

COMMISSION OF THE EUROPEAN COMMUNITIES

information management

**The impact on user charges
of the extended use
of on-line information services**

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(Final Report)

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Prepared for
International Council of Scientific Unions
Abstracting Board (ICSU AB) in fulfilment
of CEC study under contract

Published by the
COMMISSION OF THE EUROPEAN COMMUNITIES
Directorate-General
'Scientific and Technical Information and Information Management'
Bâtiment Jean Monnet
LUXEMBOURG

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Cataloguing data can be found at the end of this volume

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Printed in Belgium

ISBN 92-825-1009-3

Catalogue number: CD-NV-79-004-EN-C

SYNOPSIS

This study aims to assess the past and future impact of online retrieval on the revenues of bibliographic database producers, and the implications for future user charges.

An analysis of previous research, of recent revenue patterns, and of expert opinion, leads to the conclusion that subscriptions of printed abstracts journals and indexes have not so far been seriously reduced by the growth of online retrieval. The analysis also suggests great uncertainty, however, about the growth and impact of online bibliographic searching over the period 1978-85.

A scenario-building model is developed to help database producers explore their own assumptions about the future, and illustrated using a fictional case study. The case study leads to the conclusion that online royalties are low in relation to the price of printed products, and are likely to be increased (in relative terms) by a factor of 2-2½ times, over the period 1978-83. The report argues that real-life database producers will tend to come to qualitatively similar conclusions to those in the case study. One implication is that there is likely to be some easing of the rate of price increases for printed products.

Proposals are made for the routine collection of further facts, so that a better assessment can be made by 1981.

The study was carried out between December 1977 and September 1978, on behalf of the Commission of the European Communities.

FOREWORD

This project was undertaken by the author, acting as a consultant to the International Council of Scientific Unions Abstracting Board (ICSU AB); ICSU AB, in turn, was operating under a study contract for the Commission of the European Communities. Within ICSU AB, the project was controlled by a special steering group comprising:

Ron Smith, Biosis (Chairman)
Derek Barlow, Inspec
Lois Granick, Psychological Abstracts
Tony Kent, UKCIS
Jeanne Poyen, ICSU AB
Barrie Stern, Excerpta Medica.

The author's thanks are due to the members of this group, as well as to the many other people who have contributed to the study at a personal level, or by responding to awkward questionnaires which came through the post. Particular thanks are due to Derek Barlow, who first conceived the "what-if?" model, argued for its inclusion in the study, and provided computer facilities for its realisation.

Further thanks are due to the other members of the project team at the London Business School: Robert Cleverdon (survey analysis), Frances Oldland and Frances Huckle (analysis of previous research), James Kowalczyk and Ross Luke (computer programming).

While the views expressed here are the author's, they have been endorsed by the ICSU AB steering group. They do not necessarily reflect the views of all ICSU AB member services, however.

Patrick Barwise
London Business School
20th October 1978

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MANAGEMENT SUMMARY

The Nature of the Problem

The issue addressed by this report is as follows.

Online retrieval of bibliographic data is expected to grow fast over the next few years. At the same time, the use of printed abstracts journals and indexes, which contain the same bibliographic data, may decrease. But the producers of the data - the abstracting and indexing services - still derive almost all their revenue from printed products. How, then, will they revise their user charges to adapt to the new conditions? What is going to happen over the next few years to online bibliographic data base royalties, and to the prices of abstracts journals and indexes?

The report would ideally conclude with a quantitative forecast of user charges, including a specified range of uncertainty. In practice, this would be inappropriate to the nature of the problem, for three reasons:

- (a) The range of uncertainty would have to be very wide indeed, because it is still quite unclear what balance will eventually emerge between online retrieval and printed products. Specifically, there is much uncertainty about the future growth of online retrieval, and even more about its impact on the demand for printed products. Some of this uncertainty could be reduced by short-term empirical research, but much of it is a matter of having to wait for 2-3 more years.
- (b) The patterns of cost and revenue show great variation between data base producers. Online retrieval may increase this variation. So, even with perfect knowledge about the future, one would have to allow for a wide range in the patterns of user charges for different data base producers.
- (c) The third reason is more fundamental. Even with perfect knowledge of the future market, and of costs, and even if all data base producers were identical, it would still be impossible to give an objective forecast of user charges. This is because the costs of data base production are mostly fixed and indirect: the costs of disseminating the data, in the form of journals for the user, or computer tapes for the online service operator, are relatively small. There is no objective way of allocating the large, fixed cost of the data base among the different products. So any discussion of user charges must ultimately come down to the criteria for allocating costs. Some of these criteria are commercial - increasing the expected revenue and/or reducing the risks - but others involve deciding how the total burden should be allocated between different groups of users. Data base producers must make their own decisions here, and it is impossible to forecast objectively what these will be.

For these reasons, EFAG 22 has not been a classical forecasting study.

How EFAG 22 Attacks this Problem

The approach adopted has been broad, in order to paint as complete a picture as possible. The attack comprises two main thrusts: analysis and scenario-building.

The analysis is described in Section 2 and Appendices B-E. It covers previous published research (Appendix B, based on the annotated bibliography, Appendix C), and two new mail surveys: a survey of data base producers' recent revenue patterns (12 responses out of 25, see Appendix D), and a survey of expert opinion (51 responses out of 92, see Appendix E).

The analysis gives us some idea of the range of possible future outcomes. This range is still very wide. The scenario-building described in Section 3 ("modelling the future") aims to help us explore the implications of each outcome from the data base producer's viewpoint. This involves making assumptions, and judgements. In order to help data base producers test their own assumptions, a computer model has been specially developed: the INSPEC Decision Model, described briefly in Appendix F, and in a separate user guide. But to illustrate the process, most of Section 3 describes the exploration of various pricing strategies by a fictional data base producer. For each strategy, eight scenarios are projected, corresponding to different combinations of underlying demand, online takeoff, and the impact on print subscriptions. The results of this case study are the nearest thing in the report to a forecast of user charges (p.22).

Conclusion

The main conclusion is that online royalties are currently being subsidised by printed products, and that, as online becomes established, this policy ceases to be appropriate. It is therefore argued that a more neutral policy involves increasing online royalties, in relation to print prices, by a factor of 2-2½ times over the period 1978-83. What such a shift will mean in absolute terms will be different for each data base, but will generally depend on the level of underlying demand, online takeoff, and the impact of online on print subscriptions. In the worst-case scenarios, where demand is weak and online has a high impact on print, printed products will cost about 15% more in real terms in 1985 than in 1978. At the other extreme (high demand, high online takeoff, low impact on print), real print prices could drop by as much as 30%. The average scenario is that real print prices will be steady until 1981-82 (while real online royalties increase by up to 100%), and will then decrease by about 2%-3% p.a. until 1985, while real online royalties tend to stabilise.

These projections relate to real US dollars: in money terms, allowance must also be made for continuing inflation, assumed here at 7% p.a. over the period 1978-85.

The above conclusion represents the author's best guess, spelt out in the case study in Section 3, with explicit assumptions and criteria. Section 4 spells out this conclusion in rather more detail. It also summarises the study's empirical findings, and gives recommendations for further research (discussed more fully in Appendix G). It is argued that, even if data base producers reject the author's detailed conclusion, they should still plan ahead along the lines of the Section 3 case study, but making their own assumptions. Those who fail to do so may discover too late that they are headed for a large financial deficit. Sudden, drastic changes at that stage would be disruptive, not only to themselves, but also to the orderly development of on-line retrieval.

1. INTRODUCTION

Background

This report is about abstracting and indexing (A & I) services' pricing policy over the next 5-8 years. To put it another way, it is about how information users pay for bibliographic databases to be produced, and how the pattern may change with the extended use of online retrieval systems.

The main medium for bibliographic information is still printed A&I journals. Many such journals are now produced using computer typesetting, so the databases from which they are derived already exist in machine-readable form. Database producers have therefore been able to sell computer tapes of bibliographic data at low cost, for processing by users. Initially, such processing was usually in batch mode, providing current awareness services within the user organisation. As such, it had little impact on the revenue from printed products, and indeed helped contribute towards the costs of producing the database.

In recent years, user processing of tapes has expanded to include the provision of services outside the user organisation, and of retrospective searches as well as current awareness services. These trends have now markedly accelerated with the take-off of online processing in North America. A similar acceleration may be expected in Europe, with the advent of EURONET.

So far, database producers have continued their policy of covering almost all their costs with revenue from printed products, while charging for the use of tapes at low levels: they are taking a long view of the time needed for development of these new markets. The speed with which online is taking off, however, and the possibility that it might seriously impact the revenue from printed products, mean that this pricing policy may no longer be appropriate, and may soon be quite infeasible. Falling subscriptions might lead to price increases, causing subscriptions to fall further, and so on, until the costs of database production could no longer be covered. A change of policy therefore seems likely, so as to bring about a smooth transition to a mixture of electronic and printed products at much more nearly equal levels.

A rational pricing policy should be based on agreed facts and an agreed decision framework. These are largely lacking at present. In their absence, there is a danger that hurried decisions may be taken, which could disrupt the orderly development of online services.

Objectives

To meet this situation, the current study was set up with the following aims:

- (a) To provide data on the growth of bibliographic online retrieval in science and technology, its interaction with printed products, and its contribution to overall data base costs.
- (b) To examine the implications for the future pricing of online services and printed products, including related commercial aspects such as conditions of sale.

The study aims to reduce uncertainty by providing agreed facts and an agreed framework. If it meets these aims, it should be of benefit to database producers, online service operators, network planners, and users.

Methodology

In the course of this study, the methodology has evolved and broadened.

The original emphasis was on the collection of historical data from the member services of ICSU AB. It was hoped that detailed analysis of such data would enable the study to meet its objectives.

In the course of the Phase I feasibility study, (December 1977 to March 1978), it became clear that this would be inadequate. To quote from the Phase I report,

"At this stage, it is too early to say what balance will eventually emerge between A&I journals and online searching. In particular, online sales data are too few and too dynamic for one to extrapolate them into a credible forecast. So although the collection and analysis of such data form an important part of the research design, it is proposed to supplement them as follows:

- Collect informed opinion about the recent past and the future.
- Find out what other relevant research has been done, and integrate the results with the findings of this study.
- Explore the financial implications of different ways in which the market may develop. This exploration will be aided by a simple computer model, based on the economics of a typical database producer."

And again,

"At this early stage, the collection and analysis of long-run historical sales data - however technically excellent - will not tell us about the market in 1985 or even 1980. The aim is therefore to collect as many bits of the jig-saw puzzle as possible, make various guesses about the missing bits, and test the effect of different guesses on the overall pattern."*

* The full statement of methodology in the Phase I report is given in Appendix A.

The broad approach proposed at the end of Phase I has been followed during the main Phase II study. Its disadvantage is that, by covering such a wide area, the study is rather superficial in places. Its advantage is that it provides a framework for orderly debate: the reader is encouraged to make his own assumptions, and to draw his own conclusions. (Also, as it happens, the conclusions seem to be little affected by small changes in the assumptions. Unless the assumptions are systematically quite wrong, the conclusions are roughly right.)

Report Structure

Most of the detail in this report has been pushed into the appendices, while the argument is spelt out in the main sections on pp 4-7 and 8-22.

Section 2, on analysis, discusses the results of previous research, of the survey of ICSU AB member services, and of a survey of expert opinion.

Section 3, on modelling the future, discusses pricing policy for a fictional data base producer called Widget Abstracts. This is the heart of the report. The revenue for Widget Abstracts is projected over the years 1978-85, under various assumptions about the underlying demand for information, the take-off of online retrieval, its impact on sales of printed products, and Widget Abstracts' own pricing policy. It is argued that the best policy is to:

- increase online royalties steadily so as to double them in real terms by 1983 (and, for offline print royalties, to increase threefold over the same period), and
- improve the way revenue data are recorded and analysed so that pricing policy can be further revised in 1981, on the basis of known facts.

Under this policy, it is argued that online retrieval poses no real threat, and that the future from 1982 onwards looks fairly rosy for Widget Abstracts and its users (see p.22).

Widget Abstracts is only an illustration, and the particular numbers will be different for every database producer. But if producers agree with the arguments, their conclusions will be qualitatively similar. In this case, the Widget Abstracts example will indicate the sort of pricing policies that may be anticipated.

The report concludes with a discussion of likely developments 1978-85, and with a number of recommendations.

It should be noted that the study reported here is about bibliographic data-bases. It is not about factual, numeric, or full-text data banks.

2. ANALYSIS

The Data Analysed

The data analysed come from three sources: previous published research; a survey of ICSU AB member services' recent revenue patterns; and a survey of expert opinion.

The results of previous research are discussed in Appendix B, based on items in the annotated bibliography, Appendix C.

The two mail surveys were carried out during May-August 1978, based on pilot work during January-March. The revenue survey, described in Appendix D, produced 12 responses out of 25 (48%). The opinion survey, described in Appendix E, produced 51 responses out of 92 (55%). The response rates of both surveys might have been higher if there had been time for follow-up mailings to non-respondents.

The Impact to Date

There seems to be nothing in the published literature to indicate that online retrieval has yet had a perceptible impact on print subscriptions. This negative conclusion is supported by the evidence of the two surveys.

The analysis of revenue data leads to the following rough generalisations - with marked variation between databases:

- 1973 showed significant growth over 1972.
- Since 1973, print volumes have on average declined by $\frac{1}{2}\%$ to 1% p.a., while real prices have typically increased by about 2% p.a., on top of inflation averaging 8% p.a. for the US dollar.
- Over the period 1973-77, price elasticity for printed products was low, perhaps 0.3 or so. That is, a 1% real price increase led to a 0.3% decrease in subscriptions.* If real prices had been steady, subscriptions would have shown little overall change either way.
- On average those databases which have been commercially available online since 1975 or before still derived less than 5% of their 1977 revenue from online.

* It would seem that abstracts journals and indexes are cancelled with great reluctance. The cuts in library budgets since 1973-4 have probably been felt more by publishers of primary journals and (especially) books.

There is no evidence so far of any significant decrease in the revenue from printed products as a result of the impact of online services.

Similarly, the analysis of expert opinion about the recent past shows a fair measure of agreement that the main negative influences on the sale of printed products in the last 3-4 years have been weaknesses in the level of underlying demand, and price increases. Specifically, 44% of the total weighting was given to the combination of various factors related to underlying demand (e.g. "recession", "government cut-backs", "library pooling"), while 24% of total weighting was given to the single factor "price increases".

Only 9% of the total weighting was given to the impact of online services (13% among US respondents).

The evidence from both surveys, although scanty, is consistent: that the impact to-date of online retrieval on print subscriptions has been small. Subscriptions have been steady, or slightly declining, since 1973, because the level of underlying demand has been less buoyant than before, and (probably to a lesser extent) because of price increases, not because of the impact of online retrieval.*

Future Expectations

There have been few published attempts to forecast the growth of online retrieval, and none to project the impact on print subscriptions.

The most comprehensive forecast to-date has been that by PA Management Consultants Ltd. (1974), who projected very fast growth in Europe over the ten years 1976-85. This study is now generally thought to have been optimistic, both as regards total potential (there was some double-counting), and timing.

The PA report assumed a rapid decrease in the real cost per search, and a rapid increase in the number of bibliographic databases and (especially) factual/numeric data banks. The relationship between price, growth, and the availability of new databases is discussed by Flowerdew, et al (1976), who conclude that European demand for online bibliographic data is most unlikely to grow by more than ten times over the period 1976-85, although total online usage (including non-bibliographic data) could grow by more than this. Since the growth in N. America is likely to be less than in Europe, relative to 1976, and since N. American usage was 80%-90% of the world total in 1976, Flowerdew's conclusions imply that worldwide growth in online bibliographic retrieval will be less than a factor of ten for the period 1976-85.

* Another minor factor may have been product weaknesses. These were given a weighting of only 5% by the whole sample, but there was a possibly significant difference between database producers (who gave it zero weighting) and other respondents (8% weighting).

Recent evidence tends to support this conclusion. There is a shortage of hard data on the growth of online usage, and such data as exist include the growth due to new databases becoming available, as well as the growth for databases already available. Even on this basis, the data quoted recently by Tomberg (1977b) suggest that the absolute rate of increase in searches per year has been decreasing in the USA, from about 300,000 new searches/year in 1973, to about 150,000 new searches/year in 1976. The data also suggest a slowing-down in European growth in 1976.

Tomberg's data were collected by EUSIDIC, and may relate mostly to usage by existing large users. In this case, the growth due to the influx of new, small users may be understated: future growth may in fact be "not so much a matter of more searches per user organisation (as) of new user markets with initially vigorous and subsequently slackening growth". This suggestion is also discussed by Lindquist (1977). Other commentators, such as Barlow (1976), Cuadra (1977), Williams (1977b), tend to differ with Tomberg's finding that growth is slowing down. There is a shortage of hard data.

Some light may be thrown by the findings of the two surveys in the present study. The revenue data suggest average growth in online revenue of only 15%-25% in 1976-77, for individual database producers already online before 1976. This represents a marked slow-down compared with the percentage revenue growth in previous years (60%-plus), and would also imply some slow-down in absolute terms. Some recovery was projected for 1977-78 (e.g. 30%-35% increase in revenue). Growth in usage has probably been slower than revenue growth, although this is hard to assess at this early stage, because base charges (as opposed to use charges) have been a significant revenue element.

