a librarian-tutor to students present in a class with a variety of expositional devices (OHPs, Power Point slides and the like). Task execution of required educational activity in order to demonstrate comprehension of initial expositions is hybrid, that is, it may take place electronically (for example on an electronic database) or 'traditionally' (for example by looking at a printed index or hard copy reference work). Feedback may come from the librarian-tutor or, in group-working contexts, from fellow students. Mediation by personal contact of the first and third phase of the educational process is crucial to this definition.

Courseware-taught methods may be understood as denoting teaching activity where the real-time exposition of learning materials is unmediated by direct personal contact with librarian-tutors, the students taking in materials entirely from the courseware package. Task execution of required educational activity in order to demonstrate comprehension of initial expositions is not hybrid, taking place purely electronically (for example on an electronic database). Feedback may come from the librarian-tutor or, in group-working contexts, from fellow students, though working on single workstations in courseware workshops makes effective group-working less achievable unless Computer-Mediated Communication methods are used (and CMC approaches were not adopted in GAELS). Teaching at the first exposition phase is thus unmediated by personal contact, and the third feedback phase is hybrid, consisting mainly of feedback from the package or, in the last resort where unmediated feedback is insufficient, by contact with the librarian-tutor.

These definitions are tabulated below:

Table 2: Definitions of types of information skills methods used in Phase II evaluations

	Exposition	Activity	Feedback
Established	Tutor-mediated	Hybrid (electronic + print)	Tutor-mediated
Courseware-based	Package-mediated	Electronic	Hybrid (package- and tutor-mediated)

It is important to note that the use or non-use of a particular educational technology is not implicit in either of these two definitions. Unmediated or non-tutor-mediated teaching methods can include correspondence course teaching and workbook-based teaching. It is also possible to use a courseware package as part of a mediated, personal contact teaching approach. For example, if a teacher feels that a learning package is too weak to stand on its own, or the student group is not confident in using an unmediated package, then the teacher may (for example) project the pages of a web-based package onto a class display screen and then talk to each page as it is displayed on the screen.

It is also important to note that the phrases 'mediated' and 'unmediated', 'tutor-mediated' and 'package-mediated' are terms which are themselves open to challenge. All teaching based on prepared learning materials must of necessity be mediated by teachers. The key difference between unmediated and mediated teaching is not therefore the use of mediation, rather, it is in the timing of the mediation. Package-based teaching (be it print workbook-based or web-based) divides the act of content provision and the act of personal communication of content. In this sense it is an asynchronous teaching method. Tutor-mediated teaching, where the librarian is also the teacher, conflates the role of provider of learning materials with the role of teacher, and in this sense can be defined as a synchronous teaching method. The synchronous/asynchronous distinction fits the comparison categories used below as accurately as the mediated/unmediated distinction, and, if need be, may be preferred.

Lastly, in some cases the courseware workshop tutors were not librarian-tutors but academic staff in the departments. Where this occurs, the distinction is clearly indicated.

10. Phase II evaluations

In Phase II, large-scale evaluations were undertaken at the University of Strathclyde in the academic session 2000-2001 involving 1187 students. It should be noted that this sample did not include all the students who received information skills training and that in some cases data from traditionally taught students was excluded. For example, where tutor-librarians indicated that the student-teacher ratio was large and unfavourable, making the completion of tasks and feedback on tasks impractical, data from traditionally taught students was excluded.

In the first instance, 437 students in the Science Faculty were assessed. Of these, 185 took the courseware in a workshop context with library staff acting as tutors, while another 76 students took the course with support delivered only by academic staff from their departments. 176 Science students received traditional user education classes. All these students gave feedback via a questionnaire (see Appendix). Secondly, this questionnaire was also distributed to other students from three other Faculties at the John Anderson campus at the University of Strathclyde who were all taught information skills by established user education methods. The sample sizes for these traditionally taught Faculty groups were large enough to give results that were comparable with the Science groups: Arts and Social Science 92, Business 410, Engineering 248.

The small group of Engineering research students at Glasgow and Strathclyde who still took the original GAELS course were not included in the Engineering Faculty sample because the bulk of Engineering students at Strathclyde were not being taught by means of a courseware-based approach. The main function of the Engineering undergraduate sample (who possessed a similar technological learning background to Science Faculty students) was to act as a traditionally taught comparison group for the courseware-taught Science Faculty undergraduates. Filtering out the courseware-taught GAELS Engineering research students thus simplified comparisons.

Our main focus of attention was on the level of reported learning outcomes among students. We wished to see whether there were differences in reported learning outcome levels between groups taught by different methods, and to see if reported learning outcomes varied between Faculty.

As our results show (Fig. 2) reported learning outcomes were high for all groups regardless of Faculty affiliation. In turn, 91% of Arts and Social Science students, 88% of Engineering students and 91% of Business students reported high learning outcomes as a result of taking traditional user education classes at Strathclyde. For our purposes, a 'high learning outcome' was taken to be a report of having learned *a fair amount, quite a lot, or a lot* from their classes (points 3 to 5 on the response scale).

But in Science, the majority of whom were courseware-taught, 84% students reported high learning outcomes, a lower proportion than the other Faculty groups, all of whom were traditionally taught. We needed to investigate the cause of this. Given that evaluations of the quality of presentation in all Faculties and across all teaching methods were uniformly acceptable (at no point falling below 90% of students rating presentation *fair, good or very good* in each group respectively), the cause of this lower rating probably did not lie here. When learning outcomes were mapped against reported low initial knowledge (that is initial knowledge rated as knowledge of only some or none of the materials presented in the class) it was clear that two thirds of each of the traditionally taught Faculty groups had a comparable low level of initial knowledge. By contrast, only half of the Science Faculty group reported low initial knowledge. This greater initial knowledge in Science students may have meant that, having less to learn, they reported learning less in consequence of taking information skills classes. At this point, varying levels of initial knowledge seemed to explain variations in learning outcomes between the traditionally taught Faculty groups, and the Science Faculty students, who were taught by a variety of methods.

In order to explore the results returned by Science Faculty students further, we compared data from the three sub-groups within this Faculty (Fig. 3), the traditionally taught students, the courseware-taught students with librarian-tutor support (CAL1), and the courseware-taught students with departmental academic staff support (CAL2). This comparison showed that the results of the traditionally taught Science students and CAL1 group students (courseware plus librarian

supported) were in fact more in line with the traditionally taught students in other Faculties, with 87% and 86% of students reporting high learning outcomes compared with an average of 90% for the three traditionally taught Faculties. The group with lowest reported learning outcomes - 72% reporting high learning outcomes - was in fact supported by departmental staff. Initial knowledge seems not to have been a significant factor between the three Science Faculty sub groups, since initial knowledge was virtually the same between all three (50%, 50%, and 51% respectively reporting low initial knowledge).

