# BIODOC - the transition from research project to fully fledged service

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This is the third in a series of papers describing BIODOC, a service now in its fourth year that addresses the access versus holdings debate in a University library.

The main aims of the study were to evaluate the cost effectiveness of a wholly access based information service, to analyse user perception/receptivity and the impact of such a service, as well as to improve upon the existing service to the staff and students involved. As part of the project the Library also wished to compare document supplier performance and disseminate all findings among the academic and research communities.

BIODOC was conceived originally as a research experiment. Year 1 was heavily research oriented and featured a high level of library intervention and monitoring. Years 2 and 3 were transitional years as the experiment moved towards a full service model. The service is currently in its fourth year of operation and has now been fully integrated into normal library procedures. Further details on the background, context, and operation are available in Evans *et al* [(1)].

In summary, journal subscriptions for all titles serving the Biotechnology Centre (now the Institute of Bioscience and Technology or IBST) at Cranfield were cancelled and replaced with electronic current contents and a fast document delivery service.

A preliminary user analysis performed after six months showed that staff and students within IBST were generally favourably disposed to the service. A full interim study of user perceptions is given by Harrington *et al* [(2)].

This paper will use both quantitative and qualitative data to add to previously published results by examining how the project has affected both the students and staff in IBST, as well as Library staff. It will show that the results have implications not simply at a local level but also for other institutions in higher education.

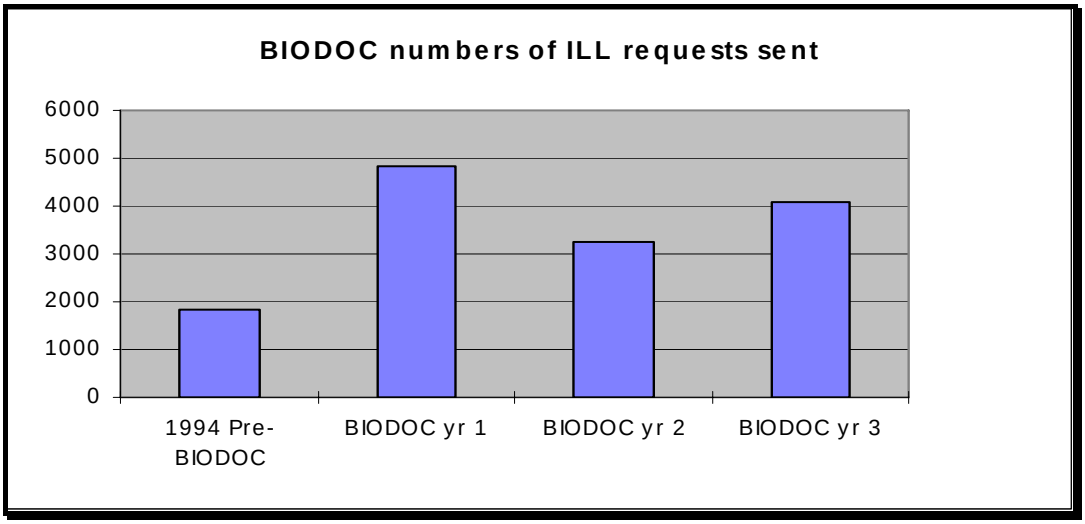
## User impact

The analysis of user impact focused on changes in information seeking behaviour including changes in usage patterns, the widening access to material, the currency of items requested, and the relevance of items requested.

### *Usage*

Figure 1 shows the change in demand for interlibrary loan requests over four years, one year prior to the project, and the first three years of the project.

Figure 1




BIODOC requests in Year 2 showed a 35% decrease on Year 1 (to 3139 requests) but this still represents a 70% increase in demand over the pre-BIODOC year. The difference between the pre-BIODOC year and the first year amounted to a 162% increase in the demand for material, from 1849 requests to 4849.

Two factors were thought to explain these figures: the ease with which material could be requested, and the raised awareness of users of the new service. Firstly, Year 1 users were able to initiate requests in a variety of ways e.g. annotated email, current contents from UnCover, telephone, etc. Library staff then entered requests onto the automated library system on behalf of users in order to manage the use of a range of suppliers and to offer an extra incentive for participating in the experiment. No limits were imposed on users of the service and so there was no artificial dampener on demand. Secondly, the project appeared to illustrate the 'Hawthorne effect' [(3)] where intervention in any process raises awareness, interest and demand. The Biotechnology Centre had just had all their journals cancelled and so they were going to ensure that they made use of this new service to its full potential.

In Year 2, the project team decided to reduce the high amount of library staff intervention. As a consequence the project reverted to using the existing inter library loans arrangements, whereby users input their own requests using the library's automation system.

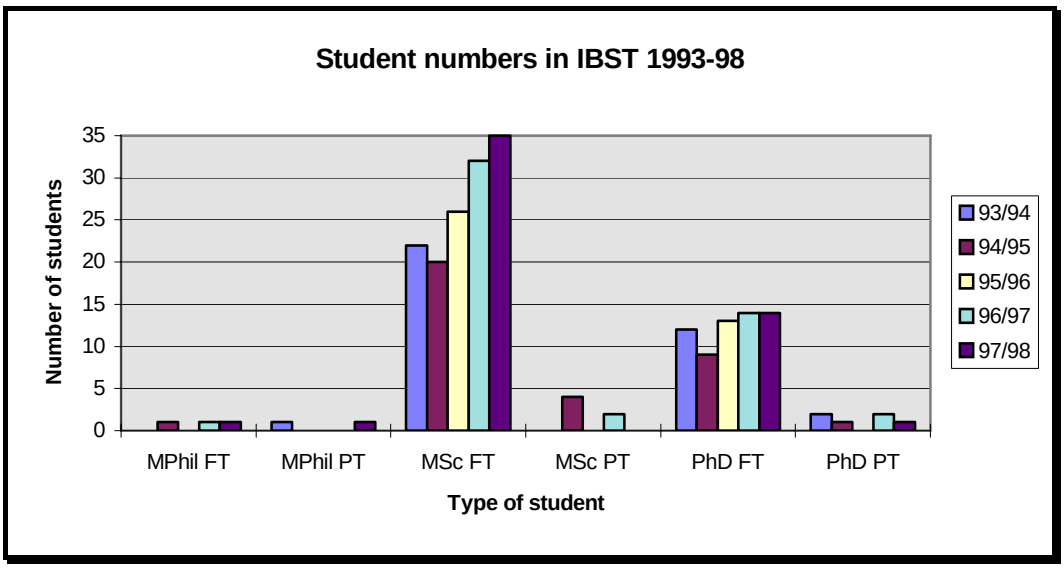
Throughout both years usage patterns clearly followed what was already known about existing patterns of behaviour, that is, periods of high demand in May (when many literature searches are undertaken), August (when references require checking prior to thesis submission, as well as belated literature searching) and October (when academic staff are able to undertake research before onset of teaching activities).

In the first half of Year 3 figures were actually higher than the first BIODOC year, implying that the first two years in fact did not display a standard pattern. The figures for the whole of Year 3, however, show a decrease on Year 1 but an increase on Year 2.

One very interesting comparison between Years 2 and 3 is the change in demand from MSc students.

The MSc programme has been an increasingly important part of the IBST's activity, as Figure 2 shows, numbers have increased from 20 in 1994/95, to 35 in the current year (1997/98). The first year of BIODOC coincided with the beginning of the increase in Msc numbers, however, these numbers have been maintained, so any fluctuation in request levels cannot be attributed solely to this increase.