From the viewpoint of this study, which aims to assess the impact of online on database economics, and thus on user charges, it is the growth in usage of the individual bibliographic database which matters. The opinion survey asked how such usage might be expected to grow by 1980 and 1985, relative to 1978.

Some of the responses explicitly included growth due to data banks and new bibliographic databases, while other probably did so implicitly. Allowing for this, respondents projected roughly straight-line growth* 1978-85, with most respondents placing the increase over this period at a factor of between $2\frac{1}{2}$ and 10 times.

(The author's personal view is that, in terms of this study, the growth will fall towards the lower end of this range. More precisely, for those bibliographic databases already available online by 1978, I expect the total number of searches in 1985 to be between $2\frac{1}{2}$ and 5 times their 1978 level. For the purposes of the

* Almost by definition, the growth curve will ultimately be S-shaped, not a straight line. But at this stage we do not know whether the point of inflection will come in 1990, 1985, 1980 or whenever - according to Tomberg's data, it came in 1974. A straight line is a simple and robust approximation.

next section, however, on modelling the future, the wider range is considered, as reflecting the range of majority opinion.)

A wide range is also assumed for the future impact of online retrieval on print subscriptions. Implicitly at least, most experts in the survey assumed that such impact would be small, but there is little evidence to-date. The fact that so far there seems to have been little impact proves nothing. Users who have gone online may indeed have found that print and online are complementary; or they may just be adopting a wait-and-see policy.* Cancelling a secondary journal to which they have subscribed for a long time is a big step, and could be hard to reverse.

The opinion survey asked for expectations about India. No-one expected significant online usage in India, even by 1985. During this timescale, India and other less-developed countries will have little relevance to the development of online. (But online will have relevance to the less-developed countries, since the way costs are allocated between print and online is especially important to those countries that only use printed products.)

* Some online users may currently be non-subscribers to the printed version anyway.

3. MODELLING THE FUTURE

Introduction: The INSPEC Decision Model

Our picture of the 1975 market for bibliographic information is still like an incomplete jig-saw puzzle. In the previous section, some bits of the puzzle were collected. In this section, various guesses about the missing bits are made, to see how the overall picture might emerge.

This process of scenario-building can be computer-aided. Appendix F describes the INSPEC Decision Model set up specifically for this purpose, and available to ICSU AB member services for their own use. The INSPEC model allows detailed projections to be tested, with sensitivity analysis and risk analysis.*

In this report we illustrate the process with round numbers, based on a fictional database producer called Widget Abstracts.

Widget Abstracts: an Illustration

Widget Abstracts is a medium-sized bibliographic database producer, part of an American learned society. It covers the whole range of widget research, from academic studies of widgetology, through applied research in widgetry and widgistics, to practical developments in widget engineering. Rather more than half of its coverage is unique among bibliographic database producers.

Its 1978 revenue of \$1.0 million came 90% from print, 6% from batch service operators, and 4% from online service operators. Simplifying somewhat, the breakdown was as follows:

Table 1: 1978 Revenue

		<u>\$000's</u>
Print :	1,000 subscribers x \$900	900
Batch :	10 subscribers x \$6,000	60
Online:	100 users x av. \$400	40
		<u>1000</u>

The price of the main printed product, Widget Abstracts, includes cumulative indexes. The batch tapes are used mostly for the provision of in-house current awareness services; revenue from use charges is negligible. Conversely, online tapes are used largely for retrospective search services sold on the open market by two or three major operators: revenue from base charges is negligible.

* This model, first conceived by Derek Barlow of INSPEC, was set up during Phase I of this study; and further developed during Phase II. A user guide is available from ICSU AB.

The average of \$400 per online user came from a skew distribution, with a wide range - most users contributed less than this, while a few contributed much more. On average, those who used Widget Abstracts online at all during 1978 did so on 80 occasions, on average for 15 minutes, and with 50 references printed offline.* The royalties of \$15 per connect hour and 2½¢ per offline reference were fairly typical for 1978, perhaps a little below average,** but the intellectual cost of producing Widget Abstracts was lower than for many other databases. Breaking down the \$400 for the average on-line user, we thus have

$$\begin{aligned} \$400 &= 80 \text{ accesses} \times [(\$15/\text{hour} \times 15 \text{ minutes}) + (2\frac{1}{2}\text{¢}/\text{ref} \times 50 \text{ refs})] \\ &= 80 (\$3.75 + \$1.25) \end{aligned}$$

The average cost to the user per connect hour (excluding costs of staff, terminals and overheads) was about \$80 in the USA, of which \$20 went to Widget Abstracts:

Table 2 : 1978 Cost per Connect Hour : USA

		<u>\$ per hour</u>	
Connect hour charge :	royalty	15	
	online operator	<u>35</u>	
		-	50
Telecommunications			10
Offline print charges:	royalty	5	
	(200 refs/hour) online operator	<u>15</u>	
		-	<u>20</u>
Total			<u>80</u>

In Europe, the high cost of telecommunications (about \$30 per hour) raised the total from \$80 to \$100 per hour, of which still only \$20 went to Widget Abstracts. This pattern was quite different from the situation for printed products, where virtually all of the user's expenditure went towards the cost of producing the database.

Base Case: Constant Real Prices 1978-85

The management of Widget Abstracts was concerned about the possible impact of online usage on future revenue. So far, the evidence was that the impact on print subscriptions had been minimal, but it was expected that such an impact if it happened, would be delayed by 2-3 years, and would then increase in

* Two points may be noted. First, the figure of 15 minutes per access occasion is not an average search time, since fulfilling some search requests involves more than one terminal session, and the searching of more than one database. Secondly, we are simplifying by assuming that total connect hours are given by the product (total users) x (av. accesses/user) x (av. time/access). In practice, these numbers would not quite reconcile, because, as Wanger et al (1976) note, the product of the means is not quite the same as the mean of the products.

** Page (1978)

line with the growth of online usage. The problem was to assess roughly how big the reduction in revenue might be, and how soon it might begin to matter.

As a starting-point, the management considered what might be the possible outcomes if they held their prices constant in real terms right through till 1985. In money terms, they thought this would mean average price increases of about 7% p.a.

There seemed to be three big unknown factors:

- (a) The underlying demand for information: this would mainly depend on the state of the world economy.
- (b) The takeoff of online usage of Widget Abstracts: this would depend mainly on market acceptance - whether, with experience, users found online to be as revolutionary as its disciples claimed. But the takeoff of online would also be affected by the underlying demand for information, and by pricing.*
- (c) The impact of online on print subscriptions: this, in turn, would depend on (a) and (b) above, as well as on the detailed patterns of user behaviour, about which very little was known - especially how people currently used the printed products.

If just two possibilities were considered for each of these three factors - "high" and "low" - there would be eight possible combinations, i.e. high/low underlying demand, high/low online takeoff, high/low online impact.

With fixed real prices, and neglecting the impact of online, it was felt that print volumes would probably grow at between zero and 4% p.a., depending on the level of underlying demand. This was the likely range, but there was perhaps a 10% or 15% chance that the number of subscriptions might decline, even with fixed real prices, and a similar chance that it might grow at more than 4% p.a.

Over the previous six years 1972-78, subscriptions had grown by $\frac{1}{2}\%$ to 1% p.a.*; despite real price increases of 2% to 3% p.a. For most of this period, (i.e. 1973-77), the level of underlying demand had been exceptionally low. It might be argued, however, that the market was now saturated, and that little further growth in the number of special libraries would occur. In this case, print volumes would remain static. But this was not the majority view at Widget Abstracts.

* To make matters more complicated, these factors would themselves be affected by the takeoff of online.

** This average included significant growth in 1972-73, with no overall change since then.

The growth of online usage was even more uncertain. Widget Abstracts reckoned that, if they held their prices constant in real terms, the real cost per connect hour in 1985 would have fallen from about \$80 in the USA, and \$100 in Europe, to \$60 in both cases;

Table 3: 1985 Cost per Connect Hour in 1978 Dollars (Fixed Real Prices)

	<u>\$1978 per hour</u>
Connect hour charge: royalty	15
online operator	<u>20</u>
	- 35
Telecommunications	5
Offline print charges: royalty	5
(200 refs/hour) online operator	<u>15</u>
	<u>20</u>
Total	<u>60</u>

Of this \$60, the amount coming to Widget Abstracts would still be about \$20 in 1978 dollars - say \$30 to \$35 in actual 1985 dollars.

On these prices, it was felt that online usage of Widget Abstracts could grow by anything between $2\frac{1}{2}$ and 6 times if the level of underlying demand were low, and from 3 to 10 times if demand were high.

Again, it was possible that the 1985 outcome might be outside even this wide range. But, at the bottom end, if usage in the USA settled down at just 60% above its 1978 level, and usage in all other countries combined grew to just 85% of the US total, the lower growth limit would be exceeded. Similarly, at the top end, it seemed unlikely that a moderate-sized database like Widget Abstracts would chalk up more than the 20 thousand connect hours implied by the 10-fold increase, even in the best market conditions. Total online usage, including data banks and databases not online in 1978 would in this case grow by anything up to 30 times by 1985 - conceivably even more.

Most of the growth in online volume was expected to come from an increase in the number of users, with some slight increase in the average number of searches per user. This would be in line with known patterns of consumer behaviour under conditions of low market penetration:* among existing users, volume would tend to increase, but the average would be reduced by the influx of non-users becoming small users. (For simplicity, we here assume that all the growth in online comes from an increase in the number of users.)

Similarly, no net change was expected in the average search time or the average number of references printed offline. The increase in the cumulative

* Penetration is here defined as the proportion of the target market who buy at least once in a given time period. Among this group, the frequency of purchase tends to follow a regular pattern, represented by a distribution called the negative binomial distribution. See Ehrenberg, A.S.C., Repeat Buying, Amsterdam: North-Holland, 1972.

online database (leading to longer searches and more references) would be roughly cancelled out by the increase in the number of small searches carried out online. Conversely, the tendency for search time to decrease with searcher experience would be cancelled out by the influx of less experienced searchers, perhaps including a significant proportion of end-users by 1985.

How much all this would impact the revenue from print was quite unknown. For simplicity, the "low impact" scenarios were taken as zero net impact: that is, print volumes would be unaffected by online. Some of the management argued that print volumes might even be boosted by the publicity of online, and by people using the abstracts journal to follow up references listed online. But the general view was that, on balance, there would probably be some net impact.

An upper bracket was given by assuming that, if the level of underlying demand were low, a print subscription would be lost for every online user: with high online takeoff, this would reduce the number of subscribers from 1000 to 400 by 1985. If the level of demand were high, it was assumed that 80% of online users would lead to lost subscriptions. These assumptions seemed pretty drastic.

Simple assumptions were also made about the impact on the number of batch subscribers.

The base case assumptions are summarised in Table 4, and the resulting revenues for 1985 (in 1978 dollars) in Table 5.

Table 4: Base Case (Fixed Real Prices): Volumes in 1985

Underlying Demand	Online Takeoff	Impact on Print	Print Subs.	Batch Subs.	Online Hours
High	High	High	520	8	20,000
		Low	1,320	8	20,000
	Low	High	1,080	10	6,000
		Low	1,320	10	6,000
Low	High	High	400	6	12,000
		Low	1,000	6	12,000
	Low	High	750	8	5,000
		Low	1,000	8	5,000
Initial values for 1978			1,000	10	2,000

Table 5: Base Case (Fixed Real Prices): Real Revenues in 1985
(1978 Dollars)

Underlying Demand	Online Takeoff	Impact on Print	Print	Batch	Online	Total
High	High	High	470	50	400	920
		Low	1,190	50	400	1,640
	Low	High	970	60	120	1,150
		Low	1,190	60	120	1,370
Low	High	High	360	40	240	640
		Low	900	40	240	1,180
	Low	High	670	50	100	820
		Low	900	50	100	1,050
Initial revenues for 1978			900	60	40	1,000

Implications of the Base Case

The first impression at Widget Abstracts, on studying Table 5, was that the range of uncertainty was very wide. Even this wide range did not cover all possible outcomes. Apart from the possibility of some major catastrophe (e.g. World War 3), there was perhaps a 10% or 20% chance that real revenue in 1985 would fall outside the projected range.

The next stage was to make some simple assumptions about costs. Real cost increases were expected, as a result of two main factors: the increase in the number of items processed each year, and the cost of staff. Fortunately, both of these factors would be positively correlated with the level of underlying demand. That is, the sort of conditions which would lead to fast growth in the primary literature, and to high pressure for real salary increases, would also tend to cause the level of underlying demand (and therefore the revenue) to be higher. There was also some limited scope for reducing real cost increases through further automation, etc.

Overall it was reckoned that real costs would increase by between 1% and 3% p.a. depending on the level of underlying demand. Anything less than this would involve cheapening the product or cutting down on development work. In line with this, the target revenue for 1985 was \$1.07 to \$1.23 million, in real terms (\$1.71 to \$1.95 million in current terms, with 7% inflation).

Against these targets, the base case gave the following net outcomes for 1985:

Table 6: Base Case (Fixed Real Prices): Real Net Outcomes for 1985
(Thousands of 1978 Dollars)

Underlying Demand	Online Takeoff	Impact on Print	Revenue (from Table 5)	Less Target	Net Outcome	%
High	High	High	920	-1,230	-310	-25%
		Low	1,640	-1,230	410	33%
	Low	High	1,150	-1,230	- 80	- 7%
		Low	1,370	-1,230	140	11%
Low	High	High	640	-1,070	-430	-40%
		Low	1,180	-1,070	110	10%
	Low	High	820	-1,070	-250	-23%
		Low	1,050	-1,070	- 20	- 2%
Average High Demand			1,270	-1,230	40	3%
" " Low "			920	-1,070	-150	-14%
Average high takeoff			1,090	-1,150	- 60	- 5%
" " low "			1,100	-1,150	- 50	- 5%
Average high impact			880	-1,150	-270	-23%
" " low "			1,310	-1,150	160	14%
Overall average			1,090	-1,150	- 60	- 5%

If no action were taken, the real net outcome might be anything from a surplus of \$410 thousand to a deficit of \$430 thousand. Some uncertainty came from the unpredictability of the level of underlying demand, but the most important factor was the impact of online usage on print subscriptions. If the impact were high, and online really took off, it would be necessary to cut costs heavily, and bring in some very large price increases, to bring the 1985 position back into balance.

Obtaining Better Information

Widget Abstracts needed better information. An immediate task was therefore to improve their record-keeping, so that, as soon as possible, they could tell roughly which of the eight scenarios (or which intermediate scenario) was unfolding. This would enable them to take action before being forced to do so by events. Better anticipation would help them to steer a steadier course, which was in everyone's interest - including their own.

Improved record-keeping would mean, first of all, monitoring revenues by product and geographical region - in particular, assessing whether the growth of online usage was linked (with a time lag) with a reduction in print subscriptions in the same geographical region.

Ideally, it would be possible to go further than this, taking the level of analysis down to individual users by: (a) following up all users who cancelled print subscriptions to find out why: this was already being done, but should now be intensified; and (b) requesting a list of users, with usage rates, as part of the standard contract with online service operators; this was not happening at present, and would need the co-operation of the online operators.

Given these data, it would be possible to assess how many users of Widget Abstracts online were already subscribers to the main printed product; and of these, how many ended up cancelling their print subscriptions. At a more fundamental level, research was needed into the frequency and purpose of printed product usage. One use of the abstracts journal was for full manual searches, e.g. going back over the last 5-10 years to identify 50+ references. It was in this area that most online usage would occur, and the main impact be felt. Even in this area, print offered the benefits of easier browsing*, and (if usage was high and the cost of labour neglected - e.g. with PhD students) economy. But with large and/or multi-subject searches, and with staff time costed at an economic rate, online searching was probably better value for money, and would be even more so by 1985 (by which time Widget Abstracts online would go back well over ten years).

There were, however, other possible uses of the abstracts journal, such as:

- Small searches, e.g. locating a few recent references on a specific topic, or just finding a couple of introductory review articles.
- Reading the abstracts of given references, including references which had come from an online search. This avoided waiting for offline prints through the post, and was much cheaper than printing abstracts online.
- Checking bibliographic references, (e.g. correct author, title, page numbers) before requesting an inter-library loan, or whatever.
- As an educational tool, for students, researchers and information staff.

* Especially if the searcher spoke English as his first language. Akeroyd and Rogers (1976) found low correlation between references retrieved by manual and online searches on NTIS. Until more powerful software can be developed, there may be scope for using printed products to retrieve references which have been missed during on-line searching.

Detailed research into printed product usage would give some indication of how much online might supplement print, and how much it might supplant it. Research might also help Widget Abstracts develop their product range so as to exploit what was best in both media, and end up with products which complemented each other better than now, and gave the user more of what he wanted. Such research would not, however, lead to automatic decisions; and it would take time and money. Meanwhile, there was an immediate need for developing new policies before it might be too late.

Revised Strategy: Increased Online Royalties

Widget Abstracts felt they should decide on a new policy as from 1978, which would cut down the risks later.

They could make various changes in their online conditions of sale, e. g. by ceasing to provide online abstracts altogether, or to non-subscribers to the printed product, or whatever. But they would rather continue with flexible conditions of sale, and leave it to the market to decide. They had no wish to discriminate in favour of print and against online: as a database producer, they had no particular bias for either one or the other.