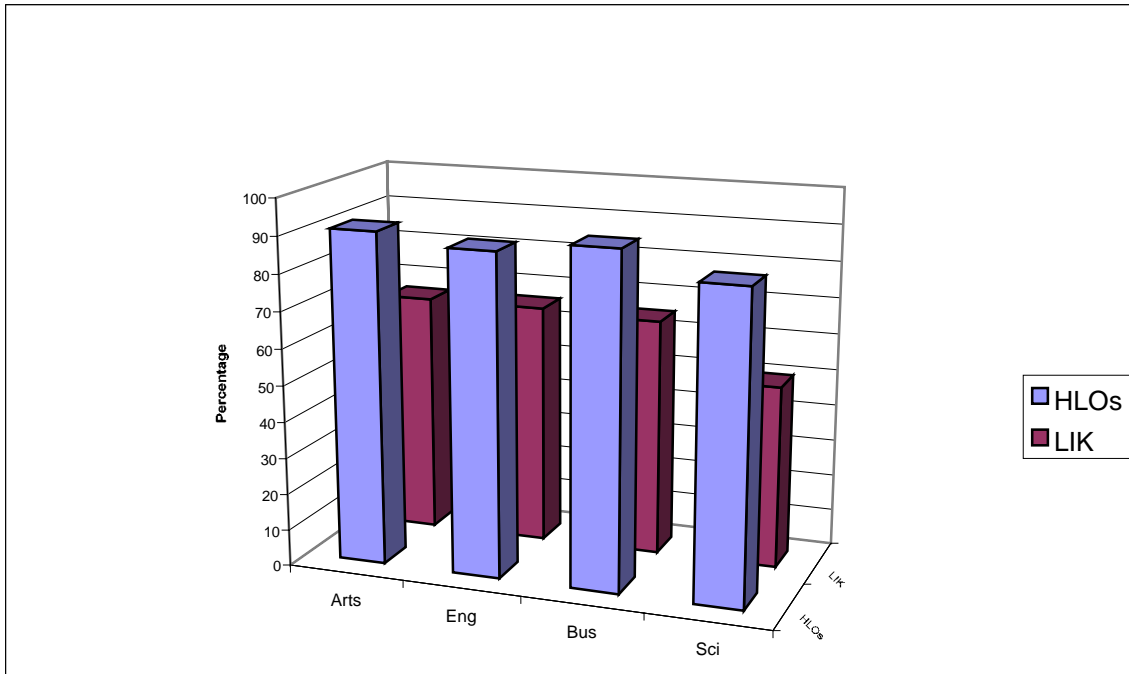


Fig. 2: High Learning Outcomes mapped against Low Initial Knowledge levels (Four faculties).

Our data seemed to indicate therefore that courseware workshops with librarian tutors present and traditional user education classes had broadly similar results in terms of reported learning outcomes. However, once all librarian support was withdrawn, the level of reported learning outcomes did fall significantly (from around 90% to 72%). Knowledgeable tutor presence does matter therefore, and had a more significant on reported learning outcomes than initial knowledge levels in our groups.

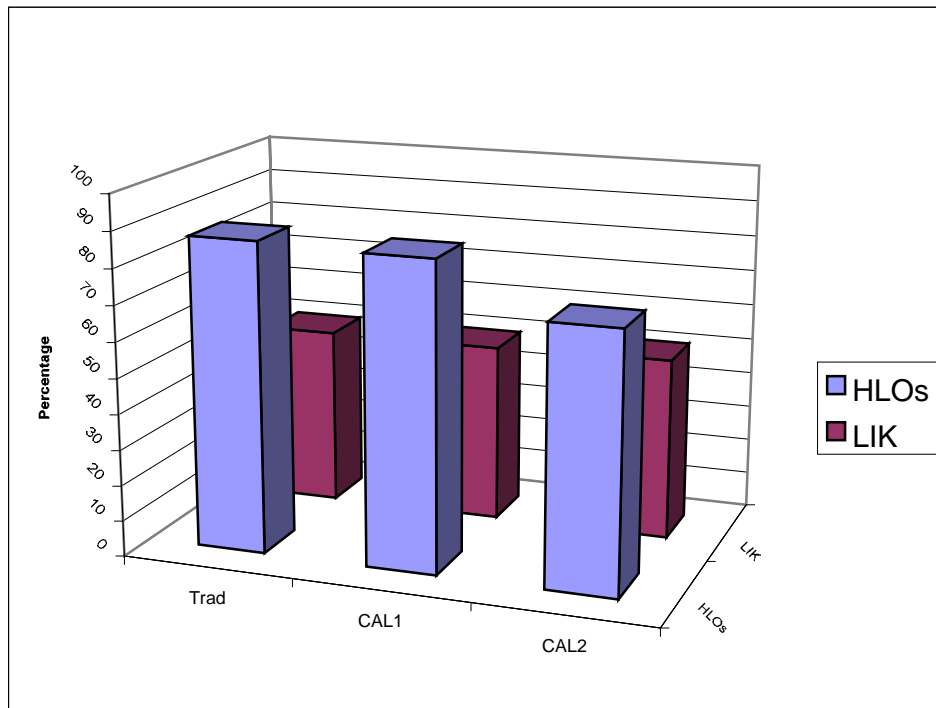


Fig. 3: High Learning Outcomes and Low Initial Knowledge levels (Science Faculty).

11. Interpretation of results

The results of the GAELS courseware evaluations can be interpreted in a number of ways.

Firstly, if one teaching method is less successful than another, what then is an acceptable fall in reported quality of learning outcomes? A teaching method in which 72% of students report high learning outcomes cannot be judged a failure. Furthermore, there is a significant saving of resources in terms of library staff time when user education is delivered without any mediation on the part of librarian tutors. It is also important to note that information skills courseware delivered without librarian support can reach many users who would otherwise be quite unable to receive any teaching whatsoever, and still gives an educational result of acceptable quality. At a time of severe resource constraint in Higher Education the advantages of improved outreach, together with a recouping of valuable staff time are significant benefits of a courseware-based approach to information skills training that need to be weighed against any reported diminution in quality of learning outcomes.