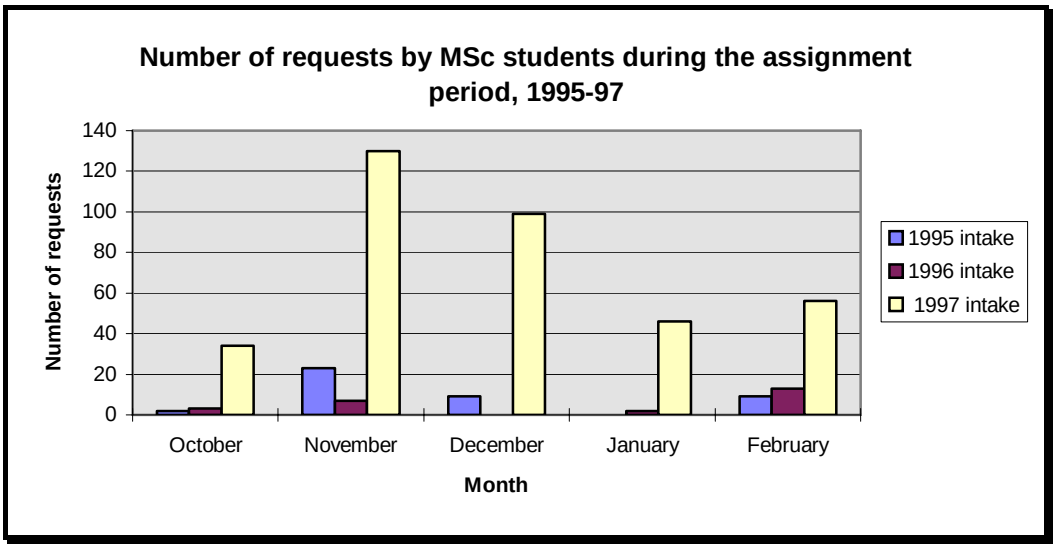
Figure 2




The project team have always been confident that the speed of delivery achieved by the BIODOC service has been adequate to meet the needs of MSc students studying for their thesis. Feedback received from the students in Years 1 and 2 raised some doubt as to whether the service could provide the necessary support for the students during the taught phase of the course in which students have to complete a series of two-week assignments. The restricted time-scale given for the assignments made it almost impossible for students to plan and carry out literature searches and to obtain the necessary articles through BIODOC. Instead students were forced to fall back on older material already held in the library.

For the 1997/98 intake of students, the course team decided to make changes to the way assignments were set, in particular, the length of time allowed to complete assignments was increased from two weeks to four weeks. Figure 3 below shows the increased opportunity provided for MSc students to request supporting material during the assignment period (October to February).

Figure 3



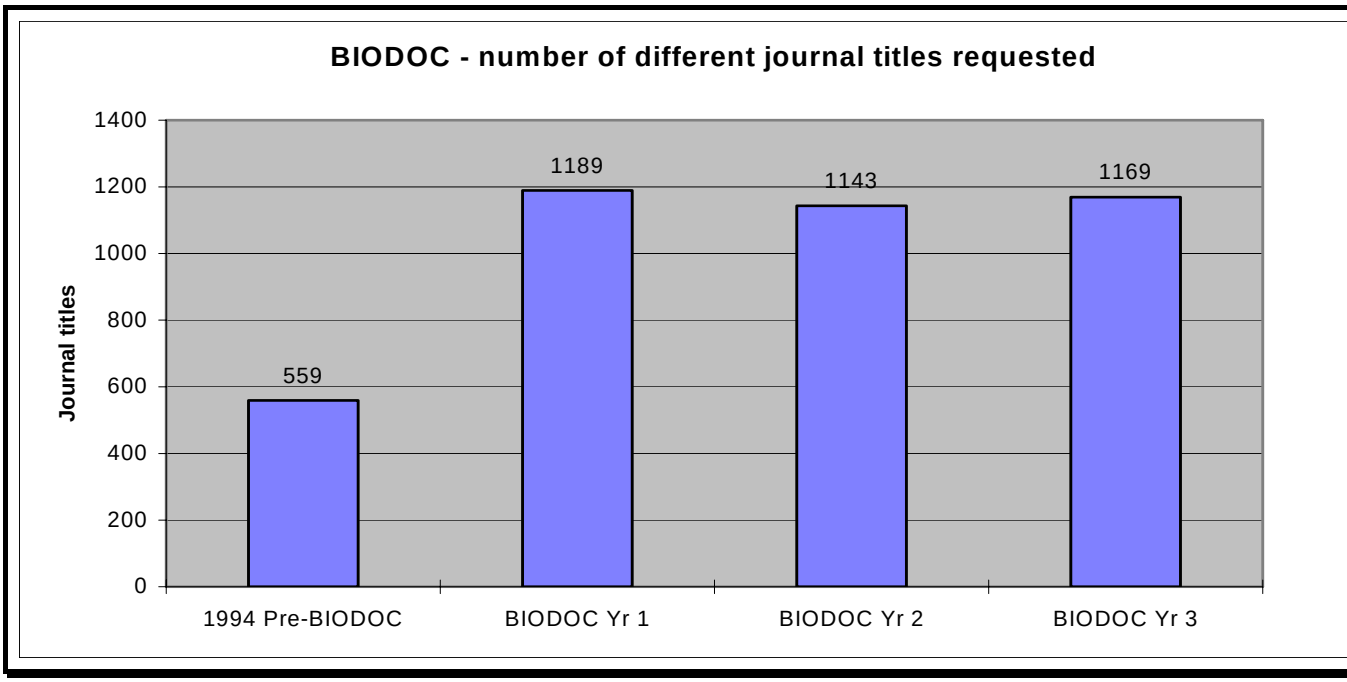

The main conclusion on usage emerging from the analysis of all three years of the project is to confirm the difficulty of predicting demand in the context of a 'supply on demand' service. Usage of the BIODOC service has been extremely volatile. The fact that the number of requests made during the first six months of Year 3 exceeded even the high demand shown in Year 1 for the same period, casts some doubt on earlier conclusions that demand had been artificially stimulated in the first year by making it extremely easy to request documents. This volatility in usage and the consequent difficulty in predicting and therefore budgeting for

demand has to be an important consideration for any library service considering the adoption of greater 'just-in-time' information provision.

***Widening access***

A key outcome of the project is the consistent evidence of the provision of access to a far wider range of sources than utilised in the pre-BIODOC service. Figure 4 shows that in BIODOC Year 1 there was a dramatic increase in the number of different journal titles requested (from 556 to 1189) and the Year 2 figure of 1143 is, if anything, more impressive given the smaller total number of requests (4849 requests in Year 1, 3139 requests in Year 2). Year 3 title counts are very similar to the two preceding years at 1169, while the number of requests rose to 4102.