They could plan to increase prices across-the-board. If they started to raise all prices by 2% to 3% p.a. (in real terms) straight away, then, even allowing for some loss in volume, their average outcome for 1985 would be a surplus of \$70 or \$80 thousand, in 1978 dollars. Even if they were in deficit, the action which would still have to be taken would be far less drastic than if they had done nothing before.

It seemed to the management, however, that this apparently neutral pricing policy would in fact constitute heavy discrimination in favour of online and against print. They felt that print was currently subsidising online, which was quite right as long as online was in its infancy, but was not in users' interests once online had become a major force in the market.

They cited two arguments in support of this view.

- (a) Without the advent of online, there would be little potential problem. Except in very adverse conditions, print revenue would keep pace with cost increases with little real further increase in price.
- (b) There was evidence that far more than 4% of the utility derived from the database in 1978 went to the 100 online users, although they provided only 4% of the revenue. This was shown by the fact that their total expenditure on searching the database was at least four times the revenue

they contributed to Widget Abstracts* (five times, in the case of Europe). On this basis, online provided about 15% of the total utility, but only contributed 4% of the total cost. Moreover, the continuing growth of online was proof that its utility was significantly higher even than its current cost of \$80 to \$100 per hour: this growth showed that there were still many potential users for whom the benefit exceeded the cost.

The management felt that a truly neutral pricing policy would mean that, if (say) 15% of the total utility to users came from online, then online would contribute 15% of the cost of the database. Given such a policy, Widget Abstracts would be indifferent to the balance which emerged between print and online: this choice would be left to market forces.

According to this view, there was a serious imbalance in current pricing policy. To eliminate this imbalance, online royalties should increase by a factor of 3-4 times, (relative to the cost of print) during the transition to a mixed economy of the two media.

It was then argued that this view might be too extreme. Users' expenditure on manual searching was itself more than the total subscription revenue: it also included significant expenditure on staff time. If online royalties were increased by less than the theoretically neutral amount - say by 2-2½ times - the outcome would still probably be better for print users than if online had never happened. Moreover, it seemed better to err on the side of under- rather than over-reaction: if they increased royalties by a factor of four, even spread over several years, they might seriously impede the development of online.

They also wanted to take a decision without having to hire a professional philosopher to help them define "utility".

So they agreed to explore the implications of increasing online royalties from \$15 per connect-hour and 2½¢ per offline print reference, to \$30 per connect-hour and 7½¢ per offline reference, in real terms, over a five-year period. Thus, the connect-hour charge would increase by a factor of two, and the offline print charge by a factor of three, between 1978 and 1983. In current terms, these price increases would be rather higher.

There were two reasons for increasing the offline print royalty more than the connect-hour royalty. First, to discourage "cannibalisation" of print subscriptions, or at least reduce the loss if it occurred; and secondly, because users seemed to look mainly at the connect-hour charge in assessing the cost of online: keeping down the online royalty increases would thus reduce the dampening effect on online takeoff.

* \$80 per connect hour, of which only \$20 went to Widget Abstracts.

On this basis, the real cost per connect hour in 1985 would be about \$85, assuming no change in the online operator and telecommunications charges:

Table 7: Real Cost per Connect Hour in 1985: Increased Royalties

		<u>\$1978 per hour</u>	
Connect hour charge:	royalty	30	
	online operator	<u>20</u>	
		-	50
Telecommunications			5
Offline print charges: (200 refs/hour)	royalty	15	
	online operator	<u>15</u>	
		-	<u>30</u>
Total			<u>85</u>

This was, in real terms, similar to the cost in 1978: \$80 in the USA and \$100 in Europe. But in the base case, it had been assumed that real costs would drop to about \$60 - a drop of about 30% on average (25% in the USA and 40% in Europe). Management were unsure how much of the online growth in the base case should be attributed to this price reduction, and should therefore be excluded from the projections at a constant cost of \$85 or so. Their best guess was that the 30% reduction had boosted usage by about 45%, so that total expenditure on online would be unaffected.* With the revised royalties, they therefore reduced the projected online volumes by 30%. The impact on print was correspondingly reduced.

Implications of the Revised Strategy

It was projected that the revised strategy would lead to the following real net outcomes for 1985 (see Table 8).

The revised strategy would give Widget Abstracts much more room for manoeuvre. Six out of the eight outcomes were in the range \pm \$150 thousand, while the other two were both on the plus side. Even the worst outcomes (high impact and low underlying demand) would not require too drastic further action, while if the impact were low, and especially if online takeoff were high, there would be scope for reductions in real prices in the second half of the period.

Management reckoned that, if they immediately improved their record-keeping, and started seriously investigating the impact of online, then by 1981 they would know roughly what course they were on. This would give them time to revise their strategy for 1982-85, bringing them back on course for the 1985 target, as shown in Figure 1, (p.20).

* Because $0.7 \times 1.45 \doteq 1.0$. The 45% would come from new users, more searches among existing users (especially small searches) and less efficient searching, especially by end-users. The 45% assumption would be roughly in line with the conclusions of Flowerdew et al (1976). As these authors themselves make clear, asking existing users how they would react to price changes tends to underestimate the effects of price cuts. It also tends to overestimate the effects of price increases.

Table 8: Revised Royalties (\$30/hour, 7½¢/ref): Real Net Outcomes in 1985
(Thousands of 1978 Dollars)

Underlying Demand	Online Takeoff	Impact on Print	Revenue	Less Target	Net Outcome	%
High	High	High	1,360	-1,230	130	11%
		Low	1,870	-1,230	640	52%
	Low	High	1,290	-1,230	60	5%
		Low	1,380	-1,230	150	12%
Low	High	High	940	-1,070	-130	-12%
		Low	1,420	-1,070	350	33%
	Low	High	950	-1,070	-120	-11%
		Low	1,110	-1,070	30	3%
Average high demand			1,480	-1,230	250	20%
" low "			1,100	-1,070	30	3%
Average high takeoff			1,400	-1,150	250	22%
" low "			1,180	-1,150	30	3%
Average high impact			1,140	-1,150	-10	-1%
" low "			1,440	-1,150	290	25%
Overall average			1,290	-1,150	140	12%

User Charges in 1985

Without a change of course in 1981-82, real user charges in 1985 would be \$900 for print, \$6,000 for batch tapes, \$30/connect-hour royalty and 7½¢ per reference offline print royalty. For good measure, the offline print royalty would also be applied to abstracts printed online.*

Allowing for a change of course in 1981-82, the final outcome would depend on the three intervening variables: underlying demand, online takeoff and online impact. Making some allowance for the effect of real price changes on subscriptions, the change of course might lead to higher user charges, but was a little more likely to lead to real reductions over the period 1982-85. Either way, the relationships between the charges for different products would be little affected.

As an illustration, the average scenario in Table 8 would give a real revenue of \$1.29 million in 1985, versus a target of \$1.15 million, a surplus of 12%.

* In 1978, it typically took 30-60 seconds to print an abstract online, costing the user 5-10 times the cost of an offline print. But by 1985, lines and (especially) terminal printers would be significantly faster.

In this case, the change of course in 1981-82 would lead to real user charges in 1985 of about \$800 for print, \$5,200 for batch tapes, \$26 connect-hour royalty and 6¢ per reference offline print royalty, giving the following revenue:

Table 9: 1985 Revenue: Revised Strategy, Modified 1981-82 (Average Scenario)
(1978 Dollars)

Print :	1,000 subscribers x \$ 800	\$ 800 thousand	(70%)
Batch :	8 subscribers x \$5200	\$ 40	" (3%)
Online:	410 users x av. \$ 760	\$ 310	" (27%)
	Total	\$1150	"

Choosing a Neutral Pricing Policy

According to this average scenario, online usage would increase by a factor of 4.1 times between 1978 and 1985, while the real cost per connect-hour would have fallen from about \$80 in the USA and \$100 in Europe to something in the range of \$75 to \$80, of which just under half would go towards the cost of the database:

Table 10: 1985 Cost per Connect Hour: Revised Strategy, Modified 1981-82
(Average Scenario)

		\$1978 per hour
Connect hour charge :	royalty	26
	online operator	<u>20</u>
		- 46
Telecommunications		5
Offline print charges:	royalty	12
	(200 refs/hour) online operator	<u>15</u>
		- 27
Total		<u>78</u>

Real expenditure on online searching of Widget Abstracts (a measure of utility) would be about \$78 x 8,200 hours, i.e. \$640 thousand - 40% to 45% of total expenditure on all three media (print, batch and online). Since online would still be contributing only 27% of the database costs, one could argue that it was still being subsidised by print. If print sales were to disappear overnight, the cost of online would be astronomical.

Against this, one could argue that the net effect of online had been to allow the real price of print to be reduced from \$900 to \$800. This would be of particular benefit to poorer organisations (who could not afford online), and poorer countries (who would not have been able to access online, even if they could have afforded it).

The strategy therefore seemed to Widget Abstracts to strike a fair balance between print and online, at the same time reducing the risk to themselves of a large deficit, and the risk to the market of drastic changes in direction.

It was therefore adopted.

User Charges 1978-85

In real terms, Widget Abstracts expected to hold their print and batch prices fairly constant over the period 1978-81, while steadily increasing their on-line royalties from \$15/hour and 2½¢/ref. to about \$24/hour and 5½¢/ref.

From 1982-85, the pattern would change, depending on the underlying level of demand (and the growth of costs), the takeoff of online usage, and its impact on print subscriptions. In real terms, prices in 1985 might be as follows:

Table 11: Real User Charges in 1985

1978 Dollars	Worst* Scenario	Average Scenario	Best** Scenario
Print subscription	\$1,040	\$800	\$600
Batch tape subscription	\$7,000	\$5,200	\$4,000
Royalty/connect hour	\$35	\$26	\$20
Royalty/printed ref (on-or offline)	8½¢	6¢	5¢

* Low demand, high takeoff, high impact
 ** High demand, high takeoff, low impact

For the average scenario, as an illustration, the pattern of user charges 1978-85, in constant dollars, would be roughly:

Table 12: Real User Charges 1978-85: Average Scenario

1978 Dollars	78	79	80	81	82	83	84	85
Print subscription \$	900	900	900	900	875	850	825	800
Batch subscription \$	6,000	6,000	6,000	6,000	5,800	5,600	5,400	5,200
Royalty/hour \$	15	18	21	24	26	26	26	26
Royalty/ref ¢	2½	3½	4½	5½	6	6	6	6

Assuming 7% inflation, in money terms these would be as follows (rounded):

Table 13: Actual User Charges 1978-85: Average Scenario

Current Dollars	78	79	80	81	82	83	84	85
Print subscription \$	900	960	1,030	1,100	1,150	1,190	1,240	1,280
Batch subscription \$	6,000	6,400	6,900	7,400	7,600	7,900	8,100	8,400
Royalty/hour \$	15	19	24	29	34	36	39	42
Royalty/ref ¢	2½	3½	5	6½	8	8½	9	9½

4. CONCLUSION

User Charges

The main conclusion relates to the title of this study, the impact on user charges of the extended use of online information services. This conclusion reflects the author's opinion, not necessarily those of the Commission, nor of all ISCU AB member services.

It is still too early to say what balance will eventually emerge between online retrieval and printed abstracts journals and indexes. There is much uncertainty as to the future growth of online; and even more as to its likely impact on print subscriptions. Trying to project user charges, which will themselves depend on such uncertain intervening variables, might seem to be a hopeless task.

If the arguments cited in Section 3 ("Modelling the Future") are accepted, however, this is not so. According to these arguments, there is if anything less uncertainty about user charges than about the volumes to which they will apply.

To see why this is so, consider the Widget Abstracts illustration. In this case, it is argued that online user charges will increase in relation to print prices by a factor of $2-2\frac{1}{2}$ times over the next five years, regardless of the level of underlying demand, the takeoff of online, and its impact on print subscriptions. These unknown factors will determine the absolute level of user charges, e.g. whether print prices continue to increase faster than inflation or - rather more likely - begin to decrease slightly in real terms. But the relative user charges for online versus print will still increase by a factor of $2-2\frac{1}{2}$ times (with some shifting of emphasis from connect-hour to offline - and online - print royalties).

There are two inter-related reasons for the projected increase in online royalties in the Widget Abstracts case:

- (a) Current pricing discriminates in favour of online, and against print. This results from a conscious and valid policy of using print revenues to subsidise the cost of online until it becomes established in its own right. Once online is established, such a policy becomes unfair to print users, and it is time to move towards a more neutral policy.* In the case of Widget Abstracts, it is argued that a fully neutral policy would involve a relative increase in online royalties of as much as 3-4 times, so that if online provides 15% of the utility of using the database (as indicated by total expenditure by online users), then it should also contribute 15% of the costs of that database. At present, it contributes only 4% of that cost.

* This argument is not new, see e.g. Kent (1977), Collier (1977), Williams (1977b).

It is then argued that Widget Abstracts would probably adopt the intermediate policy of increasing online royalties by only $2-2\frac{1}{2}$ times, relative to print, and of spreading the change over five years.

- (b) Because it is more neutral, the revised policy greatly reduces the uncertainty for the database producer: he becomes relatively indifferent to the balance which emerges between online retrieval and printed products.

While the numbers will be different for every database producer, if the arguments are accepted, the conclusions will be qualitatively similar. That is, online royalties are likely to increase by at least 100% over the next five years, relative to print prices, in order to remove the current discrimination in favour of online, and in order to cut down the database producer's risks.

Apart from reducing the risks, it is not clear whether the greater commercial benefit currently lies with increasing online or print user charges. The indications are that the price-elasticity of demand is higher for online services than for printed products, e.g. 1.0* versus 0.3, or thereabouts. At present, database charges account for only 20%-30% of the cost per connect-hour, so that a 10% increase in royalties will only increase the cost to the user by 2%-3%. The effective elasticity from the viewpoint of the database producer is thus only about 0.2-0.3 or so, roughly similar to print.

By 1985, however, the database element in the cost per connect-hour is likely to have increased to about half, so that royalty increases will have a more marked effect on the total cost to the user. At this stage, there may again be a temptation for database producers to discriminate in favour of online and against print, by increasing print prices faster than online royalties.

In the meantime, the outlook for print prices is fairly optimistic. While the development of online would be minimal if it had to carry the whole cost of the databases, a shift towards a more neutral policy may well mean a lightening of the burden carried by print subscribers. This conclusion is in line with the broad aims of EURONET: "to make scientific and technical knowledge easily and equally accessible to all potential users within the EEC" - presumably including those users who use printed products.

The INSPEC Decision Model

The above conclusion reflects the author's personal opinion, based on a whole series of assumptions and arguments.

* As assumed in Section 3, i.e. a 1% increase in the total cost per connect-hour would reduce usage by 1%, leaving total user expenditure unchanged. This relates to online services as a whole. For an individual online operator, demand would be much more elastic than this, because users could switch to other operators. A recent attitude study done by J. Walter Thompson Company Ltd. for the CEC suggests that online price elasticity may be rather less than the 1.0 assumed here, but still more than for printed products (because of differences in how the user pay for these two products).

Database producers will make their own assumptions (some of which have been measured by the opinion survey), and some may come to quite different conclusions. To help them in this process, we have developed the INSPEC Decision Model, described in Appendix F and in the user guide, available from ICSU AB. Alternatively, they may prefer to make simpler assumptions as in the Widget Abstracts illustration, and test the results with a pocket calculator. Either way, it is hoped that the tools provided by this study will be of some help.

Empirical Findings

In order to project user charges into the future, we have had to go well beyond the proven facts. Some support for the assumptions, however, comes from the study's empirical findings. These are described in Section 2 ("Analysis" and in more detail in Appendix B ("Previous Published Research"), Appendix D ("Survey of ICSU AB Member Services: Recent Revenue Patterns") and Appendix E ("Survey of Expert Opinion"). They include the following tentative findings:

- (a) Subscriptions to printed abstracts journals and indexes showed no increase over the period 1973-77, and in many cases declined. This was in contrast to the marked growth of the previous year 1972-73. The main reason for the slow-down was a reduction in the level of underlying demand, largely caused by economic factors. Some drop in subscriptions resulted from real price increases of about 2% p.a. (on top of 8% inflation), necessary to keep pace with cost increases. The impact of price increases seems to have been limited, however: revenue analysis suggests that the price-elasticity of demand was low, of order 0.3 or so (that is, for each 1% real increase in price - over and above inflation - subscriptions typically decreased by 0.3% or so).
- (b) The impact of online retrieval on print subscriptions seems so far to have been small. There is extreme uncertainty about whether this will continue to be the case, but the balance of opinion seems to be that the growth of online will mainly reflect an increase in the volume of searches, rather than a switch from the use of printed products.
- (c) There is also much uncertainty about how much online usage will grow over the period 1978-85. Some of this uncertainty stems from differences of opinion about the future costs of online searching, while great uncertainty relates to the availability and usage of new bibliographic databases, and of full-

text, factual, and numeric data banks. For bibliographic databases already in existence in 1978, most experts seem to expect an overall increase in online searches of between $2\frac{1}{2}$ and 10 times. (The author's view is that the outcome will be in the bottom half of this range.*)

As well as the above, the study has confirmed what was already fairly well-known, that at least 90% of database producers' revenue still comes from printed products. The other 9%-10% includes a small proportion from microforms, but comes mostly from sales of tapes to batch and online service operators. For the ICSU AB survey sample, 1978 is expected to be the year when online revenues overtake those from batch (which are expected to start decreasing). But online is still only contributing 4%-5% of the total - much less than the proportion of user expenditure devoted to online retrieval in the same subject areas (15% or so, depending on which expenditures are included).