Nevertheless, the adoption of a teaching and learning method which leaves 19% fewer students with a satisfactory level of information skills is a step which must be scrutinised with great caution. There is in fact no such thing as an acceptable fall in reported quality of learning outcomes. Assuming the GAELS evaluations to be correct, the adoption of comprehensive courseware-based user education over the two HEIs of Glasgow and Strathclyde Universities would have the following effect: with a combined FTE student body in excess of 30,000 in total, perhaps 9,000 students would suffer an unacceptable shortfall in their level of information skills. The GAELS evaluations suggest that presently 9% of students fail to report acceptable learning outcomes from user education classes, a total of possibly some 3,000 students. The failure to acquire appropriate levels of information skills must compromise all aspects of student learning, the entirety of which must be underpinned by the ability to use information competently. In view of this, neither the present shortfall in information skills competence nor an entirely courseware-based approach is acceptable.

Such necessary caution does not constitute an argument for maintaining a uniformly traditional approach to user education, however. If, on the one hand, it is unacceptable to adopt a teaching method that leaves one in five students disadvantaged, it is also inefficient in terms of resource management to support large-scale teaching programmes where seven out of ten students could be taught equally effectively without the resource-intensive presence of tutors.

One possible resolution of this dilemma may be to adopt a filtering method, such as is already used in the IT Skills programmes at both campuses (which, like GAELS, also use shared learning materials across the two institutions). The IT Skills Programme is a comprehensive course in information technology competence which is now mandatory for all students at Glasgow and Strathclyde. Students must gain a certificate in basic IT competence at either institution. In these programmes, students are assessed before they receive tuition, and the type of tuition and the degree of exposure to mediated tuition offered each student is carefully matched with the degree of need indicated by their assessment. One of the reasons for such an assessment-based approach is to avoid waste of staff resources by offering teaching to students who do not require it and who can gain a certificate of IT competence by demonstrating their skills via an online assessment module.

If this hybrid model were adopted in information skills teaching at both institutions, then no student would receive information skills teaching without prior assessment. Once students had received an appropriate form of tuition, then the success of the tuition would be evaluated. Where particular problems were identified, extra personal teaching effort could be concentrated on their needs.

If this IT Skills Programme model were applied within the existing framework of GAELS, then all students entering either University would receive an integrated assessment (preferably a online module) to ascertain their level of IT skills *and* information skills. At present there is comprehensive assessment *only* in IT skills at Glasgow and Strathclyde. Where there was a demonstrable need for information skills training (which would be the case for the majority), the courseware option for information skills teaching would become the first option for all students. If the student preferred, the courseware option could be delivered over the network. In this case the GAELS courseware would have to be slightly redesigned to incorporate objectively assessable outcomes from the tasks set in the learning materials so that student could demonstrate that they had taken the course.

If delivered in a workshop format, paraprofessional library staff (equivalent to ITS programme trainers) would present the workshops in order to use staffing resources most efficiently. If subsequently (say) 30% of students reported or demonstrated low learning outcomes (the approximate figure predicted by the GAELS evaluations), then those students would receive remedial classes with personal attention from professional tutor librarians. If in turn a proportion of these students were still unable to demonstrate an acceptable level of information skills competence (the approximate figure predicted by the GAELS evaluations would be 10%), then more intensive personal tuition with an even more advantageous student-tutor ratio would be offered.

Most importantly, an assessment-based approach would identify and provide extra help for the ten percent of students who reported low learning outcomes even after receiving traditional tutor-delivered classes. At present such cases pass through the user education system with no systematic attempt to identify and rectify their shortfall in information skills. In practice this 10% of the student body becomes the source of most reference desk enquiries, in which unskilled library users present unpredictably at an enquiry desk and demand extensive and in depth training in a spontaneous and unplanned fashion. This form of reference work – where 10% of the student body can absorb 100% of the time and attention of reference staff - is frustrating for librarians and library assistants and unsatisfactory for the library user.

One answer to this problem may be to introduce a centrally managed, comprehensive information skills training programme using hybrid library instruction methods. This would be more successful than the current model. The current traditional user education is not systematic, consisting of voluntaristic and ad hoc arrangements between individual tutor-librarians and individual departments. Despite using the most effective (and most resource-intensive) forms of teaching method, it leaves a significant minority of students with an unacceptable shortfall in information skills levels.

12. Overall conclusions:

1. One of the major problems in a project of this nature is convincing the subject librarians of their ownership of the project. The tendency is for them to consider that the contract worker is there to do the courseware whilst they provide advice and supervision without being directly involved. In such circumstances eliciting the subject matter from the subject experts is a key bottleneck in maintaining the learning materials. This is likely to reduce the long-term prospects of the courseware being used and maintained. The project demonstrated that practitioner librarians are capable of taking over the long-term running of courseware materials, developing and adapting them as required.
2. Where broadly similar subject matter is being taught in similar institutions, it makes sense to share these learning materials between the institutions. Creating a networked package of computer-aided learning materials is a practical and effective way of doing this. There are economies of scale gained by using resources in such a way, and benefits in reaching users who otherwise would not be able to gain access to traditional user education classes.
3. When courseware is used without expert tutor mediation, learners reported a lower level of knowledge acquisition than when such materials are used with expert tutor mediation. Reported learning outcomes are still high, however, and there are economic and other learning-related benefits to be gained from a networked approach to delivering shared learning materials. Whether there should be a policy decision in Higher Education Institutions to change the delivery of user education in view of such findings is an important learning management issue. The findings of this project could be interpreted in such a way as to favour a change of this nature. The integrated model of IT Skills and information skills training offered above is one way of introducing such a change. Whatever approach is adopted, it must acknowledge that tutor-mediated teaching is likely to be more effective than unmediated teaching techniques, and innovative teaching methods must not be adopted for economic gain at the expense of inferior student learning outcomes.
4. The decision of Glasgow University henceforward to abandon hard copy holdings, in favour of an entirely electronic journals acquisition policy is in part a result of the effectiveness of the GAELS learning materials in teaching users the skills needed to exploit electronic information services. It is hoped that the adaptation of the courseware to subjects other than engineering will mean that similar decisions will be possible in other subject areas, resulting in a rationalisation of hard copy journals holdings across the metropolitan area network in Glasgow.