Figure 4



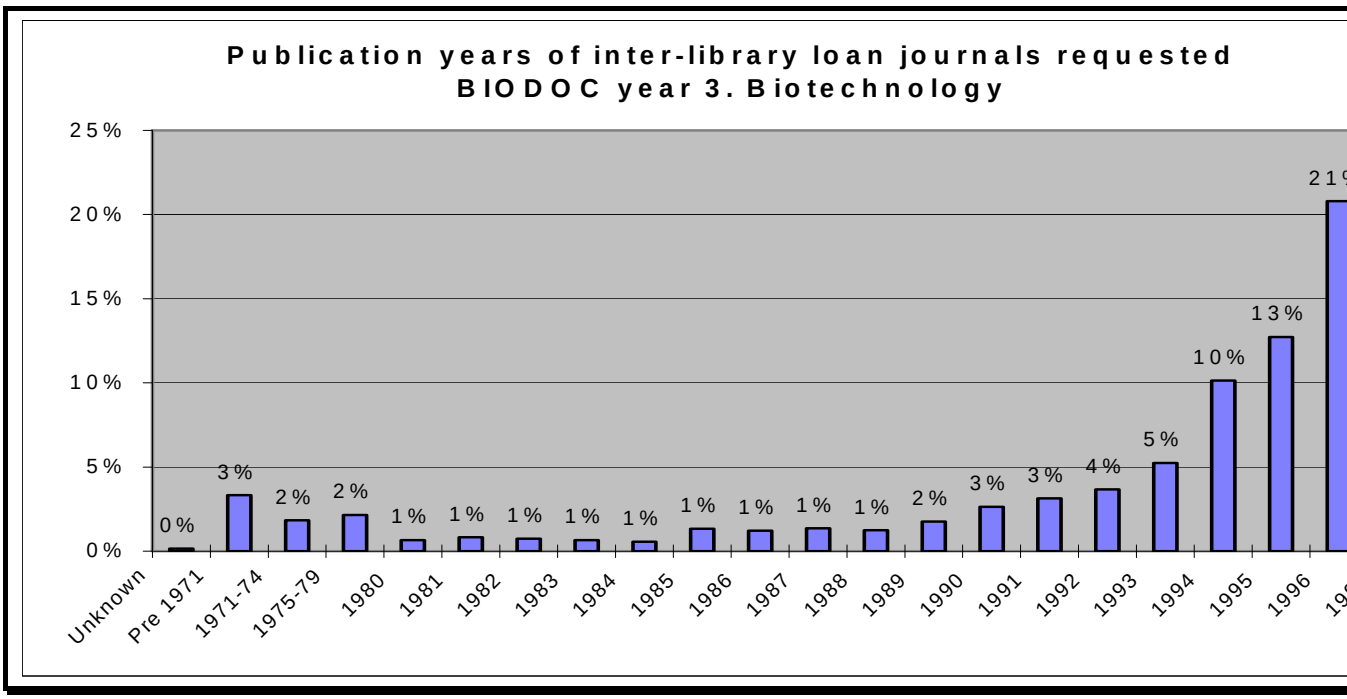

These figures reinforce the project team's belief that the in-house journals collection for IBST, (consisting of only 17 titles in 1994), which was replaced by the BIODOC service, was totally inadequate to support such a multi-disciplinary subject area. The number and range of titles requested each year indicates the difficulty that a library faces in trying to define a 'core' collection and questions the utility of trying to maintain this in the face of the specialist and wide ranging interests which are encompassed by such a multi-faceted field of research.

***Currency of items requested***

There is clear and consistent evidence of a second major change in user behaviour. Prior to BIODOC the majority of requests for material were for items published in the year preceding the current year. However, BIODOC Years 1 to 3 consistently show that the majority of

requests are now for items published in the current year. It has been assumed that the reason for such a clear change is the immediate access to material on publication provided by the UnCover Reveal current contents service. In summary, BIODOC users appear not only to be reading more widely, but are also drawing upon more up-to-date published research. Evidence of this is shown in Figures 5-7 for the BIODOC years and Figures 8 and 9 for the two years prior to the start of the project.

Figure 5


Publication years of inter-library loan journals requested
BIODOC year 3. Biotechnology
25%
20%
15%
10%
5%
0%
0%
3%
2%
2%
1%
1%
1%
1%
1%
1%
1%
1%
1%
2%
3%
3%
4%
5%
10%
13%
21%
Unknown
Pre 1971
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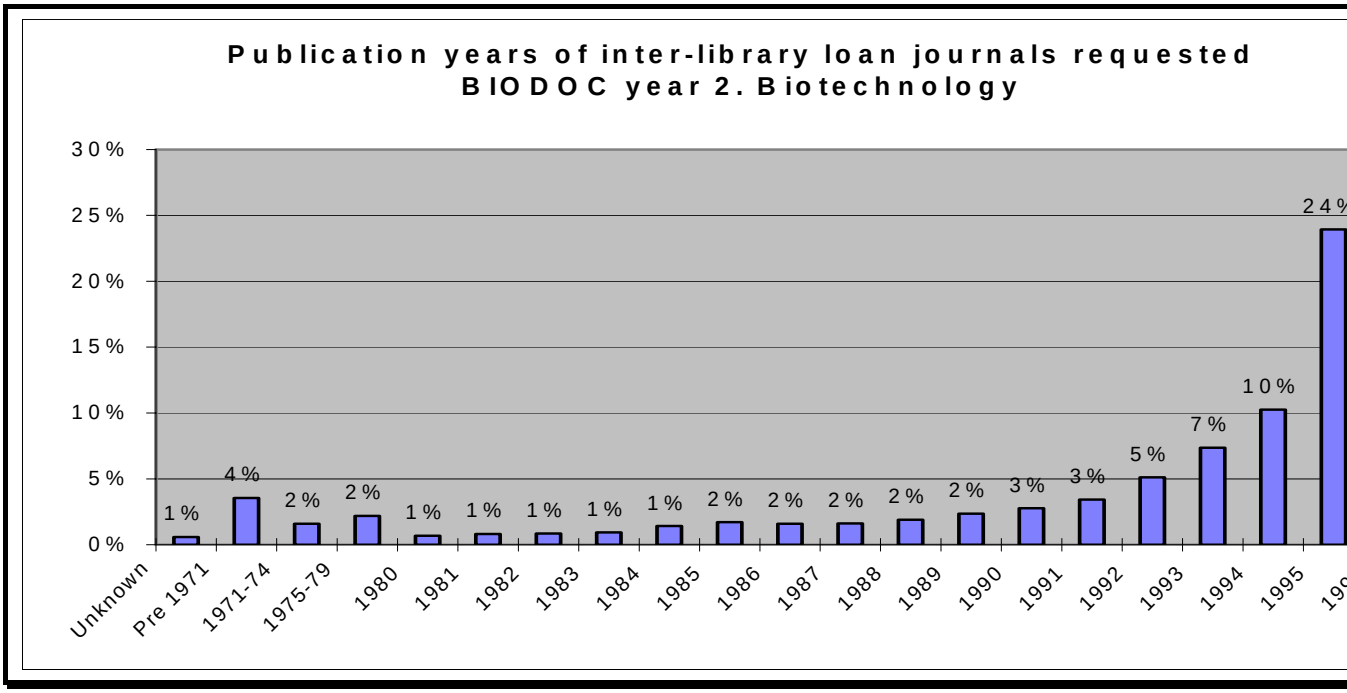
1996

Figure 6


Publication years of inter-library loan journals requested
BIODOC year 2. Biotechnology
30%
25%
20%
15%
10%
5%
0%
1%
4%
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1995