Recommendations

Recommendations are again very much a matter of personal opinion.

The main recommendation is that database producers should as soon as possible go through the process Widget Abstracts went through in Section 3: deciding where they think they might be in the early to mid 1980's; and, if appropriate, changing course smoothly, now - not suddenly, later. (The tools developed during this study may be helpful here.)

The other recommendations relate to the need for more facts. Collecting these facts is more a question of organisation and co-operation than of massive expenditure.

The facts which most need to be collected relate to the total volume of on-line usage, and its impact on print subscriptions. These should be monitored systematically, once a year. This will involve international co-operation among and between database producers, online service operators, and user organisations. It will also involve some improvement in record-keeping, as well as finding ways of coping with the problem of confidentiality and comparability between organisations**. Initially at least, it will involve direct rather than postal contact.

* In the author's view, many commentators seem to be over-optimistic about the decreasing cost of online searching, perhaps through overestimating the electronic hardware element as a proportion of total cost. Both the online operators and (especially) the database producers have large staff costs, while the hardware for offline printing is more electromechanical than electronic. Telecommunication costs may be expected to keep falling due to new technology (better hardware, packet switching), but already represent only a small cost element in the USA. In Europe, telecommunications do represent a large cost element, giving users a disadvantage compared with US users. EURONET will remove this anomaly.

** These problems were substantial for the survey of ICSU AB member services' revenue patterns in the present study.

Monitoring the impact on print subscriptions will be trickier than monitoring online usage. It will involve disaggregated data, ideally at the level of the individual user, to see to what extent

- (a) Online users are also print subscribers
- (b) Organisations that initially use both online and printed products in the same subject area end up cancelling the printed ones.
- (c) Users who cancel print subscriptions say they do so because of the use of online, in their own organisations, or elsewhere.

Apart from the immediate need for more facts about online usage, and its impact on print subscriptions (to tell us which of the 1985 scenarios is unfolding, as soon as possible), there is need for more long-term research into detailed usage patterns. This is discussed in Appendix G. If successful, such consumer research will facilitate the development of improved products.*

* At present, because online is a marginal activity for the database producer, his database development tends to be print-orientated. The shift to a mixed economy of print and online will bring the new challenge of ensuring that development takes full account of online as well as print requirements.

APPENDIX A

PHASE I REPORT: STATEMENT OF METHODOLOGY

The main emphasis of the study is on the future, not on the past. Because the methodology is unusual in some respects, it will be spelt out in some detail.

The overall research design aims to be extensive, rather than intensive, and progressive, rather than ad-hoc. The analysis of data aims to be simple and data-based, rather than based on sophisticated techniques. The future projections are based on testing of assumptions, not on forecasting.

- a) Extensive research design. The original proposals were for an intensive analysis of up to 20 years' historical sales data. The current methodology is to analyse data going back to just 1972 (i.e. 1-2 years before the recession began), while broadening the study to include:

- a compilation and analysis of previous research,
- the measurement and analysis of informed opinion about the recent past and (especially) the future,
- an explicit attempt to explore ways in which the future might develop; this exploration to be computer-assisted.

At this early stage, the collection and analysis of long-run historical sales data - however technically excellent - will not tell us about the market in 1985 or even 1980. The aim is therefore to collect as many bits of the jig-saw puzzle as possible, make various guesses about the missing bits, and test the effect of different guesses on the overall pattern.

A spin-off of this approach is that it reduces the amount of sales data requested from the data base producers: that is, the original methodology would have asked for even more.

- b) Progressive, as opposed to ad-hoc. The study aims explicitly to build on previous research, and to produce results in a form that facilitates follow-up. The inclusion of a literature search during the first phase of the study should help to avoid "re-inventing the wheel". (Since the study is itself about literature search, there is also reason to argue that one should be prepared to "take one's own medicine").

Similarly the analysis of recent sales patterns, the study of informed opinion and the attempt to model the future will all aim to provide a solid foundation for future studies, as well as producing results during Phase II.

The split into a feasibility study and a substantive main study, as specified in the original brief, is in line with this progressive, step-by-step approach.

- c) Simple, data-based analysis. This is in contrast to the conventional use by social scientists of sophisticated statistical packages processed by computer. Examples of such packages are multiple regression and factor analysis. These tend to assume that the data have a given form; the computer then derives various coefficients of "best fit".

Data-based analysis tends to make less prior assumptions about the data, unless one has specific previous knowledge (which in this case we do not). It uses simpler, manual techniques, like taking averages, to try and discover what the patterns really are. For instance, in the search for evidence as to whether online has already impacted sales of printed products, we might compare the recent sales patterns for:

- the USA (where online has developed further than elsewhere) with Western Europe,
- data bases available in both forms with those at present available only in printed form.

The questionnaires on sales and opinions have been designed to facilitate such analysis.

One anticipated benefit of the proposed approach is that the results should be easier to interpret than a table of correlation or regression coefficients, or a list of factors and factor loadings.

- d) Testing of assumptions. The objections to computerised multivariate analysis also apply to forecasting by extrapolation, especially if the forecasts involve single-point estimates. In the case of the present study, there are in any case not yet enough data for the building of a credible forecasting model. Our modelling of the future must therefore be more exploratory, by forcing us to make explicit our assumptions and beliefs, and then testing them as follows:

- Are they internally consistent?
- How do the assumptions of different individuals and groups differ? What arguments can be put forward in support of a given set of assumptions?
- What are the implications of each set of assumptions, especially in terms of the ability of data base producers to cover their costs?
- What are the most critical variables?

In this way we can explore the nature of the problem, and perhaps move towards consensus views about the likely future and what should be done about it.

APPENDIX B

PREVIOUS PUBLISHED RESEARCH

Appendix C is a selective annotated bibliography, listing recent published items of relevance to the present study. It is not claimed to be comprehensive.

The dangers of online retrieval from the viewpoint of the database producer - and ultimately, of the user - have been eloquently stated by Kent (1977) and Collier (1977). As far as we know, the present study is the first specific attempt to develop these arguments further. But many related issues have been studied in depth in the published research.

Background and General

A good short general introduction to online retrieval is Barraclough (1977). Several other items give fuller general discussions, each from a slightly different viewpoint. Thus Atherton and Christian (1977) provide a "cook-book" for librarians, while Williams (1977a) and Bidmead (1976) trace the developments of online in the USA and UK, respectively; while Wilmot (1976) contrasts the patterns in these two countries. The wide-ranging discussion in Pratt and Harvey (1976b) covers a number of specifically European issues, as well as the relationships between governments, the information industry and the user. Marshall (1975) proposes user criteria for deciding which online service(s) to use. Further detail may be found in the review articles by Marron and Fife (1976) and Stern (1977), and in Hall's bibliography and sourcebook (1977a and b).

European Network Development

While telecommunications now represent quite a small element in the cost of online retrieval in the USA, in Europe they are still much more significant. European network development is therefore relevant to this study. Diebold Deutschland (1975) and Pandata BV (1975) respectively cover the economics, and the proposed implementation plan, for the EURONET network. More recently, Dunning (1977) reviews the history of EURONET, and its planned future. Tomberg (1977a), in a more prescriptive study, covers the range of European information networks, and their likely future.

Online Usage

The main attempt to-date to measure the patterns of online use is the large-scale user survey reported by Wanger et al (1976). This important report includes a wealth of data on the adoption of online services by users, how such services are charged and promoted within the user organisation, what benefits are seen by the information manager and the main searchers, and so on. Detailed usage data - number of searchers, of searches, of sessions at the terminal, of connect hours, etc - are harder to interpret and reconcile, partly because of definition problems. Aggregate usage for 1975 is reported as at least half a million searches. Numerous other aggregate figures have been quoted, e.g. by Cuadra in Pratt and Harvey (1976b), Barlow (1976), Tomberg (1977b), Williams (1977b), Page (1978), Vickery and Batten (1978). A summary is given in Hall (1977b), who concludes that in 1976 there were 1.2 million searches in the USA (with a growth rate of about 20% p.a.), and that European usage should well exceed a million searches a year within the decade 1980-90.

Individual Online User Studies

While Wanger, et al (1976) collected standardised cross-section data from many users at a particular point in time, other studies have traced individual users' experiences through time. Thus Benenfeld et al (1975) and Pensyl and Woodward (n.d.) describe MIT's experiences with online. Hawkins (1976) does

the same for Bell Laboratories, Ahlgren (1975), Cooper and DeWath (1976), and Firschein, et al (1978) for public libraries in California, Vickery and Batten (1978) for London University, and Hitchingham (1976) for the use of MEDLINE at Oakland - a university without a medical school. Other studies include those reported by Brown (1977), Fosdick (1977), Holmes (1975 and 1976), Hoover (1976) and Tagliacozzo (1975). Again, Hall (1977b) gives a concise summary.

A detailed study of user interface problems is reported by Briggs (1976), while the particular problems of the small user are discussed by Pickup (1978). Williams and Curtis (1977) discuss the role of the intermediary.

Online versus Manual Searching

The above studies focus on questions of implementation: staff and end-user attitudes, training and promotion, the impact on inter-library loans, etc. Other user studies focus more on the costs and benefits of online versus manual searching, e.g. Elman (1975), Akeroyd and Rogers (1976), Calkins (1977), Smith (1977), and Johnston and Gray (1977). The general conclusion is that, if staff costs are included, online searching is more cost-effective than extensive manual searching, but that there is room for both. Several studies, e.g. Akeroyd and Rogers (1976), Smith (1977), Johnston and Gray (1977) stress that the best method will depend on the particular database and the particular search profile, and that in some cases online and manual techniques should both be used for the same search. Manual searches tend to have lower recall than online, but the ability to browse can lead to higher precision, and to the finding of relevant material at the edges of the search profile, which would be missed by an online search.

Hall (1977b) quotes data from Engle at Cornell University, illustrating the fact that, even before online, the number of extensive manual searches by library staff was small. It seems generally agreed that the number of searches carried out by library staff increases greatly with the advent of online. What is not clear is to what extent online causes a reduction in the use of printed products by individual end-users.

The Impact of Online on Printed Products

None of the reported studies gives hard, behavioural data on the impact of online on the overall use of printed A & I products. Some related user attitudes are reported by Holmes (1976), who found that most searchers felt that online would supplement, not supplant, existing search methods.

Quite apart from online retrieval, there seem to be almost no data on the actual use of printed products. The one published study we have traced, Bingham (1974), found the reported frequency of use of CAS issue and volume indexes to be 33 per week. Further work would be needed to replicate this finding, and test how typical it is for users in general and A & I products in general (it sounds above-average to the present author). More important, the Bingham study was designed to measure the frequency of use, not the purpose and nature of that use. Despite the problems of definition and measurement, it would be of great value if this gap in our knowledge could be filled. Perhaps the Jahoda study at Florida State University, mentioned on p. 197 of Wanger, et al (1976), will help us here.

Even without precise knowledge of the use of printed products, librarians will have to decide which ones to cancel, and which to continue with, once their use of online stabilises. By 1980-81, there should be at least some user studies which report on such decisions. A related study for primary journals, (not abstracts journals and indexes) is reported by Woodward (1978).

Production and Processing Costs

For reasons of confidentiality, the costs of producing and processing bibliographic data tend not to be published for individual organisations. A general review is given by Dammers (1975). System Dynamics SA (1976) evaluate the cost structures of six European information systems (UKCIS, UK Medlars, TITUS, SABIR, IFIS and IRRD), and find no general pattern.. Related issues are addressed by Page (1976), in particular the relative benefits of national versus international systems. Vickers (1977), and Vickers and Rowat (1977), report general-purpose systems for cost accounting, and cost prediction, respectively. The Commission of European Communities (1977), using the Vickers approach of splitting costs into input (database production) and output (extracting and disseminating the data), survey the costs of 18 systems within the EEC. Despite the disparity between systems, some general pricing guidelines are proposed. The OECD (1974) report describes a comparable earlier study, which covered US as well as European systems.

Primary Literature Growth

The relation between database production costs and the underlying growth of primary literature is stressed by Barlow (1976).

King Research Inc (1977) gives extensive data on primary literature growth in the USA, while Clasquin and Cohen (1977) and the Library Association Record (1972-78, ref. 47) show how the prices of primary journals have increased. Fry and White (1976) discuss in depth the relationship between publishing costs, prices, library budgets and journal subscriptions. The IEEE conference (1977) discusses economic and technical factors of primary publishing, while Woodward (1978) focusses on how librarians decide which subscriptions to renew, and which to cancel. Hindle and Raper (1976) take an overall view of the science information system, with a view to modelling the costs and benefits of different further developments.

Pricing of Online Services

A comprehensive analysis of online user charges in late 1977 is given by Page (1978), focussing on the database element. Pratt and Harvey (1976a) discuss the cost of online searching at various volume levels, and the effect of possible future trends, while a detailed price comparison for searches using BRS, SDC and Lockheed is given in the controversial article by Bement (1977). Wish and Wish (1975) discuss favourably the scope for libraries to sell search services on the open market at various price levels. Flowerdew, et al (1976) explore the likely impact of overall price on the growth of online usage in Europe.

The likelihood of increased database charges is discussed by Kent (1977), Collier (1977), Williams (1977b) and Page (1978).

Future Growth of Online Usage

The past and future development of online usage, including the problems as well as the opportunities, are discussed by Barlow (1976), Williams (1977b) and Cuadra (1977), in generally optimistic terms. Even more optimistic is the forecast for European online usage 1976-85 by PA Management Consultants (1975). A note of caution is sounded by Tomberg (1977b) and Lindquist (1977), who describe the growth of online as already slowing down. The lack of hard data on aggregate usage is a major problem.



APPENDIX C
ANNOTATED BIBLIOGRAPHY

1. Ahlgren, A.E. Factors affecting the adoption of online search services by the Public Library. Information roundup: Proceedings of the 4th ASIS Mid-Year meeting, Portland, Oregon, May 15-17 1975. F.G. Spigai and others (eds.); Washington, DC, 1975. pp. 123-132.

The DIALIB research program providing online retrieval services to four US public libraries on an experimental basis, analyses the various cost factors in providing such a service. These include system installation and operation; individual search costs; staff training and time; subsequent document retrieval; administrative costs. User characteristics and effects on the overall library structure should also be considered.

2. Akeroyd, J. and R.C. Rogers. Online information retrieval: a comparison of manual and machine searching. Hatfield Polytechnic, 1976. 25 pp. (BLRDR 5370)

Analyses the comparative results of 10 selected retrospective literature searches carried out both manually and online, by end-users and by an intermediary, using NTIS. Results reveal the differences in search time and a low correlation between material retrieved via each system as well as the relative cost-effectiveness of each system. Proposes criteria for choosing which search method to use.

3. Atherton, P. and R.W. Christian. Librarians and online services. White Plains, NY, Knowledge Industry Publications, 1977. 124pp.

Comprehensive guide to setting up online retrieval services in libraries examines the present extent of online service in libraries, its advantages and impact; problems encountered in setting up the service; financial considerations; methods of operation; marketing and promotion; management and control. Finally, "a look at the future" discusses future effects of online services and the role of commercial services in relation to libraries.

4. Barlow, D.H. A & I services as database producers: economic, technological and co-operative opportunities. ASLIB Proceedings, v. 28, no. 10, October 1976, pp. 325-337.

Conference paper identifies four problem areas for A & I services: economic pressure, technological change; literature growth and market decline, and discusses the effect of these and some of the barriers to progress. Describes some significant and advantageous technological developments (word processing, economic models; synopsis journals), and pin-points areas where more co-operation between services would be fruitful.

5. Barraclough, E.D. Online searching in information retrieval. Journal of Documentation, v. 33, no. 3, September 1977, pp 220-238.

Good introduction to the subject of online. Discusses developments in online information retrieval systems, including online processing; problems of user/computer interaction; expectations from online systems; user reaction to terminals; user instruction; command language versus natural language; thesaurus development; increasing role of the intermediary; performance and cost of online systems, compared with manual searches. Predicts increasing popularity, proliferation of systems and databases and refinement in thesauri.

6. Eement, J.H. The new prices - some comparisons. Online, v. 1, no. 2, April 1977, pp. 9-22. (For comment by C.A. Cuadra see Online v.1, no. 4, October 1977, pp. 13; 90-91/Editorial Comment: Online, v. 1, no. 4, October 1977, pp. 6-8).

Two searches using INFORM and ERIC, were carried out on three systems (BRS, SDC and LOCKHEED) to achieve a thorough cost comparison. Further tests are necessary before reaching any definitive conclusions but it appears that BRS as a new system is competitive with SDC and Lockheed. Full search details are appended.

These conclusions are contested by C.A. Cuadra and the editorial comment raises further questions for consideration.

7. Benenfeld, A.R., M.E. Pensyl and R.S. Marcus. User receptivity to fee-for-service computer-based reference in a university community. Information revolution: Proceedings of the 38th ASIS Annual Meeting, v. 12, Boston, Massachusetts, October 26-30, 1975. C.W. Husbands and R.L. Tighe. (eds.), Washington, DC, ASIS, 1975. pp. 151-152.

Results of questionnaire to assess user receptivity to online information services at M.I.T. are favourable to the usefulness of the service, but more publicity is needed to attract potential users. Possible refinements are suggested, e.g. more uniformity and greater simplicity so that users can conduct their own searches.