13. References

- Jan W.A. Lanzin (1996) *Concept Mapping Model for Hypermedia Design*. URL: <http://www.to.utwente.nl/ism/linhyp/phases.htm> (last visited 6/8/01).
- Laurillard, D. (1993) *Rethinking university teaching : a framework for the effective use of educational technology*. London ; New York : Routledge.
- Ottewill, R & Hudson, A (1997). *Electronic information resource use: implications for teaching and library staff*. *Alt-J* Vol. 5 (2).
- University of Glasgow, IT Education Unit. *IT courses for students*. (2001) <http://www.iteu.gla.ac.uk/courses.htm> (last visited 6/8/01).
- University of Strathclyde, Centre for Educational System. *IT Induction programme*. (2001) <http://www.strath.ac.uk/ces/courses/UGITS.html> (last visited 6/8/01)

Recommendations

1. Collection Management

- 1.1. It is recommended that both institutions move towards a more electronic and a more access based model of information provision. This will require a joint review of existing subscriptions to electronic and hard copy journals.
- 1.2. It is recommended that, as the minimum for collaboration, cancellations of existing holdings or subscriptions to new journals are undertaken on a collaborative basis to ensure that the breadth of the existing joint collection is maintained.
- 1.3. It is recommended that a shift from hard copy holdings to electronic holdings (e-journals) takes place for core journals at both institutions. These holdings will then be supported by an enhanced document delivery service with electronic requesting, where possible electronic delivery, and commercial services for delivery of information types not held by the British Library.
- 1.4. It is further recommended that consideration is given to rationalisation of the retrospective and any remaining current hard copy holdings in engineering in both libraries to make a single distributed collection. This may allow funds to be released, where there is duplication, for document delivery. Discussions have already taken place in relation to storage facilities. Consideration should also be given as to whether the Universities of Paisley and Glasgow Caledonian are approached to join in.
- 1.5. It is recommended that information audits and overlap studies are carried out in suitable subject areas with a view to the implementation of similar services for other subjects

The Libraries at Glasgow and Strathclyde universities currently provide access to journal literature largely through the collection of journals in both hard copy and electronic formats, using inter-library loans to obtain items not held in the institution. This is supported by a variety of subject specific indexing and abstracting databases to enable identification of relevant articles.

A number of external factors make an assessment of traditional collections and an examination of alternative models necessary:

1. periodical prices continue to rise each year at levels above the annual rate of inflation.
2. more new journal titles are published every year.
3. library budgets at both institutions are increasingly constrained as a result.

Ongoing cuts in the journals budget are reducing the collections at each institution to a similar core of journal titles, which may eventually amount to the transactions of the various engineering institutes with a few other titles.

The information audit (see section 1) shows that the combined traditional collections represent a resource of national significance, which compares favourably with the combined engineering collections of other metropolitan groupings but that a large proportion of this resource is duplicated across the two institutions. The duplication in current serial subscriptions amounts to approximately £70,000 per annum.

Furthermore our research shows that patterns of information-seeking behaviour among engineers at the two institutions indicate relatively low levels of use of these traditional collections, and a clear preference for electronic forms of access to and delivery of information.

The move towards a joint collection will require both Library management teams and both Engineering Faculty management groups to agree terms on issues such as ownership of the joint collection, location of hard copy materials and access arrangements. Both institutions will have to agree to consult fully on issues such as journal cancellation and purchase, purchase of electronic journals and to set up the appropriate structures to allow consultation to take place. Budgetary arrangements at each library differ, with Glasgow having devolved budgeting and Strathclyde having a single budget for all journals, notionally attributed by subject, making identifying the actual costs for a particular faculty more difficult.

2. Document Delivery

- 2.1. It is recommended that electronic requesting of documents is implemented as a full service at both institutions, and that the local document delivery trial is implemented as a full service at both sites for engineering. Consideration should be given as to whether the cost of local document delivery should be charged to each site. If both institutions agree to implement collaborative collection development strategies in other areas, local document delivery may require extra staffing resources.
- 2.2. It is recommended that the current commercial document delivery service from the AIAA is continued and consideration given to other commercial services where appropriate.
- 2.3. It is recommended, in order to provide enhanced access for document retrieval, that Strathclyde University Library implements an in-house photocopying service, and current awareness and current contents services for academic staff and research students along the lines of the service provided at Glasgow University Library.
- 2.4. It is recommended that consideration be given to the creation of a single document delivery service for both sites as the project believes this would facilitate the effective operation of the services outlined above.

3. Access

- 3.1. It is recommended that the management groups at both institutions consider relevant issues, particularly compatibility between access and authentication systems.

The term 'reciprocal access' is generally applied to membership, consultation and borrowing rights for staff and students of one institution at the library of another. In this respect, the reciprocal access agreement between Glasgow and Strathclyde is very good when compared to sector norms; staff and research students are entitled to free membership and borrowing rights, and undergraduates have access for reference purposes.

User perceptions of reciprocity are not so good. Key issues are the requirement to register annually and the lack of access to electronic products and services. On both these issues, there is little that can be done in the short term. Automatic library registration can only be achieved in partnership with other departments e.g. Registry, Human Resources, Pay Roll etc. The restrictions imposed by academic licensing agreements prevent an extension of access to electronic journals and bibliographic databases.

4. Courseware

- 4.1. It is recommended that the two institutions share common information skills learning materials between both sites with a view to such common materials being created jointly rather than individually at both institutions.

- 4.2. It is recommended that the two institutions explore CAL-based approaches to user education with a view to decreasing the amount of professional staff time in contact teaching at both sites.

5. Staffing

- 5.1. It is recommended that the management teams of both libraries continue to meet on a regular basis to move forward collaborative ventures.
- 5.2. It is recommended that subject librarians at both libraries should be encouraged to work more closely in support both of teaching and research.