Figure 7

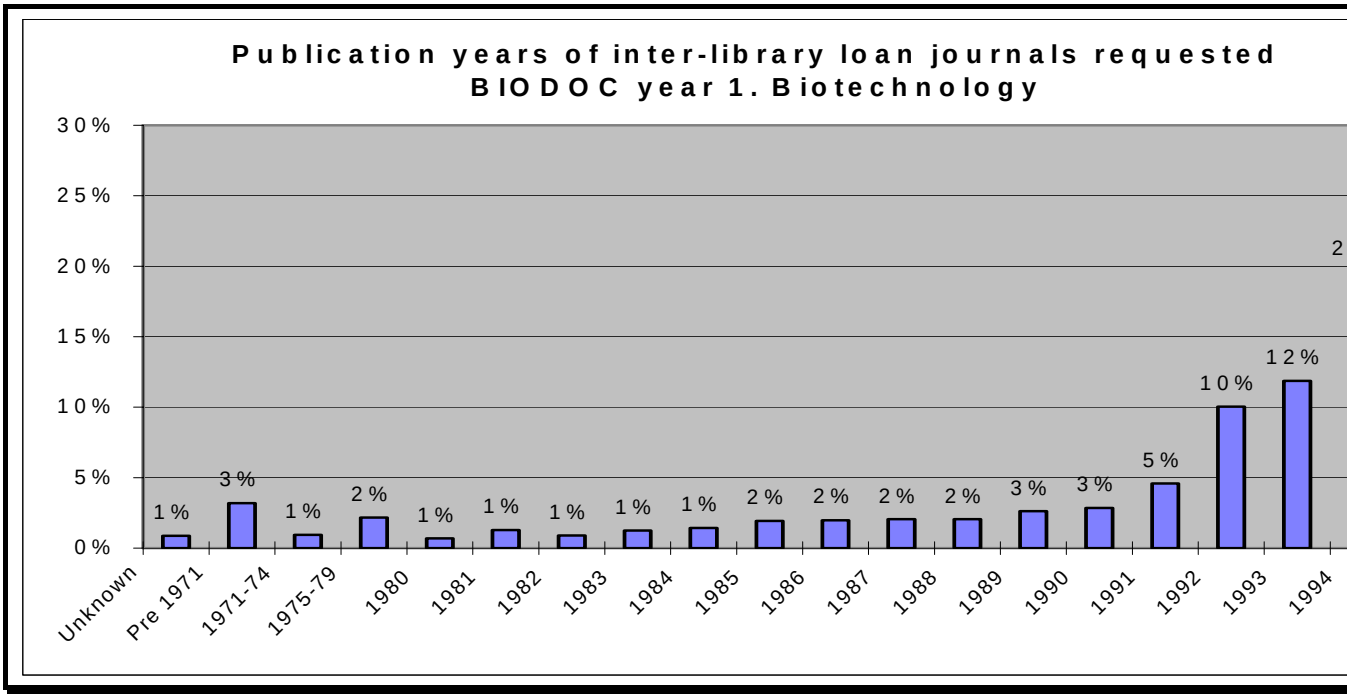



Figure 8

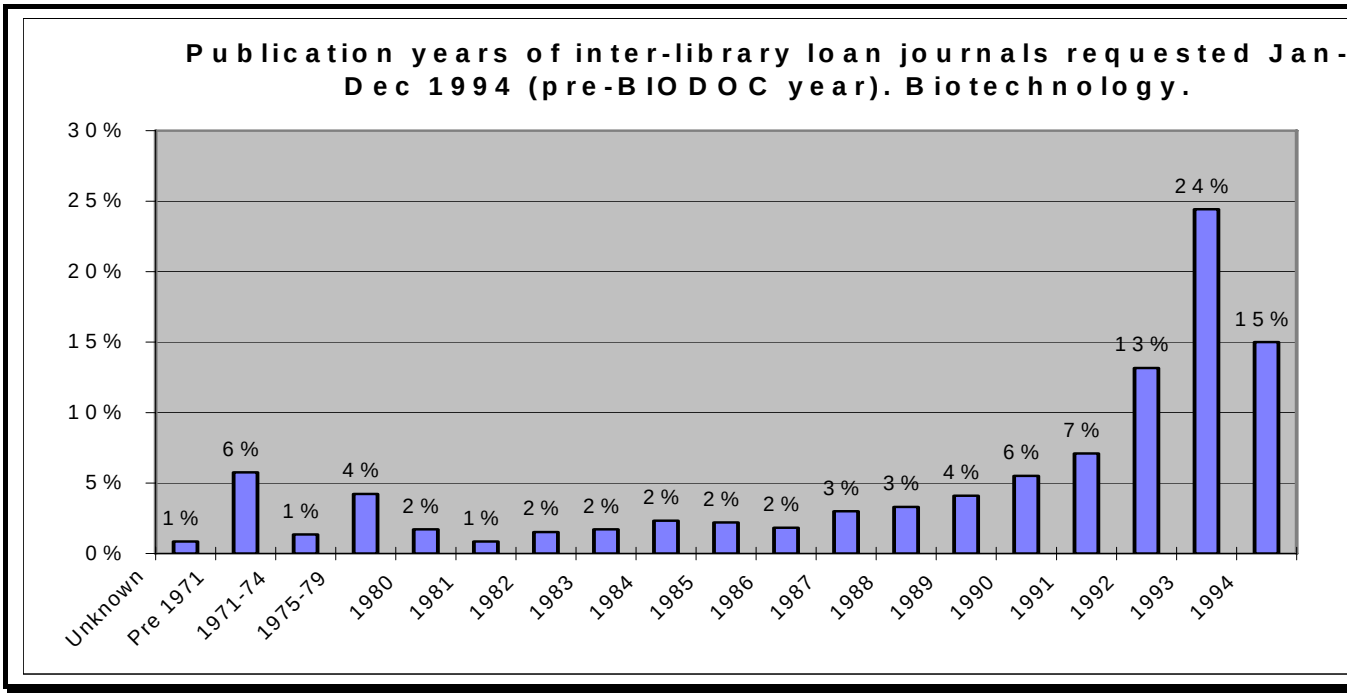
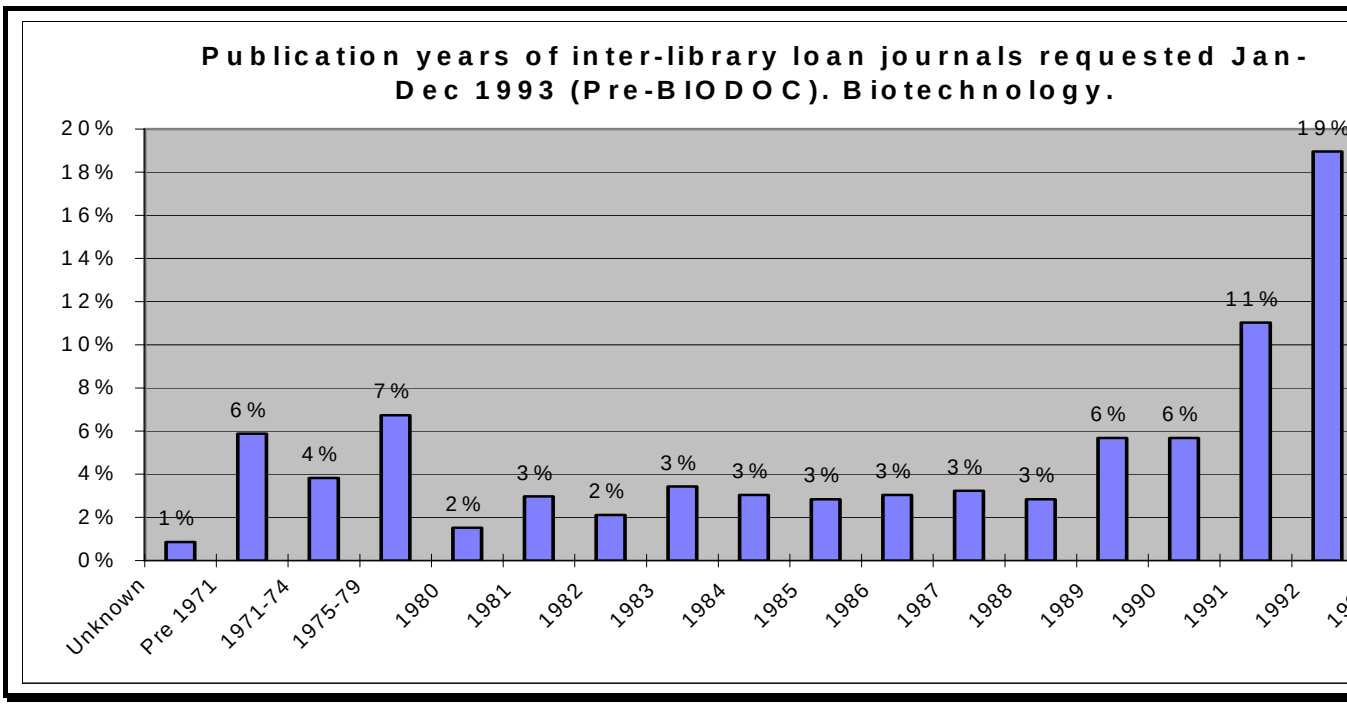


Figure 9


Publication years of inter-library loan journals requested Jan-Dec 1993 (Pre-BIODOC). Biotechnology.
20%
18%
16%
14%
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10%
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4%
2%
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1%
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4%
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1992

The BIODOC service therefore does seem to have induced two very significant changes in user behaviour in that Biotechnology staff and students are selecting articles from a much wider range of titles and are focusing their attention on the most current material. The project team were keen to find out if these two changes had had a beneficial impact on the standard of work in the Centre. Two impact studies were conducted to try to provide an answer to this central question.