8. Bidmead, M. (ed.) Use of computers in libraries and information centres: Proceedings of a conference held by ASLIB with the co-operation of the ASLIB Computer Applications Group in London on 19-20 May 1975. London, ASLIB, 1976. 94pp.

Variety of papers on the patterns of development in computer usage with particular reference to information retrieval. Final summary indicates four main factors conducive to increased use of computers; greater flexibility; cost of labour; reduction of routine work; increasing demand for information.

9. Bingham, A. Marketing in a partnership environment. Part 1 - Chemical Abstracts (Issue and volume indexes), Part 2- Chemical Abstracts (section groupings). UKCIS, 1974. 2 vols.

Study assesses the market for additional copies of Chemical Abstracts and its various off-shoots. Subscribers were asked to submit information concerning type and frequency of use and storage problems. Main conclusions are that the average uses per week of the Abstracts is 33.5 whilst for section groupings the figure is 7.2; Chemical Abstracts is used mainly for retrospective searches and the Groupings for current awareness. Seems to be some demand for extra copies, but this is dependent on available storage space.

10. Briggs, R.B. The user interface for bibliographic search services. The Use of computers in literature searching and related reference activities in libraries. F.W. Lancaster (ed). Urbana-Champaign, Illinois, University of Illinois: Graduate School of Library Science, 1976. pp. 56-77.

Joint research project between University of Georgia and UCLA examines user interface problems with a view to constructing models of the search services and for a multidisciplinary bibliographic information network. Results of questionnaires are analysed into user characteristics, intermediary characteristics, the interviewing process between user and intermediary, users questions, profile of coding and search results, with user and intermediary reactions. Conclusions note in particular the need for an intermediary assisted by a system specialist.

11. Brown, C.P. Online bibliographic retrieval systems use. Special Libraries, v. 68, no. 4, April 1977, pp. 155-160.

Small evaluative study of user reaction at the National Bureau of Standards Library, shows that whilst library staff are enthusiastic, other users have reservations concerning cost and difficulties of use. Reduced costs, continual promotion of the services and more training ~~are needed~~ to persuade potential users to take advantage of online retrieval.

12. Calkins, M.L. Online services and operational costs. Special Libraries, v. 8, no. 1, January 1977, pp 13-17.

Assesses favourably the cost-effectiveness of online information retrieval systems compared with manual searches at the US Environmental Protection Agency Library. Outlines recent system developments and puts forward suggestions for future improvements.

13. Clasquin, F.F. and J.B. Cohen. Prices of physics and chemistry journals. Science, v. 197, no. 4302, 29th July 1977, pp. 432-438.

Analyses cost of 294 physics and chemistry journals between 1967-1976, compares results with previous studies and concludes that the 1976 index figure for physics was 340, and for chemistry 300, versus 170 for consumer prices (1967 = 100). Discusses implications of this for academic science libraries, the main effect being a great distortion of stock and resources. Suggests financial support from the State should be provided.

14. Collier, H.R. Long term economics of online services and their relationship to conventional publishers seen from the data base producers' viewpoint: Paper presented at the 51st ASLIB Annual Conference, University of Lancaster, 20-23rd September 1977. ASLIB Proceedings, v. 30, no. 1, January 1978, pp. 16-24.

Describes database producers and costs involved in production with detailed breakdown of online costs to the user. Stresses the balance between income from printed index and online services, both provided by the database producers, and suggests that the two forms will continue to complement each other.

15. Commission of the European Communities. Cost of scientific and technical information and documentation systems. Luxembourg, Commission of the European Communities; Scientific and Technical Information and Information Management, 1977. 193 pp. (EUR 5531).

Surveys the costs of 18 selected STID systems in EEC member states to provide guidelines for a pricing policy for automated information retrieval systems within the EEC. Analyses input and output costs involved in producing a database and subsequently extracting information, and gives breakdown of total operating cost of an information system. Conclusions note the difficulties of making generalisations because of the disparity between systems and suggests pricing policy should take this into account.

16. Cooper, M.D. and N.A. DeWath. The cost of online bibliographic searching. Journal of Library Automation, v. 9, no. 3, September 1976, pp. 195-209.

Analyses cost and time of 400 online searches at four public libraries using Lockheed DIALOG; each request involving seven tasks which were also analysed. Labour costs, database charges and off-line print charges were considered but telecommunications and administrative overheads were not. Cost and time figures varied widely between the

libraries but the average cost was \$28 and the average request took 7-8 days to complete.

17. Cuadra, C.A. Commercially funded on-line retrieval services - past, present and future: Paper presented at the 51st ASLIB Annual Conference, University of Lancaster, 20-23 September 1977. ASLIB Proceedings, v. 30, no. 1, January 1978, pp. 2-15.

Outlines development of computer information retrieval systems with illustrations of typical searches, and indicates rapid recent growth of commercial services, particularly in the US. Forecasts that in the future, more databases will be available which will be more sophisticated, cheaper and easier to use. Particular developments worth noting are the online KWIC index and the personalised system.

18. Dammers, H.F. The Economics of computer-based information systems; a review. Journal of Documentation, v. 31, no. 1, March 1975, pp. 38-45. (For comment by W.A. Martin see Journal of Documentation, v. 31, no. 3, September 1975, p. 218).

Reviews developments in automated information storage and retrieval when optimism in the 50's and 60's gave way to disillusionment with the comparative costs of running computer systems and user resistance. However, recent developments have led to decline in comparative costs and higher demand for retrospective searches and this trend is likely to continue in future with strong effect on libraries. Suggests that assessment of benefits and costs is necessary to relate developments to local needs and facilities.

19. Diebold Deutschland GmbH. The Economics of the European information network (EURONET): Study on the cost of alternative network configuration and related questions. Frankfurt, Diebold for the Commission of the European Communities, 1975, 24pp. plus Appendices A, B, C of 25pp.

Surveys economics of three alternative approaches to future European networks:

- 1) centralised versus national online retrieval systems, where the annual operating costs of the former is 10 million DM cheaper;
 - 2) distributed system versus independent star networks, where cost difference favours the former by 500,000 DM, despite greater initial outlay;
 - 3) leased lines versus dial-up lines, where for optimum cost-effectiveness, decision should be made individually for each connection within EURONET.
- Also recommends a thorough appraisal of EURONET benefits for the user in order to obtain a sound estimate of the total economics of the system.

20. Dunning, A.J. The origins, development and future of Euronet. Program, v. 11, no. 4, October 1977, pp. 145-155.

Traces history and principles behind the setting up of EURONET and describes the first Action Plan (1975/77) concerned with implementing the network, using packet-switching technology, and examines economic aspects and methodology. Also discusses future plans, in the form of a second Action Plan (1978/80), bringing EURONET into operation.

21. Elman, S.A. Cost comparison of manual and online computerized literature searching. Special Libraries, v. 66, no. 1, January 1975, pp. 12-18.

Analyses and compares cost and searching time of manual and online literature searches and concludes that computer searches are cost-effective.

22. Firschein, O., R.K. Summit and C.K. Misk. Use of online bibliographic search in public libraries, a retrospective evaluation. Online Review, v. 2, no. 1, March 1978, pp. 41-55.

Analyses the results of the DIALIB project which provided online bibliographic retrieval service in four public libraries in the US for three years. Originally free of charge, during the second year at half cost and in the final at full cost. Evaluates type of user (mostly academic and professional); use of databases (mostly ERIC and PSYCH ABS); library staff reaction and time and cost of searches. Conclusion warns of possible future competition between libraries and commercial information brokers.

23. Flowerdew, A.D.J., J.J. Thomas, and C.M.E. Whitehead. Demand for online information. Luxembourg, London School of Economics for the Commission of the European Communities, 1976. 2 vols.

Study to determine a pricing policy for the EURONET system examines "the likely short-term and long-term price elasticities of demand for online information services", using data already available from previous studies as well as new material collected by questionnaire. Results indicate that the rate of expansion of online depends heavily on the type of data available (i.e., more than purely bibliographic); that charging systems should be related to use and that price increases of up to 20% could occur before greatly affecting demand. Demand depends heavily on budget availability within the individual organisation and there is some difference of opinion as to whether manual searching is a comparable alternative. Finds that a EURONET monopoly is generally not a good idea whilst government involvement, especially financial aid, would be valuable.

24. Fosdick, H. An SDC based online search service: a patron evaluation survey and implications. Special Libraries, v. 68, no. 9, September 1977, pp. 305-312.

Evaluative study of user and non-user reaction at CERL Library shows fairly high satisfaction, with costs not a significant factor. Finds subsequent access to relevant documents is more significant and suggests funds be made available to solve this problem. Also, user presence at the search is preferable and trends may be towards the end-user actually performing the search.

25. Fry, B.M. and H.S. White. Publishers and libraries: a study of scholarly and research journals. Lexington, Mass., Lexington Books, 1976. 167pp.

Analyses results of a study held in the US between 1969-73 to examine the economic relationship between publishers and libraries. Examines libraries' budgets; measures taken to counteract economic pressures; borrowing and lending activities; scholarly and research journal, publishing; costs and revenues. Concludes that cost of publishing such journals is not being met by main subscriber i.e. the library, due to increasing economic restrictions and neither sector is acting very positively to correct this situation. Recommends more co-operative publishing and financial support from the state for author, publisher or library.

26. Hall, J.L. (comp.) Online information retrieval 1965-1976; a bibliography with a guide to online data bases and systems. London, ASLIB, 1977. 125 pp. (ASLIB Bibliography No. 8).

Comprehensive bibliography covering the period up to Summer 1976 aims to present a conveniently organised introduction to the literature. Also give guides to databases available and to past and present systems which have been devised.

27. Hall, J.L. Online information retrieval sourcebook. London, ASLIB, 1977. 267 pp.

Aims primarily to be a "book of sources", but includes a broad introduction to online retrieval and a short historical perspective. Chapters 4 and 5 summarise previous research on the online user, and on the cost and time of searches. The bulk of the sourcebook comprises directories of databases and systems, and a bibliography of 425 references, mostly published 1974-77. Gives further detail of DIALOG, ORBIT, ESA-RECON, STAIRS and BLAISE.

28. Hawkins, D.T. Impact of online systems on a literature searching service. Special Libraries, v. 67, no. 12, December, 1976, pp. 559-567.

Describes use of online retrieval systems at Bell Laboratories in 1975 comparing use of systems and databases and costs involved. Notes the effects on library services and concludes with a list of economically worthwhile advantages in using online systems, completeness, expansion of resources, modest costs, speed, good offline printout, flexibility and high productivity.

29. Hindle, A. and D. Raper. The economics of information. Annual Review of Information Science and Technology, (Vol. 11) M.E. Williams (ed.) Washington, DC, ASIS, 1976, pp. 27-54.

Reviews the literature and discusses three problem areas - the economic environment, the measurement of objectives or goals and the methodology of economic analysis. Identifies four areas of concentration: specialised information services; systems of libraries (i.e. library co-operation and networks); the library system; collection control. Reviews cost benefit analysis and modeling in each of these areas and suggests possible future research.

30. Hitchingham, E.E. MEDLINE use in a university without a School of Medicine. Special Libraries, v. 67, no. 4, April 1976, pp. 188-194.

Evaluates free searches to test user satisfaction. Results show that most searches were of major value with an average precision value of 54%. All users show willingness to pay for future searches. Concludes that MEDLINE can operate successfully in a non-medical environment and offers a fairly cheap introduction to further online services.

31. Holmes, P.L. British Library feasibility study for UK based online information services; market assessment. Provisional Report. London, British Library Research and Development Department, 1975. 41 pp. (BLRDR 5374).

Describes two parallel studies - one on individuals and one on organisations - to assess potential use of three main databases (CHEMCON, INSPEC & MEDLARS). Results suggest a substantial potential market with a price of £10 per search but the growth rate of this market is not forecast. This study is linked to the P.A. International Management Consultants survey of the potential market for Europe.

32. Holmes, P. Online information retrieval: an introduction and guide to the British Library's short-term experimental information network project. vol. 1 Experimental use of non-medical information services. British Library Research and Development Dept. 1967. 61 pp. (BLRDR 5360HC).

Evaluates results of a British Library research programme at user centres (mostly academic institutions) throughout the UK to estimate the technical, economic and user value of online retrieval systems with a view to setting up permanent services. Records user reactions, especially in comparison with traditional search methods, the relationship of the service to other library resources and the role of the intermediary.

33. Hoover, R.E. Patron appraisal of computer-aided on-line bibliographic retrieval services. Journal of Library Automation, v. 9, no. 4, December 1976, pp. 335-350.

Shows from survey of user reactions at the University of Utah Marriott Library that the service is unanimously felt to be worthwhile; that cost increases would affect post-graduate students rather than other researchers, (although the speed advantages largely overruled the cost), and that it increases use of other library services. Finds that social science searches take longer than pure science searches and CAC, ERIC, NTIS and PSYCH ABS are most frequently used.

34. IEEE Conference on Scientific Journals, 1977. IEEE Transactions on Professional Communication. Vol. PC-20, no. 2, September 1977, pp. 49-136

Special issue reproduces 30 papers given at the conference covering the publishing environment and the future impact of economics and technology; technological innovations in production; relationship between periodical publishers and libraries; life-cycle of journals; future technology including database production; journal management, marketing and editorial content.

35. Johnston, S.M. and Gray, D.E. Comparison of manual and online retrospective searching for agricultural subjects. ASLIB Proceedings, v. 29, no. 7, July 1977, pp. 253-258.

An investigation at the Ministry of Agriculture, Fisheries and Food Library shows that online searches are less time consuming, cost about the same and give higher recall but lower precision of data than parallel manual searches. Concludes that machine searching is a viable alternative for libraries although consideration should be given to the differences between the printed and machine-readable forms of database before making the choice between a manual and online search.

36. Kent, A.K. Dial-up and die-can information systems survive the online age? Paper presented at the 6th Cranfield Annual Conference on Mechanised Information Storage and Retrieval Systems, July 1977. 4 pp.

Provocative paper claims that online retrieval is non cost-effective and inefficient because online databases operate at marginal costs and are heavily subsidised by the printed versions. Argues that more investment more co-ordination and a closer examination of user needs are necessary if matters are to improve.

37. King Research Inc. A chart book of indicators of scientific and technical communication in the United States. Washington, DC, National Science Foundation, 1977. 23 pp.

Prepared by King Research Inc. for the National Science Foundation, gives data on US scientific and technical communication 1960-75, with projections to 1980. Includes expenditure in total, by function, by medium etc; number of scientists and engineers; literature growth and prices; subscribers per journal; number of libraries; number, size and growth rate of US bibliographic databases in 1975; and data on federal involvement.

38. Lindquist, M.G. An explanation of the coming stagnation of information search services. Online Review, v. 1, no. 2, June 1977, pp. 109-116.

Suggests previous studies have over-estimated probable growth rates and results of a simulation study show that initial rapid growth in users of an individual ISS slows to stagnation point after two years, followed by slower annual growth rate. Argues that this stagnation will probably be reflected in the industry as a whole unless new ISS's are introduced.

39. Marron, B. and D. Fife. Online systems - techniques and services. Annual Review of Information Science and Technology, (Vol. 11), M.E. Williams (Ed.) Washington, DC, ASIS, 1976, pp. 163-210.

Review of selected literature published 1974-75, covering technological developments; online information retrieval services; problems of user interface; government involvement; copyright and royalty problems. Concludes with a general outlook on future developments, based on significant trends revealed by this literature.

40. Marshall, D.B. User criteria for selection of commercial online computer based bibliographic services. Special Libraries, v. 66, no. 11, November 1975, pp. 501-508.

Analyses important criteria to be considered for selection, use and evaluation of online retrieval systems, including the needs of the user; selection of hardware; transmission factors; what is provided in the package by the system and its vendor; databases; search strategies and evaluation methods; the user/system interface. Gives useful quick checklist.

41. Organisation for Economic Co-operation and Development. Directorate for Scientific Affairs. The costs of mechanized information systems. OECD, 1974. 99 pp.

Analyses in the first section the results of a survey of 18 systems in Europe and the US, including database producers, database processors and self-contained systems. Unit costs were derived for most operations and an overall pattern of cost distribution established. Finds that system management, salaries and staff productivity affect costs more than technical production. Then uses this data to estimate costs of an information processing network by means of mathematical models and shows cost advantages of a network over a single system. Makes suggestions for further research.

42. P.A. International Management Consultants Limited. Forecast of users of Online retrieval services for scientific and technical information in Europe, 1976-1985. London, P.A. for the Commission of European Communities, 1975. 72 pp. plus Appendices A,B,C, of 60 pp.

Detailed analysis of the forecast shows a probable dramatic increase in users throughout Europe, covered by falls in cost, an increase in databases and improved reliability of systems. Final section of the report sets the scene for the role of EURONET in the field of information retrieval in 1980.

43. Page, J. Charges applied for online use of databases: charging practices of database producers: (EFAG 21): Final report. Luxembourg, Commission of the European Communities, 1978. 145pp.

Analyses charging systems of 80 database producers and how these are reflected in the prices charged by the operator to the user, in order to examine the effect on the development of Euronet pricing policies. Identifies three charging systems: no charge systems, fixed published-priced systems and confidential business arrangements. As a result of recent decline of the former, the database element in prices charged to the user is now between 20-40%, showing an increasing trend. Other elements to be considered are communication charges and the cost of printed references.