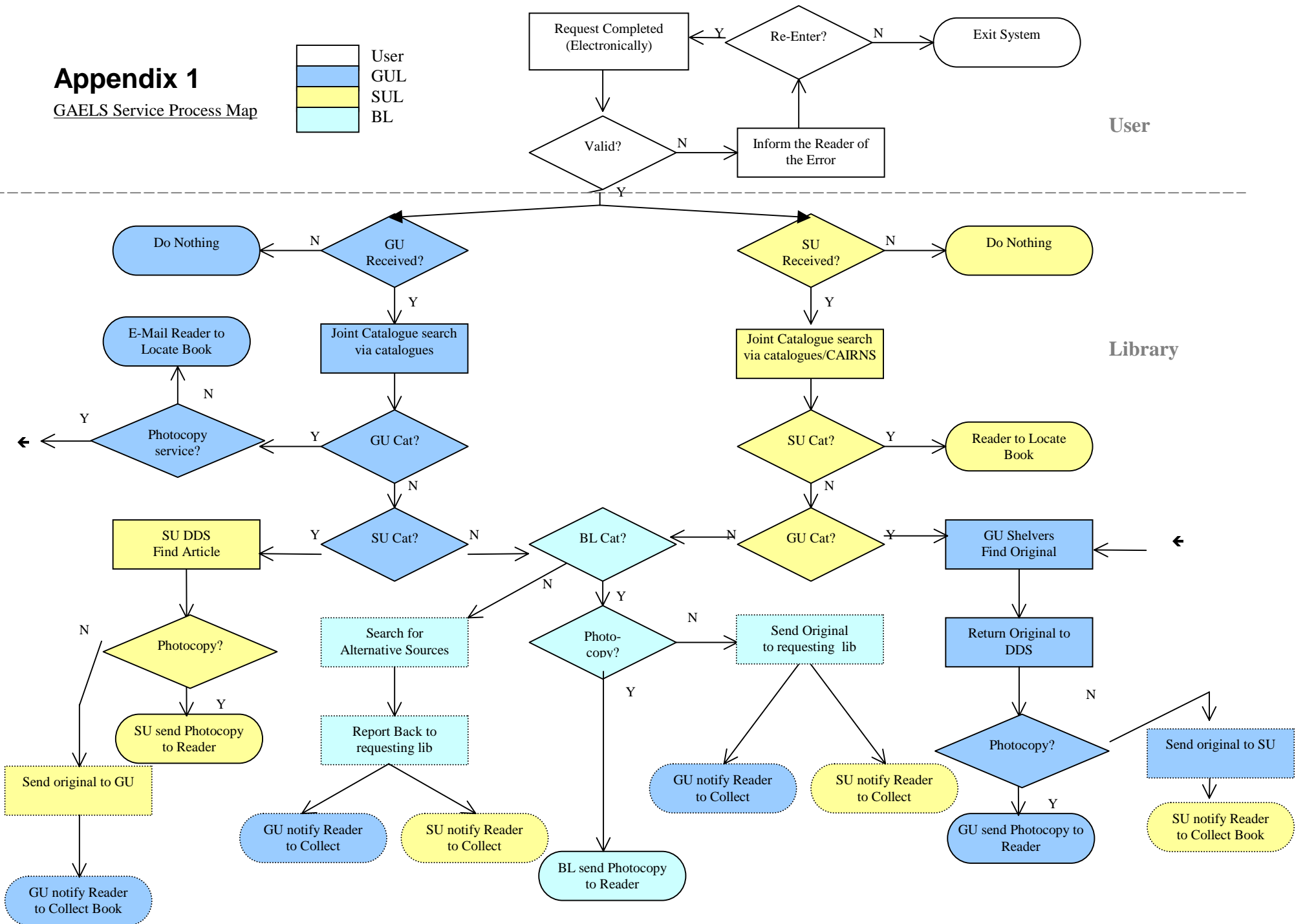
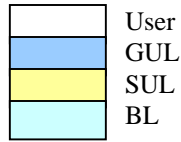
As has been outlined above, deep resource sharing has implications for service provision and staff development.

6. Other Issues

- 6.1. It is recommended that the task-orientated interface developed by Gaels becomes the de facto subject page for engineering at both libraries, and that a similar approach is developed for other subject areas.
- 6.2. It is recommended that consideration be given to collaboration over web design and service provision over the web, so that consistency of approach is achieved between the two libraries. There may be tensions between collaborative web development and the maintenance of each University's house style that will have to be considered by the joint management teams.

Appendix 1

GAEELS Service Process Map



Appendix 2

Statistical Breakdown - Glasgow University (Period 24/8/2000 – 30/3/2001)

Online ILL Requests

Department	Staff	P/Grad	U/Grad	Total
Aerospace	4	2	–	6
Civil	7	–	–	7
Electronics & Electrical	234	91	–	325
Engineering Planning Unit	1	148	–	149
Mechanical	26	2	–	28
Naval Architecture	3	–	–	3
(Test)	7	–	–	7
Total	282 (54%)	243 (46%)	–	525 (100%)

Traditional ILL Request

Department	Staff	P/Grad	U/Grad	Total
Aerospace	1	79	15	95
Civil	4	79	11	94
Electronics & Electrical	132	65	25	222
Engineering Planning Unit	–	1	1	2
Mechanical	44	88	63	195
Naval Architecture	4	23	7	34
Total	224 (35%)	289 (45%)	129 (20%)	642 (100%)

No of Unique Users (Online)

Department	Staff	P/Grad	U/Grad	Total
Aerospace	2	1	–	3
Civil	2	–	–	2
Electronics & Electrical	13	8	–	21
Engineering Planning Unit	1	19	–	20
Mechanical	5	2	–	7
Naval Architecture	1	–	–	1
(Test)	2	–	–	2
Total	26 (46%)	30 (54%)	–	56 (100%)

No of Unique Users (Traditional)

Department	Staff	P/Grad	U/Grad	Total
Aerospace	3	11	7	21
Civil	7	6	4	17
Electronics & Electrical	22	12	10	44
Engineering Planning Unit	–	1	1	2
Mechanical	10	14	8	32
Naval Architecture	3	5	2	10
Total	45 (36%)	49 (39%)	32 (25%)	126 (100%)

Online ILL - How Requests Filled

Fulfilling Library	Supplied	In progress	Cancelled	Test	Total
BLDSC	371 (71%)	—	—	—	371
University of Glasgow	72 (14%)	6	36	11	125
University of Strathclyde	21 (4%)	—	—	—	21
Other Libraries	8 (2%)	—	—	—	8
Total	472 (90%)	6 (1%)	36 (7%)	11 (2%)	525 (100%)

Appendix 3

Statistical Breakdown - Strathclyde University (Period 24/8/2000 – 30/3/2001)

Online ILL Requests

Department	Staff	P/Grad	U/Grad	Total
Bioengineering	4	59	–	63
Chemical	–	15	–	15
Civil	–	8	–	8
Design Manufacture and Engineering Management	–	31	–	31
Electronics and Electrical	19	162	–	181
Mechanical	26	28	–	54
Ship and Marine Technology	–	14	–	14
(Test)	9	–	–	9
Total	58 (15%)	317 (85%)	–	375 (100%)

Traditional ILL Request

Department	Staff	P/Grad	U/Grad/ other	Total
Bioengineering	8	21	–	29
Chemical	6	5	22	33
Civil	73	53	23	149
Design Manufacture and Engineering Management	34	68	43	145
Electronics and Electrical	81	134	57	272
Mechanical	72	58	15	145
Ship and Marine Technology	1	58	2	61
Total	275 (33%)	397 (48%)	162 (19%)	834 (100%)

No of Unique Users (Online)

Department	Staff	P/Grad	U/Grad	Total
Bioengineering	3	9	–	12
Chemical	–	1	–	1
Civil	–	2	–	2
Design Manufacture and Engineering Management	–	3	–	3
Electronics and Electrical	5	11	–	16
Mechanical	4	5	–	9
Ship and Marine Technology	–	1	–	1
(Test)	2 (14%)	–	–	2
Total	14 (30%)	32 (70%)	–	46 (100%)