## Aims of the first impact analysis study

The aim of the first impact analysis study was twofold. Firstly to discover how useful articles obtained via BIODOC were to individual users' research - and by implication, to the research goals of the University as a whole. Secondly, to ascertain whether the lack of abstracts on the UnCover database had led to requests for articles which have subsequently been found to be of little relevance once they have been ordered and inspected. These aims were achieved by asking users to judge how individual journal articles they had requested had contributed to their research.

### *Impact study methodology*

A structured questionnaire was employed. Questions were asked verbally and answers were marked on a response sheet. Each interview typically lasted 5 minutes - the interview schedule was purposely designed to keep the length of the interviews as short as possible. Although 11 individuals were interviewed, 31 interviews were carried out. This discrepancy arose because the interviews were based on *articles requested* rather than individual users. This was a small scale study but we believe that the results are indicative of general trends.

The sample for the study was obtained by identifying the ten most frequent users of the service. Each time an article arrived for one of these individuals, interlibrary loans staff photocopied the first page of the article. After two weeks requesters were contacted and an interview arranged. At the beginning of each interview the requester was shown the photocopy of the first page of the article in order to give them the chance to read the abstract and remember the details of the article in question.

The questionnaire consisted of 7 questions which were designed firstly to discover why the article had been requested, where the details of the item were found, and whether the article had been read. Secondly, to ascertain whether the expectations of the document were fulfilled and what impact it had on learning and research goals. General questions to find out status (PhD, MSc, staff) were included in order to aid with interpretation of results.

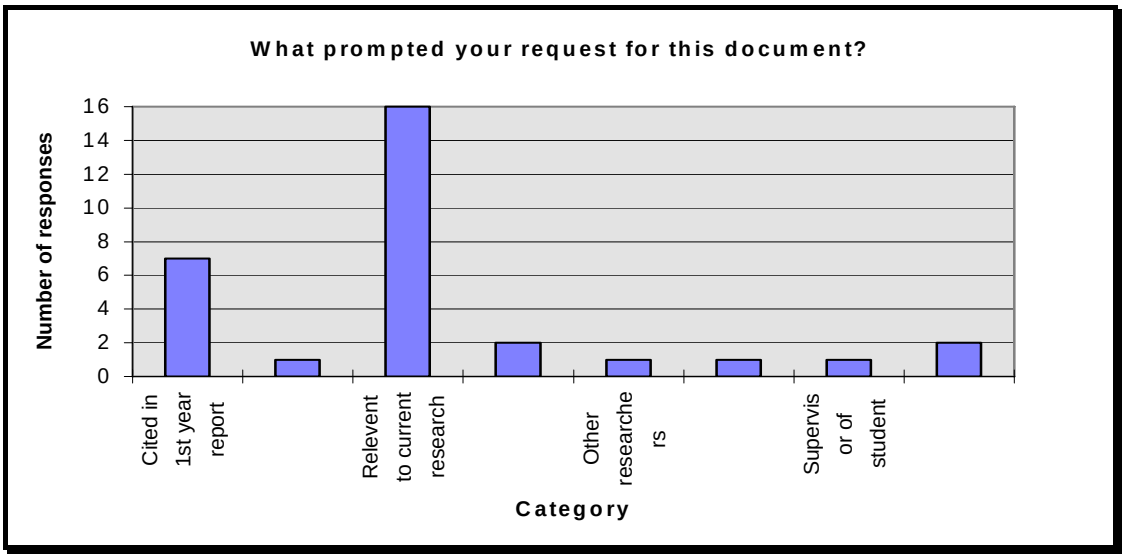
***Impact study results and discussion***

Responses to the first question 'what prompted your request for this document?' did not produce any surprises (see Figure 10) - 51% of the articles were requested as they were deemed to be of direct relevance to their research project. This is supported by the fact that most respondents proceeded to give a detailed explanation to show how the information contained within the article fitted into their research.

Seven articles had been requested by someone who had referred to them in their 1st year PhD report, but had not read them - they felt that they really ought to read them before submitting the final version of their PhD. Another interviewee managed a ProCite database for her project group and had requested the articles for this purpose rather than personal interest.

Other reasons for requesting were because articles may prove useful for future research and because the item had been cited in another paper.

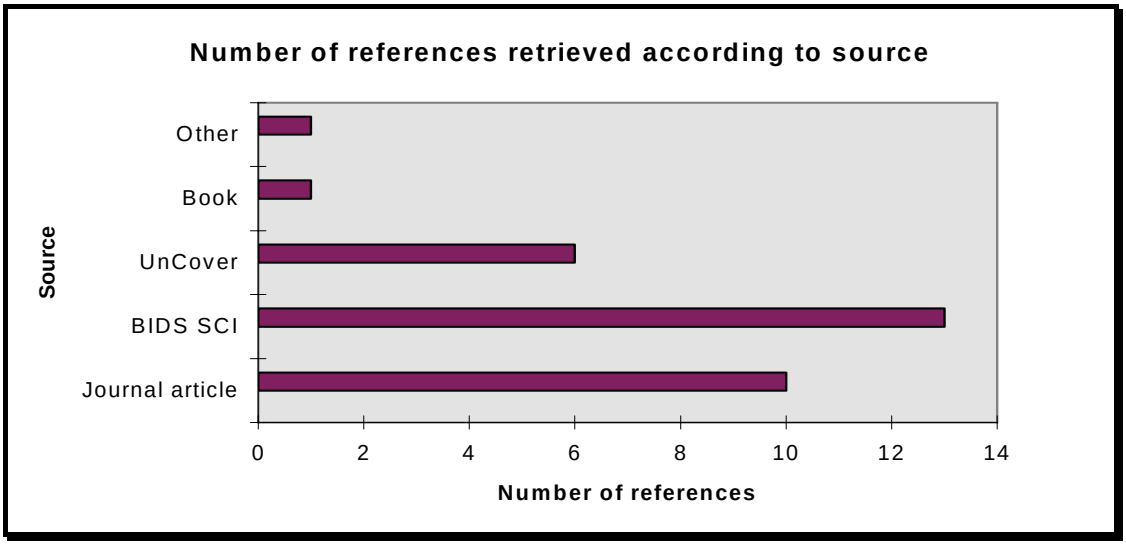
Figure 10




Interviewees were then asked where they obtained details of the article in question. To library staff at Cranfield the responses were not surprising as the most popular source was a BIDS search - 42% of articles were identified in this way. Staff were well aware that most database searching by IBST students and staff is performed on the BIDS implementation of the ISI Science Citation Index - in 1997, 30% of BIDS accesses have been made by IBST students and staff, an average of 222 a month. These figures are more significant when it is considered that IBST is the smallest school of the University.

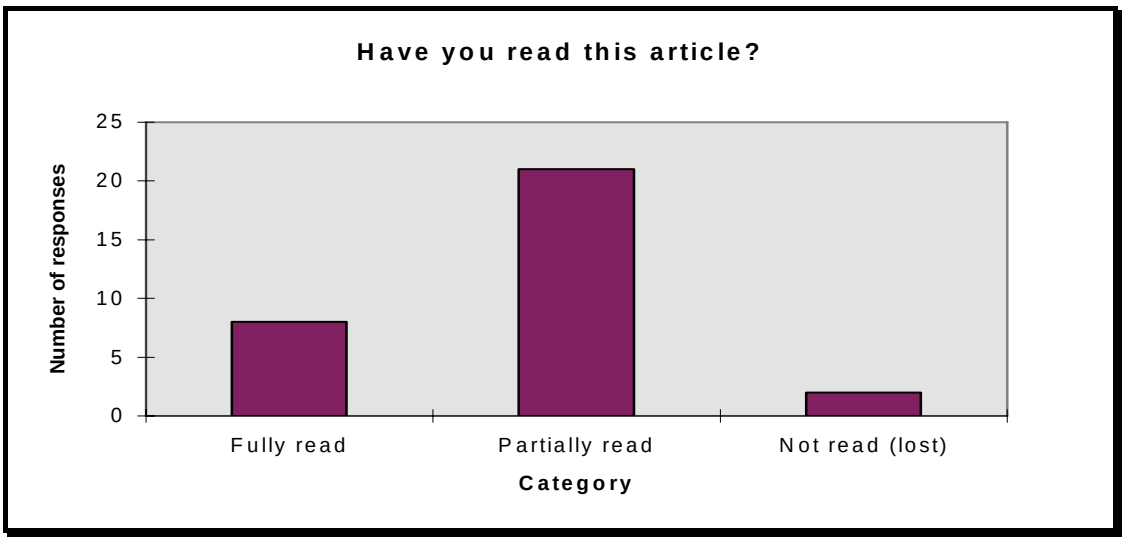
Figure 11 shows that 10 (32%) articles had been requested because they had been cited in other papers, again this holds no surprises as it has long been acknowledged that this is a primary method of information gathering. Six of the articles had been discovered by notification from an UnCover profile.