44. Page, J.R.U. Co-operative information systems: a case study. Luxembourg, Commission of the European Communities, 1976. 186 pp.

Study of the origins and history of eight international systems (GEODE, IDC, IFIS, IRRD, DIMDI, MEDLARS, SDIM AND TITVS) investigates the advantages and disadvantages of international and nationally based systems with particular reference to costs and looks at the patterns of cooperation.

45. Pandata BV. EURONET implementation study. Rijswijk ZH, The Netherlands, Pandata BV, 1975. 2 vols. (Report TR 5113-01).

Discusses the implementation of the physical network for EURONET. Proposes a four-phase action plan (pilot, transition, extended and long-term) between 1975-85. with a gradual increase in nodes, hosts and networks. In order to get started quickly, recommends that EURONET be based on the existing Cyclades/Cigale network, with added features. Also advises close involvement of PTTs and the establishment of a temporary development organisation, to be succeeded by a permanent management organisation.

46. Pensyl, M.E. and S.E. Woodford. Patterns of growth in a university's fee-for-service online search center. (NASIC) n.d. 5 pp.

Reports on improvements to the online search service (NASIC) at MIT after centralisation took place. Results were notably increased use, more cohesive planning and development, stronger promotion, impact on inter-library loans and other library services, more specialised staff and greater efficiency.

47. Periodical prices. Library Association Record, v. 74, no. 8, August 1972, pp. 144-145; v. 75, no. 8, August, 1973, pp 157-158; v. 76, no. 8, August 1974, pp. 153-154; v. 77, no. 8, August 1975, pp. 189-190; v. 78 no. 6, June 1976, pp. 249-250; v. 79, no. 5, May 1977, pp. 244-245; v. 80, no. 5, May 1978, pp. 226-227.

Annual survey of periodical prices analyses by major subject groups, by country of origin and by subject divisions. The sample based on the

"most important journals in each subject field" gives average prices and index figures. Main trends show a gradual levelling off of prices recently after heavy increases in the early 1970's.

48. Pickup, J.A. Commercially funded services - an appraisal from the viewpoint of the smaller user: Paper presented at the 51st ASLIB Annual Conference University of Lancaster, 20-23 September, 1977. ASLIB Proceedings, v. 30, no. 1, January 1978, pp. 25-33.

Discusses problems arising from varied nature of small users of information services, and also the great range, complexity and cost of available services. Suggests possible solutions would be for suppliers to provide more flexibility in their services, closer contact and partnership with the user and more planned integration to reduce number of services available. Hopes that online services will meet some of these requirements.

49. Pratt, G. and S. Harvey (Comps). Information economics: costs and prices of machine-readable information in Europe. London, ASLIB, 1976. 115pp. (European User Series No. 2).

Outlines present status of information retrieval industry and services it provides, charts databases available on ESA-SDS, SDC and Lockheed and European access to databases, and surveys by subject, periodical articles selected for databases. Includes graphs of costs by access and royalty, telecommunication, and print charges, and terminal costs per annum. Reviews previous cost analysis studies and future costs, and analyses current levels of usage. Finally, indicates a need for user education and more determined marketing.

50. Pratt, G. and S. Harvey (eds.). The online age: plans and needs for online information retrieval. Proceedings of the EUSIDIC Conference, Oslo, December 1975. London, ASLIB, 1976. 127pp. (European User Series No. 3).

Discusses relationships between information users, mediators and politicians, with special reference to European network developments; planning of online STI systems, emphasising problem areas such as growth of systems; accessibility, user interface and mediation; pricing and service policies; and the relationships between US and European suppliers and users. Emphasis throughout is on European system development.

51. Smith, R.G. Before you scrap the old ways, compare retrieval systems: manual vs. online. Online, v. 1, no. 2, April 1977, pp. 26-27; 51-59.

Suggests possible evaluation procedure for analysing retrieval methods based on the experiences of Merck and Co., Inc., using FARMDOC. Seven criteria (coverage; recall; precision; response time; user effort; form of output and cost) are used in the evaluation.

52. Stern, B.T. Evaluation and design of bibliographic data bases. Annual Review of Information Science and Technology, (vol. 12). M.E. Williams, (ed.) Washington, DC, ASIS, 1977. pp. 3-30.

Review of selected literature published since 1975. Covers bibliometric studies; citation analysis; overlap studies; relevant/recall studies; cost and user studies; education of users; publishing aspects; database design and the design of Euronet. Conclusions note increasing concern over cost-effectiveness, importance of user group contribution and government involvement in database development.

53. System Dynamics Societe Anonyme. In-depth case studies of co-operative information systems in the European communities. Brussels, S.D.S.A., 1976. 223 pp.

Study of the economic advantages of cooperative input procedures, concludes that of the six systems studied (UKCIS, MEDLARS in the United Kingdom, TITUS, SABIR, IFIS and IRRD) there was no overall similar pattern; mode of development depends on local circumstances; decision making is empirical and pragmatic; staff personalities affected the approaches used and economics rarely a major consideration.

54. Tagliacozzo, R. The Consumers of new information technology: a survey of the utilization of MEDLINE. Journal of the American Society for Information Science, v. 26. no. 5, September-October 1975, pp. 294-304.

Surveys initial use made of new service in seven information centres. Shows that majority use is by an academic population, mainly for the purposes of research. Hopes that future developments will attract more practitioners needing information for the practical care of patients and clients.

55. Tomberg, A. European information networks. Annual Review of Information Science and Technology, (vol. 12). M.E. Williams (ed.) Washington, DC, ASIS, 1977, pp. 219-246.

Summarises individual networks (local and non-local services), US networks operating in Europe and research networks. Outlines past and probable developments, with emphasis on attempts at co-ordinating network resources; strong post office influence; plans for new networks; possibility of satellite transmissions. Suggests that as networking becomes the responsibility of intergovernmental authority, this may be at the expense of user control over developments.

56. Tomberg, A. On-line services in Europe. Online Review, v. 1, no. 3, September, 1977, pp. 177-193.

Outlines possible reasons for relative slow growth of online in Europe compared with US and Canada and suggests main areas to concentrate improvements; more co-ordination of the database networks throughout the continent; an export drive; greater reliability and marketing effort.

57. Vickers, P.H. Final report on project 2: extension and revision of the COST/accounting scheme to interactive systems of the network. Luxembourg, Commission of the European Communities, Scientific and Technical Information and Information Management, 1977. 90 pp. (EUR 5627).

Describes a scheme in matrix form for computer-based information systems. Tests the matrix for applicability to different systems. Instructions are given for use of the matrix in a variety of environments.

58. Vickers, P. and M. Rowat. Development and use of models for the prediction costs for alternative information systems, PT1 (input model) and PT2 (output model): Final report on Project 3, Phase 1. Luxembourg, Commission of the European Communities, Scientific and Technical Information and Information Management. 1977, 208 pp. (EUR 5693).

Reports on models to predict the cost of input activities in compiling an information system and output activities in subsequent extraction of this information by means of different types of search, to be used in planning new information systems. The PROBHIT II system was used to construct the models which operate in three dimensions; system

configuration, operating regime and time, and comprise the mechanical component, input data and user interface.

59. Vickery, A. and A. Batten. Large-scale evaluation study of on-line and batch computer information services. Library Resources Co-ordinating Committee, University of London, 1978. 175 pp.

Analyses and evaluates study carried out between 1975-77, to consider how London University institutions would benefit from access to computer-based information retrieval services. Retrospective searches and SDI services were carried out for academic staff and post-graduate students. Success of the trial period resulted in recommendation that such services are essential aids to research and teaching and should continue, with the setting up of a central co-ordinating unit.

60. Wanger, J., C.A. Cuadra and M. Fishburn. Impact of online retrieval services: a survey of users 1974-75. Santa Monica, Calif., System Development Corporation, 1976. 307 pp.

Reports on a major study, funded by the National Science Foundation of 500 user organisations. The data were collected in late 1974 and early 1975, using mail questionnaires addressed to information managers and frequent searchers. Covers the following topics: introduction of online services; internal publicity; staff selection and training; overall levels of online use; selection and use of online systems and databases; budgeting and costing; problems encountered; expected and realised benefits.

61. Williams, M.E. The impact of machine-readable databases on library and information services. Information Processing and Management, v. 13, no. 2. 1977, pp. 95-107.

Reviews "state of the art" for the National Commission on Libraries and Information Science (NCLIS) National Program. Discusses origins, formats and characteristics of databases; variety of possible search methods; subsequent availability of documents and current research. Argues that the National Program should become involved in improvements such as, the telecommunications network; more resource sharing and co-ordination; new databases in certain subjects; more standardisation of format.

62. Williams, M.E. Online problems; research today; solutions tomorrow. Bull. of the American Society for Information Science, v. 3, no. 4, April 1977, pp. 14-16.

Shows need to solve some of the problems emerging from increased use of online search services, e.g. economic problems of decreasing use of hard copy, legal problems, availability of documents, user training and standardisation. Suggests possible solutions and emphasises that systems are becoming significantly more user-orientated or "transparent".

63. Williams, P.W. and J.M. Curtis. The Use of online information retrieval services. Program, v. 11, no. 1, January 1977, pp. 1-9.

Examines as part of UMIST involvement in the British Library research programme the results of searches via Lockheed DIALOG made by the user alone, by the intermediary alone and by user assisted by intermediary. Proves the latter to be most productive and cost-effective for, although the users expressed satisfaction with their own search, slowness made it expensive. Finds the intermediaries' search was quickest and cheapest but less specific. Interaction between intermediary and user is therefore very important.

64. Wilmot, C.E. Online opportunity: a comparison of activities in America and the United Kingdom. ASLIB Proceedings, v. 28, no. 4, April, 1976, pp. 134-143.

Compares online facilities in UK libraries with those in the US which is far more advanced and suggests how UK developments can benefit from US experience. Appendix lists online databases currently available via American suppliers.

65. Wish, J.R. and M.A. Wish. Marketing and pricing of online services. Information roundup: Proceedings of the 4th ASIS Mid-year Meeting, Portland, Oregon, May 15-17, 1975. F.G. Spigai and others (eds.). Washington, DC, 1975. pp. 143-158.

Suggests on the basis of a survey of 56 users of a free demonstration of online retrieval at the University of Oregon, that there is a potential market for libraries to retail this type of information searching. Compares different terminals and relative costs.

66. Woodward, A.M. Factors affecting the renewal of periodical subscriptions: a study of decision-making in libraries with special reference to economics and inter-library lending. London, ASLIB, 1978. 118 pp.

Analyses the results of survey of 250 academic, research and industrial libraries in the UK held in 1977. Examines library budgets and effects of financial pressure; periodical holdings for changes in size; additions and cancellations and the decision-making involved in this process. Also considers borrowing and photocopying and librarians' attitudes. Finds that in 1976 cancellations exceeded additions for the first time. Cancellations are usually due to financial pressures, but are preceded by assessment of content and value.

I. INTRODUCTION

A pilot survey was conducted during January-March 1978, and the main survey during June-August. The questionnaire, notes and covering letter (from Mel Day, President of ICSU AB) are shown as Exhibits D1-D3. 25 questionnaires were despatched. *

Response

Usable responses were received from 12 data base producers, half from W. Europe and half from the USA:

American Geological Institute	USA
American Institute of Physics	USA
Biological Abstracts	USA
Bulletin Signaletique - Bibliographie des Sciences de la Terre	France
Chemical Abstracts Service	USA
Chemie Information und Dokumentation/Berlin	W. Germany
CNRS	France
Excerpta Medica	Netherlands
INSPEC	UK
Psychological Abstracts	USA
US National Library of Medicine	USA
Zoological Record	UK

Two other member services, Engineering Index, Inc., and the British Library, expressed willingness to participate, but were unable to respond in the limited time available.

The provision of data by those who did respond was a major exercise. A typical comment was "We don't keep our records at all in the form you asked - maybe we should." Several respondents propose to improve their record-keeping as a result of the survey.

As far as we know, this survey represents the first attempt ever to collect this kind of data in such detail.

Limitations

The following analysis is based on limited data from a small and very heterogeneous sample. For reasons of confidentiality, only the general patterns are reported, usually in the form of straight averages. Certain extreme out-lying values have been omitted, but the remaining variation is still large.

This is not just the fault of the data. The underlying reality is that there are only a few major bibliographic database producers, and they are all different from each other.

Size, Growth and Coverage of Data Base (Q's 1-3)

In aggregate, respondents' databases have grown as follows (millions of

* The accompanying opinion questionnaires are discussed in Appendix E.

uniques items):

	<u>1972</u>	<u>1977</u>
Machine-readable	4.2	14.5
Non-machine readable *	19.6	25.4

Ten respondents produced machine-readable items. Among these, the average number added each year has recently almost stabilised (thousands of unique items):

	<u>72</u>	<u>73</u>	<u>74</u>	<u>75</u>	<u>76</u>	<u>77</u>	<u>78 est</u>
	123	138	157	164	171	175	177
		+12%	+14%	+4%	+4%	+2%	+1%

Six of the respondents cover physical science and technology, five cover life and social science, and one covers both. The revenue patterns are broadly similar for both groups.

2. REVENUE ANALYSIS

Growth in Total Revenue (Q4)**

On average, total revenue in \$US grew at 13% p.a. over the 5-year period 1972-77. This average is boosted by the 23% growth in 1972-73; growth over the four years 1973-77 being 10%-11% p.a. on average. Projected growth for 1977=78 is 21%, which looks a shade optimistic.

Over the same period, the value of the \$US has fallen by an average of 8% p.a.*** On this basis, average "real" growth is shown in Table D1:

Table D1: Average Annual Revenue Growth: Current and Constant \$US

N = 10	73/72	74/73	75/74	76/75	77/76	Average	Average last 4 yrs
	%	%	%	%	%		
Current \$US	23	9	14	5	13	13	10
less: Inflation	(8)	(12)	(8)	(5)	(7)	(8)	(8)
Constant \$US	14	-3	6	0	6	5	2

Over the four years 1973-77, real revenue growth was on average 2%-3% p.a. (this figure is not affected by weighting of respondents by size). The

* Including items which also exist in machine-readable form.

** Results have been normalised by netting out "other" revenue from contract research, etc., and 2/3rds of the revenue from an online service subsidiary (the other 1/3rd being taken as a royalty-equivalent). Two respondents who each roughly doubled their print price in a year have also been omitted prior to these price rises.

*** US Dept. of Commerce, Survey of Current Business, Consumer Price Index. This is used as the most standard measuring-rod available. Its use is not meant to imply that database producers' "real" costs have not risen.

variation from year to year is partly caused by the particular timing of price increases and cumulative indexes.

Geographical Breakdown (Q5)

Six respondents gave a geographical breakdown of revenue from 1974:

Table D2: Average % of Breakdown in Revenue by Geographical Region

(N = 6)	74	75	76	77	78 est
USA, Canada	38	36	37	37	36
W. Europe	44	44	44	44	43
Rest of World	18	20	19	19	21
Total	100%	100%	100%	100%	100%

While this breakdown varied greatly between respondents, in no case was there any significant time trend. Weighting the 1977 results by size (number of new machine-readable items) reduces the percentage for W. Europe to 38%, and increases the Rest of the World percentage to 26%.

Five respondents gave data back to 1972. Here again, there were no time trends.

Product Breakdown (Q6)

Average revenue from microforms has been less than 1/2% of total revenue throughout. Analysis of other product revenue shows a steady decline in the percentage derived from print (from 98% in 1972 to 91% now) as revenues grew from first batch, and then online service operators. The contribution of online is still, on average, only 3%-4% of the total.

Table D3: Average % of Breakdown in Revenue by Product

N = 9	72	73	74	75	76	77	78 est
Print	98.3	96.9	94.1	93.6	91.7	91.1	91.2
Batch	1.7	2.6	4.4	4.8	5.6	5.9	4.8
Online	-	.5	1.5	1.6	2.7	3.0	4.0
Total	100%	100%	100%	100%	100%	100%	100%

These averages are virtually unaffected by weighting.

Where reported separately, revenue from cumulative indexes showed great variation from year to year (as expected; hence the question), but averaged out through time at about 15% of total print revenue, with little variation between respondents.

Revenue from Printed Products (Q's 4, 6 and 19)

Combining results for Q's 4 and 6 gives the following average annual growth in print revenue:

Table D4: Average Annual Print Revenue Growth: Current and Constant \$US

N = 10	73/72 %	74/73 %	75/74 %	76/75 %	77/76 %	Average	Average last 4 yrs
Current \$US less: Inflation	20 (8)	8 (12)	12 (8)	5 (5)	11 (7)	11 (8)	9 (8)
Constant \$US	11	-4	4	0	4	3	1

Over the four-year period 1973-77, real revenue growth from printed products was only about 1% p.a. Projected growth of 18% for 1978 (9% to 10% in real terms) looks optimistic.

Three respondents gave figures in Q19 for the growth of print revenue in the USA and the UK excluding cumulative indexes. All three have been online for several years. The average growth in both countries is similar to the figures for the whole world (derived from Q's 4 and 6 for the same respondents), e.g. for 1973-77:

USA 11% (from Q19)
UK 12% (from Q19)
World Total 12% (from Q's 4,6)

These figures are in line with the previous finding that there was no major time trend in geographical breakdown. The fact that the US figure is marginally lower than the UK and World figures might reflect the impact of online, but the difference is well within the normal scatter of the data.