No of Unique Users (Traditional)

Department	Staff	P/Grad	U/Grad	Total
Bioengineering	2	8	—	10
Chemical	1	3	9	13
Civil	6	5	7	18
Design Manufacture and Engineering Management	5	10	3	18
Electronics and Electrical	23	28	10	61
Mechanical	10	14	5	29
Ship and Marine Technology	1	10	2	13
Total	48 (30%)	78 (48%)	36 (22%)	162 (100%)

Online ILL - How Requests Filled

Fulfilling Library	Supplied	In progress	Cancelled	Test	Total
BLDSC	247 (66%)	—	—	—	247
University of Glasgow	60 (16%)	—	—	—	60
University of Strathclyde	—	7	49	9	65
Other Libraries	3 (1%)	—	—	—	3
Total	310 (83%)	7 (2%)	49 (13%)	9 (2%)	375 (100%)

Appendix 4

Request Details Filled at Partner Library

Requesting Library – GUL

Reference No.	Request Details
GL00014	Journal of Vacuum Science & Technology; 1999; Vol 17; Part 6; pp2970-2974; Demonstration of Pattern Transfer Into...
GL00241	SIAM Journal of Scientific Computing; 1999; Vol 20; Part 6; pp 2089-2102; Anderson Model of Localization: A...; Elsner U, Mehrmann V, Milde F, Roe
GL00263	Water Resources Research; 1992; Vol 28; Part 8; pp2155-2158; Estimating Shear Velocity and Roughness; Bergeron NE, Abrahams AD
GL00267	RA Millikan; Autobiography; Prentice Hall; 1950
GL00297	Social Work in Health Care; 1996; Vol 23; Part 1; pp93-96; Reframing; Garner
GL00301	Library Trends; 1996; Vol 45; Part 2; pp192-203; Interdisciplinary Research; Wilson P
GL00305	Feminist Studies; 1998; Vol 24; Part 2; pp275-299; Disciplined By Disciplines?; Allen JA et al
GL00316	Suematsu, Yasuharu; Handbook of Semiconductor Lasers and Photonic Integrated...; Chapman and Hall 1st
GL00320	Klir GJ; An Approach to General Systems Theory; Van Nostrand Reinhold; 1969
GL00335	Talanta; 1986; VOL 33; Part 2; pp125-134; Polycrystalline and Monocrystalline Anti...; Kinoshita E
GL00341	Sensors and Actuators B - Chemical; 1990; Vol 1; Part 1-6; pp286-292; Solid Potentiometric PH Electrode; Kreuer KD
GL00347	Talanta; 1993; Vol 40; Part 8; pp1255-1259; Chemically Modified Electrode Based on...; Yuan R
GL00369	H Galster; Ph Measurement: Fundamentals, methods, Applications & Instrumentation; 1991
GL00373	J Duato, S Yalamanchili, L Ni; Interconnection Networks; IEEE Computer Society; Jan Ed: 1
GL00385	Systems & Control Letters; 1993; Vol 20; pp 249-261; Optimal H and H2 Control of Hybrid Mult...; Voulgaris, Petros G, Bamieh, B
GL00393	Bioelectrochem Bioenerg; 1987; Vol 17; pp549-557; Dielectrophoresis of Individual Cells; Dimitrov and Zhelev
GL00396	Talanta; 1986; Vol 33; pp125-134; Polycrystalline and Monocrystalline Anti...; Kinoshita, E
GL00406	1st International Conference on Optical Fibre Sensors, IEE, London, 1983; Vol 1; pp 79; Fiber Optic Rare Earth Temperature Senso...; E Snitzer, WW Morey, WH Glenn
GL00410	Fukuda, Mitsuo; Optical Semiconductor Devices; Wiley 1999
GL00421	Applied Optics; 1964; Vol 3; pp1182; Amplification In A Fiber Laser; CJ Koester and E Snitzer
GL00477	Annual Review of Information Science & Technology; 1997; Vol 32; pp 339-366; Information Ethics; Smith MM

Requesting Library - SUL

Reference No.	Request Details
ST00011	Philosophy of Structures; Torroja Eduardo, (translated by Polivka) Cambridge UP 1958
ST00012	Journal of Geophysical Research - Oceans 2000; vol 105; part c7; Convergence of Lateral Flow Along a Coas...
ST00014	Journal of Geophysical Research - Oceans 2000; Vol:105; Part C2; Fortnightly Variability in the Transvers...
ST00017	Journal of Geophysical Research - Oceans; 1999; Vol:104; Part C10; A Two-Dimensional Analytic Tidal Model...
ST00020	Journal of Geophysical Research - Oceans; 1998; Vol 103; Part C5; Separating Baroclinic Flow from Tidally...
ST00028	Ceramics International; 1997; Vol 23; Part 2; Preparation & Properties of Sic Fibre Reueno...
ST00036	Pattern Recognition; 1999; Vol32; Part 7; A One-Pass Algorithm for Local symmetry...
ST00043	Pattern Recognition; 2000; Vol33; Part 9; Coarse-to-Fine Planar Object Identification...
ST00058	Fuzzy Sets and Systems; 16 M; Vol 110; Part 3; Fuzzy Control of Thyristor Controlled Se...
ST00065	Computer Methods in Applied Mechanics and Engineering; 1998; Vol 151; Part 3-4; Finite Element Formulations for Hyperela...
ST00068	Journal of Morphology; 1988; Vol 197; Part 3; Some Histological Aspects of the Hip Joi...
ST00086	Friberg L, Nordberg GF, Vouk VB; Handbook on the Toxicology of Metals; Elsevier, Amsterdam 1986
ST00094	International Journal For Numerical Methods in Engineering; 1993; Vol:36; Part:24; Hybrid and Mixed-Penalty Finite-Elements
ST00111	Journal of Operations Management; Nov; Vol 51; Part 6; Competitive Priorities and Managerial Pe...
ST00117	Clin Pharmacokinet; Feb; Vol 32; Part 2; Pharmacokinetic Optimisation of the Trea...
ST00122	Journal of Engineering Mechanics - ASCE; 1998; Vol 124; Part 10; Young's Modulus Interpreted from Compres...
ST00130	Journal of the American Geriatrics Society; 1999; Vol 47; Part 1; pp88-92; Mismatches Between Home Environment and...; Gill TM, Robinson JT, Williams CS, Tine
ST00140	Proceedings, 31st Universities Power Engineering Conference, Iraklio, Greece, Sept 18-20, 1996; Adaptive Static Var Compensator for Enhancing Power System Stability...
ST00141	Information Sciences, Vol: 101, No 3-4, October 1997; Approach to Designing