Figure 11:



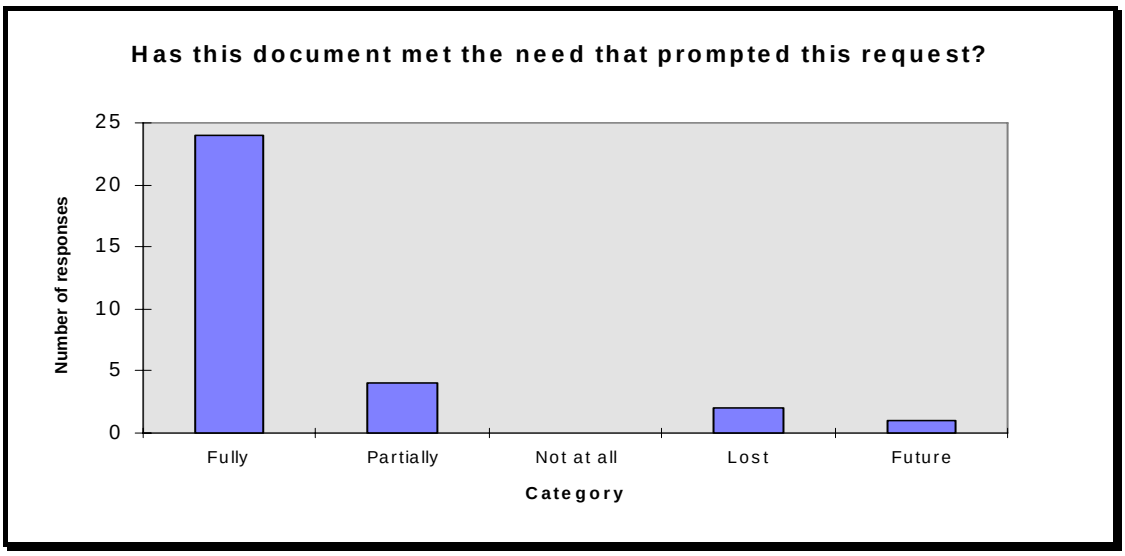

Responses to the third question on the schedule, 'Have you read this article?', were very interesting as they demonstrated that on the whole, researchers do not tend to read an article all the way through - only 8 (25%) of the articles had been fully read, whilst 21 (70%) had been partially read (see Figure 12). Individuals tend to read the abstract first to decide whether they need to read the whole article. They then either decide that they can glean as much information as they need from the abstract, or if not, they may read the conclusion and then skim through the main body of the text. This suggests that the inclusion of abstracts on UnCover would certainly help researchers decide whether they need to obtain an article. Two papers had not been read as they had been lost by the interviewees.

Figure 12




The next question asked was 'did the contents of the document meet the need that prompted the request?'. Figure 13 shows that 24 articles (77%) fully met the need for which they were requested, only 4 articles partially met their need. None of the articles were useless, whilst 1 was judged to be of use for future research. To support the validity of these results, it is worth mentioning that many of the interviewees were able to provide a very specific explanation to substantiate their answer.

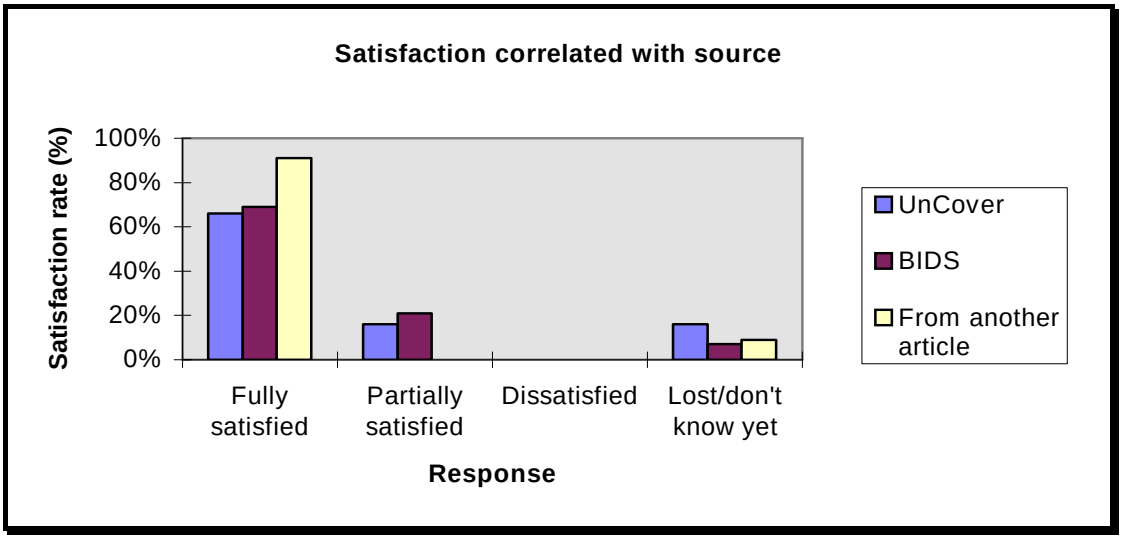
Figure 13




When satisfaction is correlated with the source where the document was discovered, it is clear that there is no great difference in satisfaction rate between UnCover and BIDS, suggesting that the lack of abstracts on UnCover has not caused too great a problem for researchers attempting to judge the relevance of an article from the title information alone. It is likely that this is due specifically to the subject matter. Titles of articles in say, business and management would not be as indicative of their subject content as those in the hard sciences. Details are illustrated in Figure 14.

Another interesting factor is that satisfaction rates for the 'other' category, (primarily references from other journal articles) are much higher. The most probable explanation for this is that if an article is interesting, the articles it cites will be related in subject matter and possibly just as useful as the original article. This is certainly a justification for emphasising the importance of citation searching to researchers.

Figure 14




Interviewees were then asked about the impact of the article on their research. They were asked:

- did this article refresh your memory or details or facts?

- did it provide you with some new knowledge?

- did it substantiate a hypothesis?

- was it irrelevant but useful?