Printed Products: Price and Volume and Price Elasticity (Q's 4, 6 and 20)

Ten respondents gave price data for their main printed product (Q20). On average, prices have risen by about 10% p.a. - 2% in real terms:

Table D5: Annual Price Increases: Main Printed Product

N = 10	73/72 %	74/73 %	75/74 %	76/75 %	77/76 %	Average	Average last 4 yrs
Current \$US less: Inflation	12 (8)	12 (12)	6 (8)	10 (5)	11 (7)	10 (8)	10 (8)
Constant \$US	4	0	-2	5	4	2	2

These data can be combined with the revenue data in Q's 4 and 5 to give an index of total print volume: (total print revenue, excl cumulative indexes) / (price of main printed product). On this basis, volumes grew marginally over the five-year period 1972-77, but declined at ½% to 1% p.a. over the last four years, 1973-77:

Table D6: Index of Print Volume. % Increase over Previous Year

73/72 %	74/73 %	75/74 %	76/75 %	77/76 %	Average	Average last 4 yrs
7	-3	5	-4	0	1	-1

A detailed analysis of prices and volumes for individual respondents shows demand to have been fairly inelastic. If we define an inflation-adjusted

price elasticity as:

$$\text{Elasticity} = \frac{\% \text{ decrease in volume}}{\% \text{ REAL price increase}}$$

we find that this ratio is generally small. There were many cases of large real price increases without a significant decline in volume. On the basis of the evidence, price elasticity is probably less than 0.5, and our best estimate would be 0.3 or so. The scatter is large, partly because the volume index (unlike the price) is not just based on the main printed product.* The price elasticity will also vary between products, depending on their competitive position, i.e. higher for a database with several overlapping competitors. For a data base with unique coverage, the elasticity would probably be even lower than 0.3.

If this estimate is roughly right, two things follow:

- If necessary, database producers can increase their revenue through further price increases. Taking the elasticity as 0.3, a 10% real price increase would lead to a 3% decline in volume, with real revenue still increasing by about 7%. Subscription loss would probably be less if prices were increased a little each year, instead of a large jump every 2-3 years.
- If producers had kept their real prices steady over the recessionary four-year period 1973-77, volumes (and, therefore, real revenues) would have been pretty well constant. That is, there would have been some fluctuation from year to year, but no long-term time trend.

Revenue from Tape Sales to Batch Service Operators (Q's 4, 6, 7-13)

As shown on (p.D4) the average percentage of total revenue derived from tape sales to batch operators increased from 1.7% in 1972 to 4.4% in 1974, and has since remained at 5%-6%.

For the five respondents who were able to give more precise data (excluding one who began selling tapes in 1974), annual growth has been as follows:

73	74	75	76	77	78est**
44%	58%	8%	11%	22%	-2%

These data are consistent with the general pattern of rapid growth to 1974, and a steadier pattern since then.

Data on detailed prices and volumes are hard to compare, but reveal an increasing tendency for use charges to become a significant revenue element:

% of batch	1972	1973	1974	1975	1976	1977
revenue coming						
from use charges:	3%	5%	6%	18%	22%	25%

* The analysis excludes 1972-73, because of the marked underlying volume growth.
 ** Four respondents only for 1978.

Revenue from Tape Sales to Online Service Operators (Q's 4, 6, 14-18)

In analysing the growth of online processing, or its contribution towards overall costs, a distinction must be made between the growth on each online database, and the growth due to new databases coming online.

Three responding databases have been commercially available online since 1973 or before. Their online revenue growth has been erratic, with something of a slow-down in 1977, but some recovery in the growth rate projected for 1978:

	74/73	75/74	76/75	77/76	78/77est
	%	%	%	%	%
Unweighted	215	24	78	10	31
Weighted	244	61	64	22	27

Including two more databases which came online in 1975, recent growth has been steadier:

	76/75	77/76	78/77est
	%	%	%
Unweighted	74	15	37
Weighted	65	27	34

Four respondents gave a breakdown of their 1977 online revenue into base charges and use charges. On average 83% came from use charges.

3. CONCLUSION

The Impact of Online Services

At the risk of over-analysing the data, some pointers may be cited which indicate that, so far, online services have not seriously impacted the demand for printed products:

- On average, the growth in revenue from printed products has been higher for data bases online since 1975 or before (9%-10% p.a.) than for those not online (6%-7% p.a.).
- For both groups equally, the percentage of total revenue coming from the USA and Canada (where the impact might have been expected) has been pretty steady: It has not collapsed in the case of those databases which have been available online for longest.
- By the standards of many industries (e.g. steel, ship-building), revenue has stood up quite well during the recession.

There are just not enough data to justify any more definite conclusions than this. There are also problems in trying to ascribe causality to the patterns, e.g. the five online respondents included four from the USA, and three covering life and social science. Both these attributes were associated with slightly better-than-average performance. Similarly, it is easier for us to test for the impact of online on print revenues for the same database, than on print revenues of related, closely competing data bases.

Summary of Findings

The results may be summarised as follows:

- (a) All databases are different. None is "typical".
- (b) Within the sample, real \$US revenue from printed products grew on average by 3% p.a. over the five year period 1972-77. Most of this growth was in the first year; for the period 1973/77, real growth was only 1% p.a. An expansion of 10% or so is projected for 1978, however - perhaps optimistically.
- (c) For printed products, real prices and volumes both grew in 1972-73. For 1973-77, real prices grew by 2% p.a., while volumes decreased at $\frac{1}{2}\%$ to 1% p.a. The indications are that price elasticity was low, e.g. 0.3 or so.
- (d) Over the period 1972-77, revenues from batch service operators grew from an average of 2% to 6% of total revenue; revenues from online service operators grew from zero to 3% of the total. Over 90% of revenue is still derived from printed products.
- (e) Revenues from batch and online service operators boosted total revenue growth for 1972-77 from a real growth of 3% p.a. for printed products alone to almost 5% p.a. for all products. For 1973-77, real growth was boosted from 1% p.a. to a little over 2% p.a.
- (f) It is too soon to say to what extent the revenue from online has been a straight extra contribution, and to what extent it has been at the expense of print revenue. At this stage, the indications are that the main negative influence on print revenue over the period 1973-77 has been the reduced level of underlying demand. A secondary factor appears to be price increases, while the impact of online seems so far to have been small. A clearer picture should emerge by 1980-81.

D. DATA BASE TAPE SALES TO ONLINE SERVICE OPERATORS (see Note 8)

	72	73	74	75	76	77	78 est
14. Total revenue from sales of tapes to online service operators (1977=100)						100	*
15. X breakdown of revenue in 014.							*
Base charges: back tapes							*
Base charges: current tapes							*
Use charges: connect hours							*
Use charges: other							*
Total	100%	100%	100%	100%	100%	100%	100%
16. Number of online service operators supplied (actual number, <u>not indexed</u> , assuming this is public information).							*
17. Royalty per connect hour (1977=100)						100	*
18. Number of connect hours (1977=100)						100	*

E. SALES OF PRINTED PRODUCTS: SIX SELECTED COUNTRIES

19. Revenue from printed products, <u>excluding cumulative indexes</u> , (1977=100) (see Note 9)	USA					100	*
	UK					100	*
	W. Germany					100	*
	France					100	*
	Japan					100	*
	India					100	*
20. Price of main printed product, (1977=100) (see Note 10)	USA					100	*
	UK					100	*
	W. Germany					100	*
	France					100	*
	Japan					100	*
	India					100	*

Organisation:

Whom to contact in case of any further queries: Telephone:

IN ADDITION, if you have any published figures on revenue or usage, please enclose a copy, or a reference to the publication.

Thank you very much for your help. Please mail the completed questionnaire to:

Patrick Barwise
 Impact of Online Information Services
 London Business School
 Sussex Place
 Regents Park
 London NW1 4SA
 UK

to arrive in London ON OR BEFORE 31 JULY 1978.

We will send you the results of this study as soon as they are available.

ICSU-AB: Impact of online information
services on sales of A & I journals

May 1978

SURVEY OF BIBLIOGRAPHIC DATA BASE PRODUCERS: NOTES ON THE QUESTIONNAIRE

1. Confidentiality For security purposes, all questions related to revenue (Sections B through E) will be coded (e.g. "data base producers A, B, C, etc") and indexed (e.g. "1977=100") in all reports to the EEC.

2. Actual Data Not Available, etc. Please use the following conventions: If the question does not apply, please strike out the box, thus or . If the question does apply, but actual data is not available, please give your best estimate, marked with an asterisk, e.g. . If you feel unable to make an estimate, please put a query . Note that all the boxes for 1978 are pre-coded with an asterisk: .

3. Rounding Please round all figures to two significant digits; unless the first digit is a one (e.g. 2.7 not 2.74; 1190 not 1189 or 1200).

4. Currency Conversion For comparability and confidentiality, all price and revenue data should be based on \$US equivalents. For data in other currencies, please do the following:

- a) Use the conversion table below to convert to \$US equivalents (i.e divide by the numbers in the table).
- b) Calculate the indexes or percentages to be entered into the questionnaire (e.g. 1977=100).

\$1.00 US equals:

		72	73	74	75	76	77	78
France	FFr	4.72	4.45	4.85	4.05	4.70	4.95	4.62
W. Germany	DM	3.17	2.75	2.45	2.34	2.58	2.36	2.08
Italy	Lira	581	590	650	640	850	885	868
Japan	Yen	300	265	280	295	300	277	226
Netherlands	DFI	3.20	2.85	2.65	2.40	2.74	2.46	2.30
UK	£	.408	.396	.420	.450	.565	.585	.547

(Source: United Nations (Mid-year figures, except 1978, which are for May)).

5. Size and Coverage of Data Base Items which exist in both machine-readable and non-machine-readable form should be included under both headings.

6. Total Gross Revenue Please exclude revenue from products and services not directly derived from the data base, e.g. special projects or grants, etc.

7. Country Groupings

Other OECD: Japan, Australia, New Zealand, S. Africa

Comecon: USSR, Poland, E. Germany, Czechoslovakia, Hungary, Rumania, Bulgaria.

8. Data Base Tape Sales These questions are designed to find areas of comparability among the very different practices to be encountered among data base producers. For instance, if there is/was no 'full' rate for tapes, select the highest rate actually charged in any one year as the 'full' rate for that year and report all others as paying less than 'full' rate.

9. Revenue from Printed Products: Six Selected Countries This question relates to the figures developed for Q6, line 1. Data for the six countries will be used for a more detailed analysis.

10. Price of Main Printed Product If there is no 'main' printed product, please select a typical or representative product for tracing the price variation (in \$US) to a subscriber over the seven years.

T.P. Barwise, L. Granick, J.R. Smith
May 1978



JP/OC/389/78
6.06.78

icsu ab

secrétariat : 17 rue mirabeau
75016 paris france tél : 527-22-76

PARIS, June 9th, 1978

THE IMPACT OF ON-LINE SERVICES

As you know we have been awarded a contract by the EEC to investigate the impact of on-line services on sales of Abstracting and Indexing journals. The study is being undertaken by Patrick Barwise of the London Business School who is responsible for ensuring the confidentiality of any information provided. It is supervised by a Steering Group comprising :

Ron Smith, Biosis (Chairman)
Derek Barlow, Inspec
Lois Granick, Psychological Abstracts
Tony Kent, UKCIS
Jeanne Poyen, ICSU AB
Barrie Stern, Excerpta Medica

The main item is a survey of member services, for which we would appreciate your help, by completing the enclosed questionnaire "Survey of Bibliographic Data Base Producers"

If we get a good response, the results will be invaluable in telling all of us about the impact of on-line, and in giving some common measures of recent revenue patterns, so that we can each make our own comparison.

To help Patrick Barwise isolate the particular effects of on-line, it is important that those of us who are not at present available on-line also respond : this will provide data for comparison with those who are on-line .

Some of the questions may need clarification. We have refined the questionnaire after an extensive pilot study, and enclosed some notes which cover the issues raised during the pilot. For further amplification, please contact myself or any member of the Steering Group : most of us will be at Toulon 8-14 July.

icsu ab

During the pilot study, most of us found at least some of the questions impossible to answer. Our records are set up for accounting purposes, while the questions are formed from a market analysis view-point. So please answer as many questions as possible in the time available, and give estimates (marked with an asterisk) for as many of the other questions as possible.

As well as the main questionnaire and notes, I also enclose for your completion a smaller questionnaire on informed opinions. We are sending this to a wider sample, including various other experts and interested parties. Again, if we get a good response, it should be fascinating to see how much we all agree with each other, and the rest of the industry. I hope you will find the questions interesting, but difficult!.

Please send both completed questionnaires direct to Patrick Barwise, Impact of On-Line Information Services, London Business School, Sussex Place, Regent's Park, London NW1 4SA, to arrive by 31st July 1978.

We are more anxious to have whatever data you can provide by then, than to have more complete data which may arrive too late for inclusion in the analysis.

For our part, we shall circulate the report on the study as soon as it is available.

Thank you for your participation,

Yours sincerely,

M.S. DAY
President, ICSU AB

Enclosures :

- Questionnaire "Survey of Bibliographic Data Base Producers"
- Notes on the above
- Questionnaire "Survey of Informed Opinion"

APPENDIX E

SURVEY OF EXPERT OPINION

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1. INTRODUCTION

Objectives

The particular aims of this survey were:

- a) To find out general expert opinion as to the recent past and the short- to medium-term future.
- b) To find out how much different experts disagree; what reasons they gave; and whether such disagreement was systematically related to the kind of expert asked.
- c) To facilitate debate.

Method and Response

The main survey was conducted during June-August 1978, following pilot work during January-March. The questionnaire and covering letter (from Dr. Mel Day, President of ICSU AB) are attached as Exhibits E1 and E2*. 92 questionnaires were despatched, as follows:

25 ICSU AB member services (together with a questionnaire on revenue)
12 other ICSU AB members (for information only, in most cases)
55 other experts

51 usable responses were received, a response rate of 55%. Respondents are listed in Exhibit E3. They include 30 from W. Europe, 17 from the USA, and 4 from the rest of the world (Australia, Czechoslovakia, Israel, Poland).

In terms of main professional interest, respondents classified themselves as follows:

Database producers	15
Online service operators	6
Batch service operators	3
Libraries/information centres	12
End users	4
Other professional interest	<u>11</u>
Total	<u>51</u>

2. RECENT SALES OF ABSTRACTS JOURNALS AND INDEXES (Q1)

Weighting

Question 1 used rather structured wording (see questionnaire). Respondents were asked to rank up to six factors out of a list of 17 (including "Other") in answer to the question

"For a typical producer of (abstracts and index) journals, what do you think have been the main negative influences on sales over the last 3-4 years?"

Many of the 17 factors were interrelated.

Results were weighted by rank (six for the first factor listed, five for the second, etc), and normalised to give a total of 100 for the whole sample.

* Different wording was used in the letters to ICSU AB members.

Results for the Whole Sample

Points allocated to the 17 factors were as follows:

Price increases	24.3
Government cut-backs	12.2
Recession: temporary drop in demand	11.8
Impact of online services	8.5
More competition	5.3
Library pooling	5.3
Falling student numbers, leading to reduced university revenue	5.0
Product weaknesses	4.8
Weaknesses in promotion	4.8
Sales were previously above an equilibrium level	3.7
Impact of batch services	3.0
Photocopying	2.8
Weaknesses in distribution	2.1
Decline in long-term demand for information	1.4
Shortage of library storage space	1.4
Impact of microforms	.4
Other (e.g. change in information-gathering habits)	3.2
Total	<u><u>100.0</u></u>

These results may be simplified by grouping together related factors.

In particular, several of the factors related to a reduction in the level of underlying demand for information products, because of reduced needs or reduced budgets. Some of these factors may be as much symptoms as causes of reduced expenditure (e.g. library pooling). These demand factors have been grouped as follows:

Temporary: "government cut-backs", "recession: temporary drop in demand".

Permanent: "library pooling", "falling student numbers, leading to reduced university revenue", "sales were previously above an equilibrium level", "photocopying", "decline in long-term demand for information", "shortage of library storage space".

The simplified results were as follows:

Weaknesses in underlying demand	44 (of which 20 permanent)
Price increases	24
Impact of non-print media	12 (of which 8.5 online)
Supplier Weaknesses (product/promotion/distribution)	12
More competition	5
Other*	3
Total	<u><u>100</u></u>

These results agree closely with the analysis of database producers' revenue patterns, which indicated that the main influence since 1973 has been the level of underlying demand, that price has also had a significant influence, and that the impact to-date of online retrieval on print subscriptions has been small.

The general pattern held across all respondent categories. Some sub-patterns may be noted, however.

* Mostly to do with demand and/or price, e.g. "reduced library budgets", etc.