Reference No.	Request Details
	the fuzzy controlled static var Compensator...
ST00142	Journal of Operations Management; Nov; Vol 18; Part 6; Configurations in Operations: An Emergen...
ST00143	Journal of Operations Management; April Vol 18; Part 3; Strategy, Advanced Manufacturing Technol...
ST00144	Ultrasound Med Biol; 1994; Vol 20; Part 1; pp27-33; Ultrasonic Imaging of the Stress Distrib...; Ponnekanti H, Ophir J, Cespedes I
ST00145	Ultrasound Med Biol; 1992; Vol 18; Part 8; pp667-673; Axial Stress Distributions Between Coaxi...; Ponnekanti H, Ophir J, Cespedes I
ST00151	Current Eye Research 1996; Vol 15; Measurement of Transmission of UV and Vi...
ST00157	Pattern Recognition; 1994; Vol 27; Invariant Pattern Recognition By Moment; S Wang, P Chen, W Lin
ST00159	CVGIP: Graphical Models Image Process; 1992; Vol 54; pp 438-460; A Survey of Moment-Based Techniques For...; RJ Prokop, AP Reeves
ST00160	An. Int. Med.; 1986; Vol 105; pp 413-420; Review: Scientific and problems In...; Feinstein AR, Josephy BR, Wells CK
ST00161	J. Am. Geriatr. Soc.; 1990; Vol 38; pp 62-70; The Scientific Basis of Exercise...; Shepard RJ
ST00162	J. Gerontology; 1989; Vol 44; pp M141-M146; Physical Performance Measures in Aging...; Guralnick JM, Branch LG, Cummings SR
ST00181	International Journal of Electrical Power and Energy Systems; Feb; Vol 21; Prt 2; pp111-18; Flexible AC Transmission System Devices: De-Oliveira-Ej et al
ST00182	Biosensors and Bioelectronics; Oct; Vol 15; Part 7-8; pp383-396; Drug Evaluations Using Neuronal Networks; S I Morefield, E W Keefer; K D Cha
ST00189	Corrosion Science; 1993; Vol 35; Part 5-8; pp1667-1675; Real-Time Oerformance Monitoring of Foul...; Winters MA, Stokes PSN, Zuniga P
ST00193	Journal of Cleaner Production; 1996; Vol 4; Part 1; pp21-27; Design Altenatives for the use of Cooli...; Bloemkolk JW, Schaaf RJ
ST00194	Current Microbiology; Vol 28; Part 6; pp359-363; Legionnaires Disease Outbreaks and Cooli...; Shelton BG, Flanders WD, Morris G
ST00195	Applied Thermal Engineering; Vol 19; Part 11; pp1223-1235; Cooling Tower - An Energy Conservation...; Goshayshi HR, Missenden JF, Tozer
ST00209	International Journal of Electrical Power and Energy Systems; 1997; Vol 19; Part 3; pp195-208; Sime: A Hybrid Approach to Fast Transie...; Zhang Y et al
ST00211	International Journal of Multiphase Flow; Nov; Vol 26; Part 11; pp1739; Two-phase Pressure Drop of Refrigerants; Tran TN; Chyu MC; Wambsganss-MW; France
ST00212	International Communications in Heat and Mass Transfer; July; Vol 27; Part 5; pp611-21; A Comparison of the Flow Characteristics; Wongwiset S, Songnetichaovallit T, Lokath
ST00234	Pattern Recognition; 1993; Vol 26; pp167-174; Pattern Recognition By Affine

Reference No.	Request Details
	Moment Inv...; Flusser J, Suk T
ST00242	Fitzgerald L, Johnston R, Brignall, T; Performance Measurement in Service Businesses; Chartered Institute of Management A 1991
ST00243	International Journal of Impact Engineering (UK); Nove; Vol 21; Part 10; pp855-879; Low Velocity Perforation Behaviour of...; Mines RAW, Worall CM, Gibson AG
ST00244	Materials and Design (UK); Octo; Vol 18; Part 3; pp167-173; Microstructural Design of Composite Mate...; Ramakrishna S
ST00278	Int. Journal of Elec. Power & Energy Systems; 1997; Vol 19; pp 397-410; Design of Reactive Current and Voltage...; KR Padiyar and AM Kulkarni
ST00287	Toxicol in Vitro; 1995; Vol 9; Part 1; pp 27-37; Quantitative Structure-Activity Relation; Barratt MD
ST00288	GN Taranto, ALB Do Bomfim, DM Falcao, N Martins; Automated Design Of Multiple Damping Controllers Using Genetic Algorithms; Proceedings of the IEEE Power Engineering Society Winter Meeting 1999
ST00297	Proceedings of the Institution of Civil Engineers: Municipal Engineer; 1998; Vol 127; Part N2; pp 94-97; Local Authorities Energy Partnership
ST00298	Automation in Construction; 1999; Vol 8; Part N4; pp 481-487; Modeling of Energy Demands For Resident...; Forowicz, Teresa
ST00299	Renewable Energy; 1998; Vol 13; Part 3; pp 333-344; Evaluation of Renewable Energy Potential; Voivontas D, Asimacopoulos D, Mourelat
ST00314	Power Engineering Society Winter Meeting; 1999; Vol 1; pp 616-621; Li Wang; Stabilization of generator Oscillations
ST00331	International Journal of Electrical Power & Energy Systems; 2001; Vol 23; Part 1; pp 69-79; Bazanella AS, E-Silva AS; Coordinated Design of Damping Controller
ST00338	Journal of Operations Management; May; Vol 15; Part 2; pp139-154; A Tutorial on Business Process Improvement; Rohleder TR; Silver EA
ST00339	Journal of Operations Management; Aug; Vol 15; Part 3; pp 193-213; Business Process reengineering...; Grover V, Malhotra MK
ST00340	Renewable Energy; Jan; Vol 22; Part 1; pp 345-351; Demonstrating Remote Area power Supply...; Lund CP, Wilmot N, Pryor T, Cole
ST00341	Fusion Engineering and Design; Jan; Vol 43; Part 3-4; pp 285-291; Recent Development in the JT-60 Data PR; Matsuda T, Aoyagi T, Saitoh N, Tsu
ST00349	ima Journal of Mathematics Applied in Business and Industry; 1998; Vol 9; Pt 2; pp 201-210; Makis V, Jiang X, Jardine AKS; A Condition-Based Maintenance Model
ST00350	Reliability Engineering and System Safety; 2000; Vol 68; Pt 1; pp 69-83; Marseguerra M; Optimizing Maintenance and Repair Policies Via A Combination of Genetic...
ST00351	Reliability Engineering & System Safety; 2000; Vol 67; Pt 2; pp 113-118; Crocker J, Kumar VD; Age-Related Maintenance Versus Reliability Centred