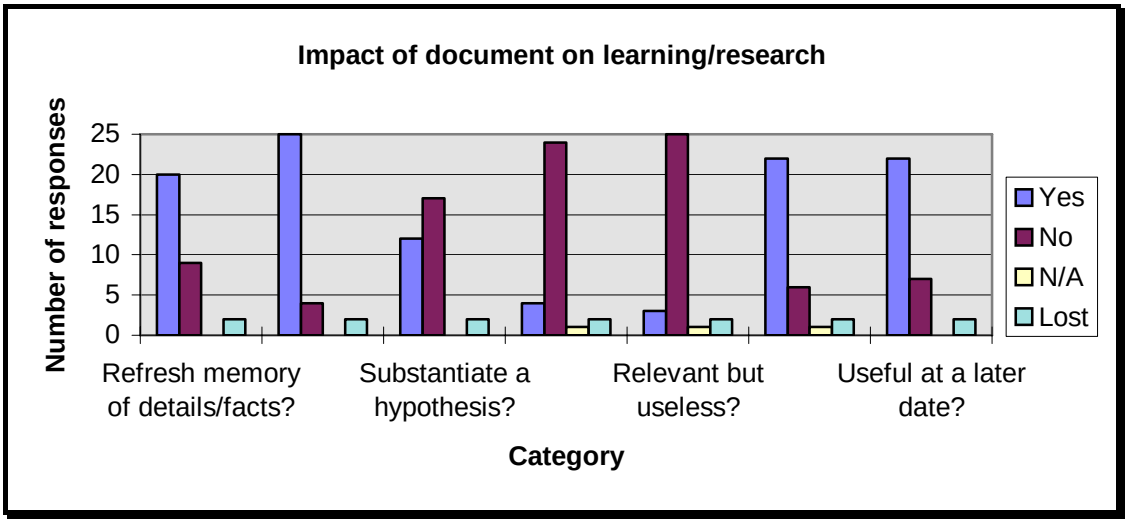
- was it relevant but useless?

- was it relevant and useful?

- will it be useful at a later date?

The results were very encouraging (Figure 15) as 80% of the articles provided the reader with some new knowledge, whilst twenty reinforced known details or facts. Twelve articles substantiated a hypothesis. Although seventeen did not, they may not have been ordered for this purpose. Twenty two articles were relevant and useful whilst twenty two will be useful at a later date - this could be because research is ongoing, or perhaps because the articles had been skim read firstly and will be fully read at a later date.

Figure 15




The interviewees were asked whether they believed that access to electronic databases would affect their demand for items not held in the library. Seven individuals felt that it would increase their demand, whilst 4 believed that as they already had access to information about articles not present in the library, their demand would stay the same. Not surprisingly, none of the interviewees felt that their demand would decrease.

***Impact study conclusions***

The most encouraging result to come out of this study was that 77% of the articles were deemed to have fully met the need that prompted the request for the item, whilst none of the respondents judged an article to have been totally useless. Other interesting (although expected) results were obtained when satisfaction rates were correlated with the source of the article (where the article details were discovered). The source which led to the most useful and interesting articles was a citation from another journal article (91% of articles discovered in this way were deemed to meet expectations).

Another important aspect which is very difficult to measure is the extent to which the readers' expectations of the relevance, interest and potential usefulness of the article influence their judgement about these factors once they have read it.

The timing of this first impact study meant that it did not take account of the increase in MSc usage during the course assignment period in Year 3 which is described above. A new impact study to measure this will be undertaken with the 1998/99 intake of MSc students.

Evidence from the most recent feedback meeting held in February of this year suggests that not all of this increased usage by MScs is as helpful as the project team would like. Comments received from MSc students suggest that some are experiencing difficulty devising effective search strategies for assignment topics. As a result some are having to place follow-up batches of requests as their grasp of the literature searching process and the technology improves.

This seems to reinforce evidence derived from observation of student database usage at Cranfield that the information skills, particularly of new students, are still inadequate. The implications of this are especially worrying in a post-graduate environment such as Cranfield, but should be of concern to academic libraries generally as they move towards greater reliance on remote access to electronic based resources.

**The second impact study**

The second impact study compared MSc marks attained by pre-BIODOC and BIODOC users. In particular it looked for a possible correlation between a student's final mark, the number of

references cited in his/her thesis, and the number of interlibrary loans requested. The results showed that the student with the highest score in BIODOC Year 1 also cited the most references in their thesis. However, the student with the second highest score cited the fewest number of references. Looking through the rest of the marks it became clear that, owing to the large number of potential variables, there was no such correlation.

## Library considerations

The analysis of possible library management implications includes the comparison of costs between the original service model and BIODOC; evidence on support of buy or borrow decisions; a review of direct benefits; and a review of indirect benefits.

### *Cost analysis*

An attempt has been made to provide cost comparisons between the original subscription based service model and BIODOC. These are shown in Table 1 and Figure 16. The cost of the original model is based on actual journal subscription prices from Blackwells, which show a 9.6% rise from 1994 to BIODOC year 1, followed by a 20.7% rise between BIODOC Years 1 and 2, and a 6.6% rise between Years 2 and 3. This small increase of 6.6% is because one title previously taken by the Library is no longer published.

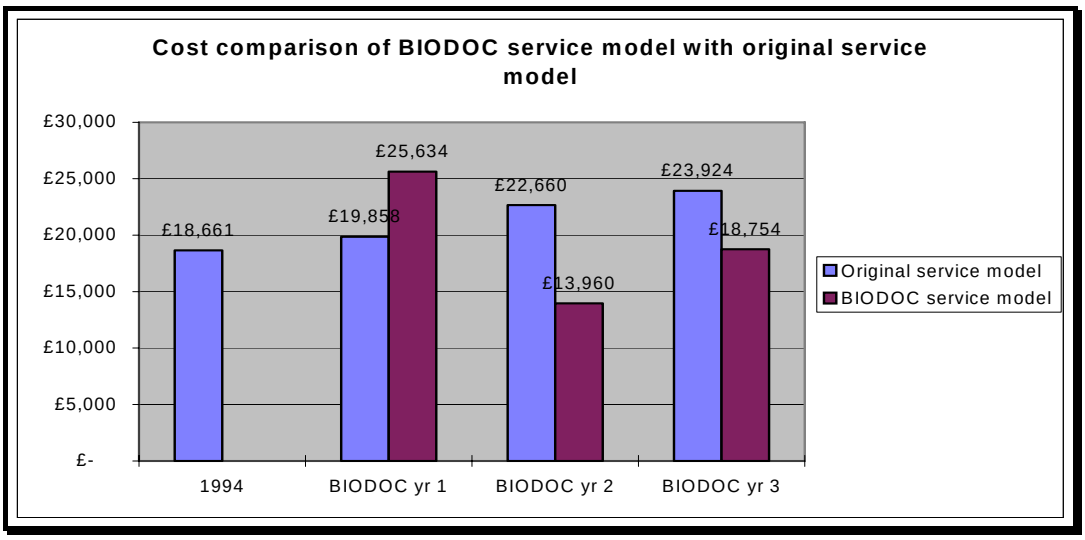
Interlibrary loan costs are included and assume a level demand but costs are inflated in line with rises in the cost of British Library Document Supply Centre vouchers over the four years shown. It also assumes that during these years there would have been no further reduction in the number of biotechnology journal subscriptions (apart from those which ceased

publication). The figures do not include overhead costs for staffing as the project has been run with no increase in personnel.

Table 1

| *Original Service Model* | **1994** | **BIODOC Yr.1** | **BIODOC Yr.2** | **BIODOC Yr.3** |
|---|---|---|---|---|
| **Journal subscriptions** | £10729 | £11760 | £14192 | £15123 |
| **Interlibrary loan requests** | £ 7932 | £ 8098 | £ 8468 | £ 8801 |
| **Total costs** | £18661 | £19858 | £22660 | £23924 |
| | | | | |
| ***BIODOC Service Model*** | | | | |
| | | | | |
| **Requests** | | £25174 | £13085 | £16548 |
| **UnCover Site Licence** | | £460 | £875 | £ 2206 |
| **Total costs** | | £25634 | £13960 | £18754 |

Figure 16



The huge inflationary increase in price between Years 2 and 3 in the original service model is one factor that accounts for the large difference in total costs between BIODOC Years 1 and 2. This clearly illustrates the economic efficacy of the BIODOC approach.

The significant reduction in costs in BIODOC Year 2 is the result of a number of factors. Firstly, there was a substantial reduction in the total number of requests (35%) from Year 1. Secondly, BIODOC Year 1 included use of premium document supply services such as UnCover and BIDS whereas BIODOC Years 2 and 3 saw almost no use of these premium services. One reason for this was that the department agreed to share the cost of such premium services. The implication of their low use was that there was general satisfaction with normal delivery speeds. In addition, there was much heavier reliance on other document suppliers such as Delft and RSC, both of which charge less than the BLDSC, whilst Delft prices benefited from a favourable currency exchange rate that year.