Reference No.	Request Details
	Maintenance: A Case Study On Aero-Engines
ST00363	Calcified Tissue International; 1985; Vol 37; Part 1; pp 63-72; Bone-Derived Macrophage Chemotactic Fact; Minkin C, Bannon JR DJ, Pokress S
ST00364	Experimental Physiology; 2000; Vol 85; Part 5; pp 519-525; Experimental Physiology; Ortega E, Garcia JJ, De La Fuente M
ST00374	Abdel-Magid YL, Dawoud MM; Tuning of Power Systems Stabilizers Using Genetic Algorithms; Electric Power Systems Research; Vol 39, No 2, 1997 pp137-143

Appendix 5

Serials Overlap Title Summary

ACI materials journal	Earthquake engineering & structural dynamics	International journal of systems science
ACI structural journal	Electronics letters	International shipbuilding progress
The Aeronautical journal	The Engineer	IT Professional (IEEE)
Aerospace America	Engineering	
AIAA journal		Journal of aerospace engineering (ASCE)
American Society of Civil Engineers package (27 titles)	Fatigue & fracture of engineering materials & structures the international journal	Journal of aerospace engineering (ASCE)
Artificial intelligence for engineering design, analysis and manufacturing AI EDAM.		Journal of applied mechanics (ASME)
Automatica the journal of IFAC, the International Federation of Automatic Control	Geotechnique	Journal of applied mechanics (ASME)
Automotive engineering international	Ground engineering	Journal of architectural engineering (ASCE)
		Journal of bridge engineering (ASCE)
Canadian geotechnical journal	Highways and transportation	Journal of cold regions engineering (ASCE)
Civil engineering (ASCE)		Journal of composite materials
Cement and concrete research	IEE subscription package	Journal of composites for construction (ASCE)
Composites Part A: Applied science and manufacturing	IEEE subscription package	Journal of computing in civil engineering (ASCE)
Computer aided design	Industry week	Journal of construction engineering and management (ASCE)
Computers & fluids	International journal for numerical methods in engineering	Journal of dynamic systems, measurement, and control (ASME)
Computing in Science and Engineering (IEEE)	International journal of control	Journal of energy engineering (ASCE)
Concrete international design & construction American Concrete Institute	International journal of electronics	Journal of engineering design
	International journal of fracture	Journal of engineering for gas turbines and power (ASME)
Design studies	International journal of heat and mass transfer	Journal of engineering mechanics (ASCE)
	International journal of solids and structures	Journal of environmental engineering (ASCE)

Journal of fluid mechanics	Journal of transportation engineering (ASCE)	Practice periodical on structural design and construction (ASCE)
Journal of heat transfer (ASME)	Journal of urban planning and development (ASCE)	Proceedings of the IEEE
Journal of hydraulic engineering (ASCE)	Journal of vibration and acoustics (ASME)	Proceedings of the Institution of Civil Engineers. Civil engineering
Journal of hydrologic engineering (ASCE)	Journal of water resources planning and management (ASCE)	Proceedings of the Institution of Civil Engineers. Geotechnical engineering.
Journal of infrastructure systems (ASCE)	Journal of waterway, port, coastal, and ocean engineering (ASCE)	Proceedings of the Institution of Civil Engineers. Municipal engineer
Journal of irrigation and drainage engineering (ASCE)		Proceedings of the Institution of Civil Engineers. Structures and buildings.
Journal of lightwave technology a joint IEEE/OSA publication	Magazine of concrete research	Proceedings of the Institution of Civil Engineers. Transport
Journal of management in engineering (ASCE)	Marine technology & SNAME news	Proceedings of the Institution of Civil Engineers. Water, maritime and energy
Journal of materials in civil engineering (ASCE)	Materials science and technology	Proceedings of the Institution of Mechanical Engineers A
Journal of materials science	Measurement and control	Proceedings of the Institution of Mechanical Engineers B
Journal of materials science letters	Mechanical systems and signal processing	Proceedings of the Institution of Mechanical Engineers C
Journal of materials science materials in electronics	Mechanics of Materials	Proceedings of the Institution of Mechanical Engineers D
Journal of materials science materials in medicine	Mechanics of structures and machines	Proceedings of the Institution of Mechanical Engineers E
Journal of microelectromechanical systems (IEEE)		Proceedings of the Institution of Mechanical Engineers F
Journal of performance of constructed facilities (ASCE)	Naval architect	Proceedings of the Institution of Mechanical Engineers G
Journal of pressure vessel technology (ASME)		Proceedings of the Institution of Mechanical Engineers H
Journal of professional issues in engineering education and practice (ASCE)	Ocean engineering	Proceedings of the Institution of Mechanical Engineers I
Journal of ship research	Optical and quantum electronics	Proceedings of the Institution of Mechanical Engineers J
Journal of solar energy engineering (ASME)	Optical engineering	Proceedings of the Institution of Mechanical Engineers K
Journal of sound and vibration	Optics and laser technology	Proceedings of the Institution of Mechanical Engineers L
Journal of structural engineering (ASCE)		Progress in materials science
Journal of surveying engineering (ASCE)	Practice periodical of hazardous, toxic, and radioactive waste management (ASCE).	
Research in Engineering Design		

Soils and foundations
Structural engineer. Journal of the Institution of Structural Engineers
Systems & control letters
Traffic engineering and control
Transactions of the Institute of Measurement and Control (part of Measurement and Control)
Transactions of the Royal Institution of Naval Architects and Marine Engineers
Transactions of the Society of Naval Architects and Marine Engineers
Water Power and Dam Construction
Wind engineering

Appendix 6

User evaluation questionnaire

Course Title:

Course Presenter(s):

Date:

We wish to evaluate the content and effectiveness of our user education work. Please answer the questions below and return the form to us at the end of the session.

To what extent were you already familiar with the content/skills of this class before the course?

(circle a number)

All	most	fair amount	some	none
5	4	3	2	1

How good was the presentation of material to you in this class?

Very good	good	fair	poor	very poor
5	4	3	2	1

How much did you learn from the course/class?

A lot	quite a lot	a fair amount	a little	nothing
5	4	3	2	1

If there were any, how did you find the exercises? (5 being very easy and 1 being very difficult)

Very easy	easy	moderately easy	difficult	very difficult
5	4	3	2	1

NOT APPLICABLE

What were the two most interesting/useful aspects?

Please return this form to the Course tutors at the end of the session or return to the Andersonian Library, Curran Building, University of Strathclyde.