As a result of these factors, the average cost of a BIODOC request in Year 2 was £4.20 compared with £5.30 in Year 1 and £4.57 in Year 3.

***Buy or borrow decisions***

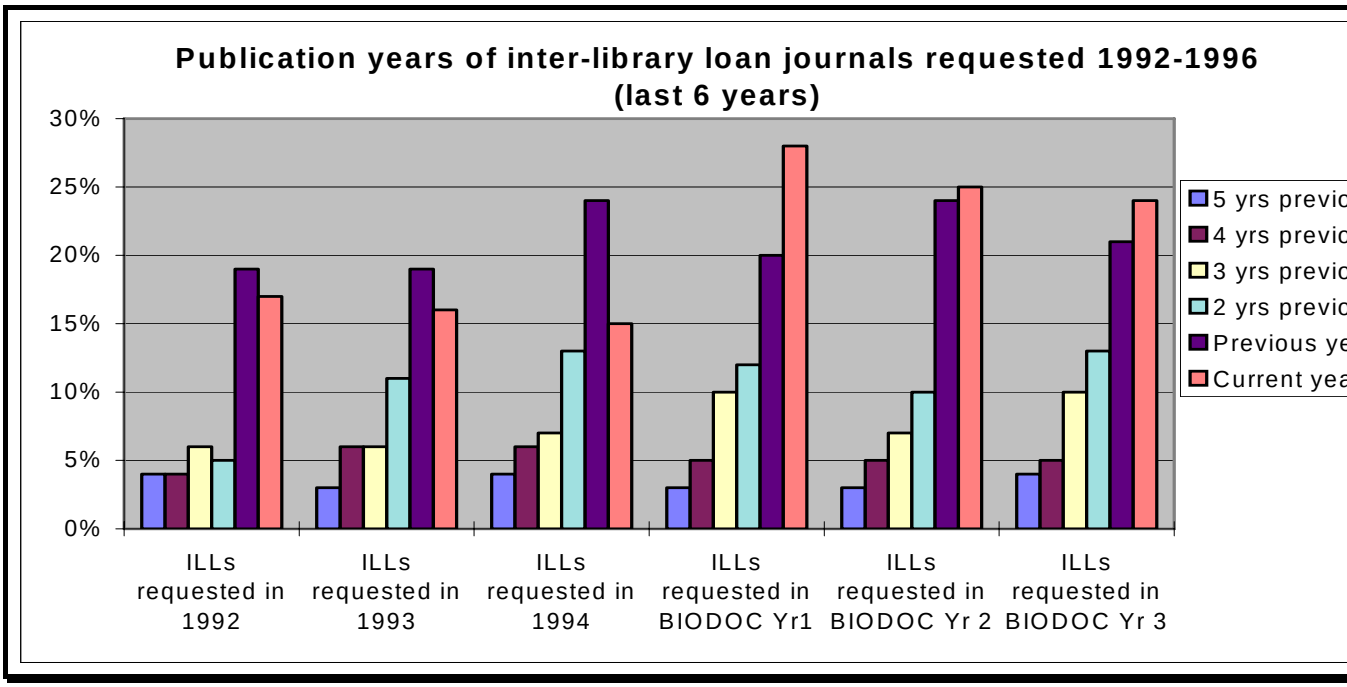
It is clear from comparisons of the list of journal titles cancelled at the start of the project along with the price of the subscription, the equivalent number of interlibrary loan requests which could be made for the price of the subscription, the number of interlibrary loan requests actually made and the cost of these requests, that it would not have been economical to subscribe to any of the cancelled titles in any of the three years of the project.

A summary of the cost savings on the cancelled journals to the end of Year 3 shows that the number of requests for the cancelled items as a percentage of the total increased from 3.4% in Year 1 to 7.0% in Year 2. At the end of Year 2 it was considered reasonable to suggest that

this percentage would continue to increase as the effect of no longer stocking the most recent issues began to cumulate, with a levelling off after a certain number of years. The slight increase from 7.0% to 7.3% in Year 3 shows that this levelling off may already have started.

Figure 17 shows that over the last 6 years an average of over 70% of requests (77% in 1997 - BIODOC Year 3) are for articles published within 6 years. This cost has to be balanced against inflationary rises in the price of the journal subscription.

Figure 17




A similar cost comparison can be made of the most frequently requested titles over the three years of BIODOC. Only one title, Applied & Environmental Microbiology, would have been more economical to subscribe to.

This may imply shortcomings in the journal selection process for IBST prior to BIODOC where a list of general titles was taken which were in fact of little use to anyone, but it also confirms how difficult it was to select a small number of journals to satisfy the diversity of work undertaken in IBST. The concept of 'core title' is being examined in another project entitled MANDOC which is currently being undertaken within the Library. This is specifically in the area of business and management. Preliminary results support the findings of BIODOC, particularly in terms of the sheer range of titles that only have a small amount of use.

Changes in the composition of the list of frequently requested titles over two years illustrate the extent of changing research interests from one year to the next. A prime example is the appearance of *Cancer Research* in Year 2, the demand for which was the result of the arrival of two new PhD students. Similarly, Year 3 provided another example of this when the *Journal of Chromatography* appeared as the fifth most requested journal, having previously not appeared in the list of top titles, while *Cancer Research* dropped out of the top list. The pre-BIODOC service provision of a limited range of in-house journal titles and a restricted interlibrary loan entitlement, would have made it almost impossible for the library to have offered effective information support for new activities.

**BIODOC Project - Summary of direct benefits**

In terms of the information support provided to staff and students in IBST, the project has enabled the library to offer a number of benefits: access to articles supplied from a wider range of titles, enhanced current awareness and document supply for the most recent published articles, and greater responsiveness to changing research interests.

Although it does seem that in providing these, BIODOC has induced changes in information seeking behaviour and that we can be reasonably confident that the majority of documents supplied are relevant to IBST's research interest, we cannot be absolutely sure as yet that these behavioural changes are having a beneficial effect on the overall quality of the teaching and research activity. However, the unanimous view expressed by staff and students at all the project feedback meetings is that BIODOC is infinitely preferable to the service that preceded it and no-one is advocating a reinstatement of the print subscriptions.

**BIODOC Project - Summary of indirect benefits**

Clearly, the impact on staff and students in IBST is the primary concern of the project, but there have been a number of indirect benefits to further reinforce the value of the project to the library. These include greater knowledge of user needs/behaviour; closer liaison links generally with IBST, improved morale amongst those members of the library staff involved with the project, proof of a model for future cross team collaboration, heightened awareness and experience of access versus holdings issues, and the beginning of direct input into the course structure by the Library service.

As to whether the BIODOC methodology is transferable to other subject areas, the case is unproven. Clearly the principle is transferable [4, 5]. The Library does now have another project team (named AJILE to signify the agility of the service to address new areas) studying which, if any, of these lessons can be applied more generally across the campus or university. The Library has also requested funding for next academic year to look at the related area of electronic journals, the extra funds being earmarked for running both a paper-based and an electronic service side-by-side for the same journals.

## Conclusion

What began as an internally funded research project has now developed and matured into a full information service. The library believes that although costs are still volatile in terms of the number of requests made, there are considerable benefits to the staff and students involved in BIODOC. It is hoped that future enhancements to the service will include integration of access to electronic journals and the electronic delivery of material to the end-user.

Illustrating the efficacy and acceptance of the service in its current form, IBST confirms in its Information Systems Strategy document for 1998 that 'the service...has shown that the replacement of hard-copy holdings by accessible digital information is an effective method of addressing the information needs of the [department]'.

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# BIODOC - the transition from research project to fully fledged service

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