US versus Non-US Respondents

US respondents placed relatively more weight than did non-US respondents on the impact of price increases (29% versus 22%), and of online services (13% versus 6%). They laid relatively less weight on the level of underlying demand, and on supplier weaknesses:

Table E1: Recent Sales of A & I Journals: US versus non-US Respondents

Negative Influences	US N=17	Other N=34	Total N=51
Demand weaknesses	40	46	44
Price increases	29	22	24
Impact of other media*	14	11	12
Supplier weaknesses	9	13	12
More competition	6	5	5
Other	2	4	3
Total	100	100	100

* Of which online: 13 6 9

Breakdown by Professional Interest of Respondent

There was wide agreement between the different professional interest groups as to the main negative influences; namely, demand weaknesses, and price increases, in that order.** The relative importance of the other factors was more in dispute (although significant variation would be expected anyway with such small sub-samples):

Table E2: Recent Sales of A & I Journals: Breakdown by Professional Interest

Negative Influences	Database Producers N=15	Online Operators N=6	Batch Operators N=3	Information Centres N=13	End- Users N=4	Other N=11	Total N=51
Demand Weaknesses	51	45	51	36	53	35	44
Price increases	22	27	27	23	25	25	24
Impact of other media*	12	7	2	20	1	13	12
Supplier weaknesses	8	15	8	12	18	14	12
More competition	3	2	13	7	-	8	5
Other	3	4	-	3	3	5	3
Total	100	100	100	100	100	100	100

* Of which online: 7 6 2 15 1 10 9

The main area of disagreement was the impact of online services. The proportion of influence attributed to online services ranged from 1%-2% (end users, batch service operators - both small samples) up to 15% for libraries/information centres. Even among this last group, however, the impact of online fell well into third place, after demand weaknesses (36%) and price increases (23%).

The other area of disagreement was supplier weaknesses: product, promotion and (to a lesser extent) distribution. Database producers gave these factors a lower rating (8%) than did the rest of the sample (13%). This difference related entirely to product weaknesses, which were mentioned by none of the

** For all groups, price was easily the most important single factor.

database producers, but were given an average rating of 8% by the rest of the sample.

3. FUTURE PATTERNS OF BIBLIOGRAPHIC SEARCHING (Q's 2, 3)

Wording

Questions 2 and 3 were designed primarily to measure the range of opinion as to the future growth of online searching. A subsidiary aim was to elicit assumptions about the relative importance of online, versus batch and manual, searching.

Question 2 (see questionnaire) related specifically to bibliographic databases already in existence in 1978, but some responses probably included projections for new and/or non-bibliographic databases. Respondents were asked, for each of six countries,

- "a) What do you think will be the total volume of searches (online, batch and manual) in 1980 and 1985, relative to 1978? (1978 = 100)
- b) What percentage of these searches do you think are/will be online? "

Question 3 asked for reasons for the responses to Question 2.

Many respondents mentioned the acute lack of data in this area, on which to base projections, but most were prepared to "have a go", at least for their own country (39 out of 51). The accompanying comments as to the lack of data varied from frustration to amusement.

Areas of Agreement

As expected, the range of response was very wide. But at a qualitative level, there was broad agreement on several points:

- a) Online retrieval is not just a passing fad. Without exception, usage was expected to grow from 1978-80, and again from 1980-85. In general, roughly straight-line growth was expected.
- b) Online usage is more advanced in the USA than in the UK and France, which are themselves more advanced than Germany and Japan. Growth will be fastest in those developed countries that are currently furthest behind. Online retrieval will tend to widen the technology gap between developed and less developed countries (represented here by India), where usage will still be minimal in 1985.
- c) The growth of online retrieval will involve a mixture of economic and technical factors, roughly as follows. Economic growth will create the need for more information. Wider availability (and familiarity) of electronic technology - e.g. networks, micro-processors, word processing, Viewdata - will lead to increased usage and lower costs. These trends will encourage the development of new databases (numerical, factu: business/economic), new suppliers and better marketing. This whole development will tend to increase the economic growth upon which it is based.

There is, however, wide disagreement as to the timing and extent of this process.

- d) There is extreme uncertainty as to the usage of printed products, e.g. for manual searching. The lack of data here is even worse than for online usage, and is critical to any projection of the future impact of online on print subscriptions. (It may also account for the previous finding, that several experts mentioned product weaknesses in their responses to Question 1, but that none of those who did so was a database producer).

- e) Despite the uncertainty as to the usage of printed products, there was general agreement that most of the growth in online usage would result from an increase in the total number of searches, rather than from a switch from manual to online.

Growth of Online Searches

By combining responses to Questions 2a and 2b, the expected growth of online searches in each country was computed for each respondent. These data should be unaffected by respondents' assumptions about what constitutes a manual search, etc.

The results shown in Table E3, in terms of the mean, median, and 10-90 range* (i.e. excluding the top and bottom 10%). India is excluded, because the 1978 base is roughly zero for online. The weighted averages assume that 80% of 1978 volume was in N. America, represented by the USA.

Table E3: Online Searches in 1980 and 1985

<u>1978 = 100</u>	<u>1980</u>			<u>1985</u>		
	MEAN	MEDIAN	10-90 RANGE	MEAN	MEDIAN	10-90 RANGE
Japan N=22	480	400	210-800	2000	590	360-4500
W. Germany N=29	340	260	170-600	1300	830	300-2400
UK N=30	310	250	170-600	1000	580	330-2400
France N=26	290	250	150-400	1100	660	330-1800
USA N=32	220	190	140-350	640	400	240-1000
Weighted Average*	250	210	150-400	780	450	260-1400

* USA = 80%, others 5% each.

These results say that 90% of respondents expect the number of searches of existing bibliographic data bases to be at least 1½ times their 1978 value by 1980; 50% expect it at least to have doubled; and 10% expect it to have increased by more than four times.

Similarly, 90% expect an increase of at least 2½ times by 1985; 50% expect an increase of 4½ times or more; and 10% expect a 14-fold increase, or more.

These figures are probably a fair reflection of the range of opinion at the bottom end. At the top end, they probably overstate the growth expected even by the optimists, since some of the responses include growth due to data banks and/or new bibliographic databases. It would probably be fair to say that 90% expect 1985 usage at least 2½ times, 50% expect at least four times, and 10% expect about ten times, the 1978 level.

US versus Non-US Respondents

For 1978-80, there was no overall difference in the growth expected by US and non-US respondents: slightly higher growth projected by US respondents for Japan and the USA was balanced by lower projections for Europe.

For 1978-85, however, non-US respondents projected significantly higher growth than did US respondents, especially for the non-US markets:

* Formally the "inter-decile range".

Table E4: Online Searches in 1980 and 1985: US versus Non-US Respondents

<u>1978 = 100</u>	1980 MEAN			1985 MEAN		
	US	Non-US	All	US	Non-US	All
Japan	490	470	480	1400	2500	2000
W. Germany	270	380	340	780	1700	1300
UK	260	330	310	670	1200	1000
France	260	310	290	790	1300	1100
USA	230	210	220	590	690	640
Weighted Average*	250	240	250	650	890	780

*USA = 80%, others 5% each.

Breakdown by Professional Interest of Respondent

Table E5 gives average online growth projections for each professional interest group. For sampling reasons, batch service operators and end-users are included among "other professional interest". This groups is therefore rather a mixture.

Table E5: Online Searches in 1980 and 1985, by Professional Interest of Respondent

<u>1978 = 100</u>	1980 MEAN					1985 MEAN				
	Data Base prods.	Online ops.	Info. Centres	Other	All	Data Base prods.	Online ops.	Info. Centres	Other	All
Japan	460	740	410	350	480	2300	2800	830	1700	2000
W. Germany	440	260	290	310	340	2300	830	640	1100	1300
UK	300	200	330	370	310	1300	660	660	1300	1000
France	360	190	300	230	290	1800	640	710	840	1100
USA	240	240	240	160	220	900	660	470	360	640
Weighted Average*	270	260	260	190	250	1100	770	520	530	780

* USA = 80%, others 5% each

The main finding is that the database producers projected very high growth 1978-85, in the USA and elsewhere. Online service operators' projections were generally close to the average, except for Japan, where they expected very high growth indeed (relative to 1978). Respondents from libraries/information centres and those in the mixed "other" groups gave generally below-average projections, especially for the USA.

Reasons for Differing Projections

The main reason for the wide range of projections is sheer uncertainty, caused by the lack of hard data, rather than that the optimists cite a different set of factors from those cited by the pessimists. In the absence of better data, perhaps the most we can do is to agree the agenda for a more systematic debate. Such an agenda might be based on those issues, which seemed important to many respondents:

- a) Search costs. Differing expectations about costs had a marked influence on projected growth. In particular, most European respondents cited the reduction in telecommunication costs, with the implementation of EURONET: this factor may account for the generally greater optimism of non-US respondents, most of whom were European. Many respondents also expected reduction in the charges levied by the online operators, due to reduced storage

costs, economies of scale, and more competition. Against this, some respondents pointed out that the database element would increase, especially if printed products declined in circulation: these respondents argued that the initial growth of online was boosted by artificially low database charges.

- c) Availability, Awareness and Attitudes. Questions here include the following. How soon will how many users have access to an online terminal? How long will it take before most potential end-users are aware of the potential benefits of online? How long before the new technology causes a change of attitudes among researchers and businessmen towards information as a resource? How long before science curricula include the use of information services (at more than a token level)? Who is going to take on the task of education/persuasion?
- d) Ease of Use by End-Users. Given availability, awareness, and favourable attitudes, how soon will end-users start carrying out their own searches on a significant scale? How easy will this be in 1985? How great will language barriers be, and how will they be surmounted?
- e) Document Delivery. How will users get hold of the original text or data in 1985: will document delivery be the bottleneck? Will single-article delivery systems keep up with the expanded demand - or will full text services/virtual journals take off before 1985? Will the bottleneck be information overload for the end-user: will people "begin to realise that they do not get wiser by references but by mastering knowledge".
- f) The Role of Government. Several respondents mentioned the importance of government involvement, and the "recognition of information as a national resource". The Japanese and German governments came in for favourable comment. The one respondent who mentioned privacy controls did not expect them to have a big impact on science information.
- g) Economic Recovery. Several respondents cited this as the limiting factor. The future of the world economy has obviously been a source of much uncertainty since 1973-4.

There is also deep uncertainty about the relationship between online retrieval and printed abstracts and indexes.

The Relationship between Online and Printed Products

By combining responses to Question 2a (total volume of searches - online, batch and manual) with the percentage of searches not online (i.e. 100% minus the responses to Question 2b), we get respondents' implicit assumptions about the growth or decline of batch and manual searches. These results only give a general indication: if we had asked this question directly, doubtless the results would have been different.

The questions were worded so as to cause respondents to make their own assumptions about what constitutes a manual search, e.g.:

"A lot depends on what you mean by "search", but I am including throughout the large volume of searching done by individuals for their own use, for specific items, often including pre-1970 material".

Five respondents explicitly omitted manual searches. Among the remainder, the median view was that online searches in the USA would grow from 30% to 70% of the total (as defined by the respondent) over the period 1978-85. For other developed countries, the median view was that online would grow from 10% - 15% of searches to 40% - 50%, over the same period.

This increase in the share of online, as a proportion of total searches, was not expected to be a straight switch from batch or manual. It was instead assumed that the total volume of searches would increase, and that most of the growth in online usage would come from this expansion. On average (both the mean and the median), respondents implicitly assumed that batch and manual searching would increase by 30% over the period. The 10-90 range was from a decrease of 60% to an increase of 120%.

Out of 34 respondents, only 12 (35%) assumed that batch and manual searching would decrease at all, and only 9 (26%) that it would decrease by more than 10%.

A decline in batch and manual searching was assumed by only 3 out of 15 database producers and online service operators; and by 9 out of 19 other respondents.

Several respondents commented on the relationship between online and manual searching, e.g.

"Online can be expected to be influential at first, as a fashionable gimmick, in introducing library-type resources to those who should have used them but didn't".

"Bibliographic searching will increase because (it) becomes easier with online searching, although not necessarily cheaper".

"(1978-80)... Increasing accessibility of databases online will tend to increasing use by the "infrequent user" - e.g., the library that only needs to use Chemical Abstracts once or twice a month, and could not afford to have the printed version sitting on shelves ...(1980-85)...Beginning to phase out printed databases in favour of online access on demand (which is where the market potential lies)."

A more sceptical note - not to say counterblast - was sounded by the following two respondents:

"There is no evidence of an increase in total demand for scientific and technical information. Growth in all developed countries in a number of searches is unlikely to exceed general economic growth... I am extremely doubtful whether online searches will ever exceed 25%-35% of total".

and

"Information services have totally lost sight of the ultimate aim... (which) is to provide access to current scientific information to people deprived by geographical, financial, or other factors of access to the primary literature. Cheap abstracts which do not aim at a ludicrous "complete coverage", and the avoidance of elaborate and expensive information retrieval empires, are the only way".

There seems to be the need for more facts about current usage of printed products about their relationship with online retrieval, and about the requirements of different users.



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6.06.78

-E10-

EXHIBIT E1

icsu ab

secrétariat : 17 rue mirabeau
75016 paris france tél : 527-22-76

PARIS, June 9th, 1978

ICSU AB operating under a contract from the Commission of the European Communities is undertaking a study of the impact of on-line services on the sales of printed publications of Abstracting and Indexing Services. A major part of the input to the study will be made by secondary services members of ICSU AB. It is recognized that it is probably too early for any definitive results to be obtained and much of the work is devoted towards the developing and testing of a model which may be applicable when more data become available.

It is our view that a summary of informed opinion would form a valuable part of the study and for this reason the enclosed questionnaire is being sent to you, and to a number of other experts throughout the world, in the hope that you will be kind enough to spare the time to complete it.

I recognize that you may feel that your answers are of necessity highly speculative, but we believe that they can make a valuable contribution to what we hope will be a very worthwhile study.

With my thanks for your help,

Yours sincerely,

po M.S. DAY
President, ICSU AB

bureau des résumés analytiques du conseil international des unions scientifiques
international council of scientific unions abstracting board

EXHIBIT E2

CONFIDENTIAL

ICSU AB: Impact of online information services on sales of A & I journals

Name:
Organisation:

May 1978

SURVEY OF INFORMED OPINION

This survey is undertaken by Patrick Barwise, London Business School, on behalf of the International Council of Scientific Unions Abstracting Board (ICSU AB). It forms part of an ICSU AB study for the Commission of the European Communities: 'The Impact on User Charges of the Extended Use of Online Information Services', Erag 22. We are asking selected experts for their views on the recent past, and their future expectations. We would be grateful for your participation, as one of the experts we have selected.

This survey is directed at people with a professional interest in literature search, split into the following six groups:

- Data base producer
- Online service operator
- Batch service operator
- Library/information centre
- End user
- Other professional interest

Please check ONE box, which ever BEST describes yourself.

RESULTS WILL ONLY BE REPORTED ON A GROUP BASIS.

1. Sales of abstracts journals and indexes are subject to various influences. For a typical producer of such journals, what do you think have been the main negative influences on sales over the last 3-4 years?

1	<input type="checkbox"/>
2	<input type="checkbox"/>
3	<input type="checkbox"/>
4	<input type="checkbox"/>
5	<input type="checkbox"/>
6	<input type="checkbox"/>

Please list up to six factors in order of importance, using the codes listed below, even if you dislike the wording.

- A. Price increases
- B. Impact of microforms
- C. Impact of batch services
- D. Impact of online services
- E. Recession: temporary drop in demand
- F. Decline in long-term demand for information
- G. Sales were previously above equilibrium level
- H. Government cut-backs
- I. Falling student numbers, leading to reduced university revenue
- J. More competition
- K. Weaknesses in distribution
- L. Product weaknesses
- M. Weaknesses in promotion
- N. Photocopying
- O. Library pooling
- P. Shortage of library storage space
- Q. Other (please specify)

2. For those bibliographic data bases already in existence in 1978:

a) What do you think will be the total volume of searches (online, batch and manual) in 1980 and 1985, relative to 1978? (1978=100)

	1978	1980	1985
USA	100		
UK	100		
W. Germany	100		
France	100		
Japan	100		
India	100		

b) What percentage of these searches do you think are/will be online?

	1978	1980	1985
USA	%	%	%
UK	%	%	%
W. Germany	%	%	%
France	%	%	%
Japan	%	%	%
India	%	%	%

3. What are the main factors which have influenced your view of

a) 1978-80?

b) 1980-85?

Thank you very much for your help.

Please mail the completed questionnaire to:

Patrick Barwise Impact of Online Information Services London Business School Sussex Place Regents Park London NW1 4SA UK
--

to arrive in London not later than 31 July 1978

Please respond promptly. For our part, we will send you the results as soon as they are available.

EXHIBIT E3

RESPONDENTS TO EXPERT OPINION QUESTIONNAIRE

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DAVIES, G., CEC, Luxembourg
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EXHIBIT E3 - cont.

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WILSON, Prof. A.J.C., Int. Union of Crystallography, UK

APPENDIX F

THE INSPEC DECISION MODEL

The computerised INSPEC Information Services Model (INSISM) was developed to provide a ready method to examine the scenarios under which a database producer might develop. The original concept of the model came from Derek Barlow of INSPEC who also kindly provided the computer facilities.

Because of restrictions on time and budget, the model was set up using standard software: the RISKAN II package on CDC's CALL/370 time sharing system. The resulting model, although suffering from the inherent limitations and built-in assumptions of a package programme, proved to be quite adequate for the purposes of the current study. However, further development of the concept would best be served by setting up an entirely new model, to produce a tailor made system.

The logic of the model is presented schematically in Exhibit F1. Represented are the elements which contribute to the three main income streams for a typical database producer i.e. components of

- (a) income from sale of publications
- (b) income from sales of batch processing tapes (including royalties from SDI searches)
- (c) royalty income from online processing services.

The user assigns to the input variables, values for an initial period and description of the growth characteristics. The model computes the values over the time period for the various income streams and the total net outcome. Both variable and fixed costs may be included.

The model has proven to be highly useful in two applications.

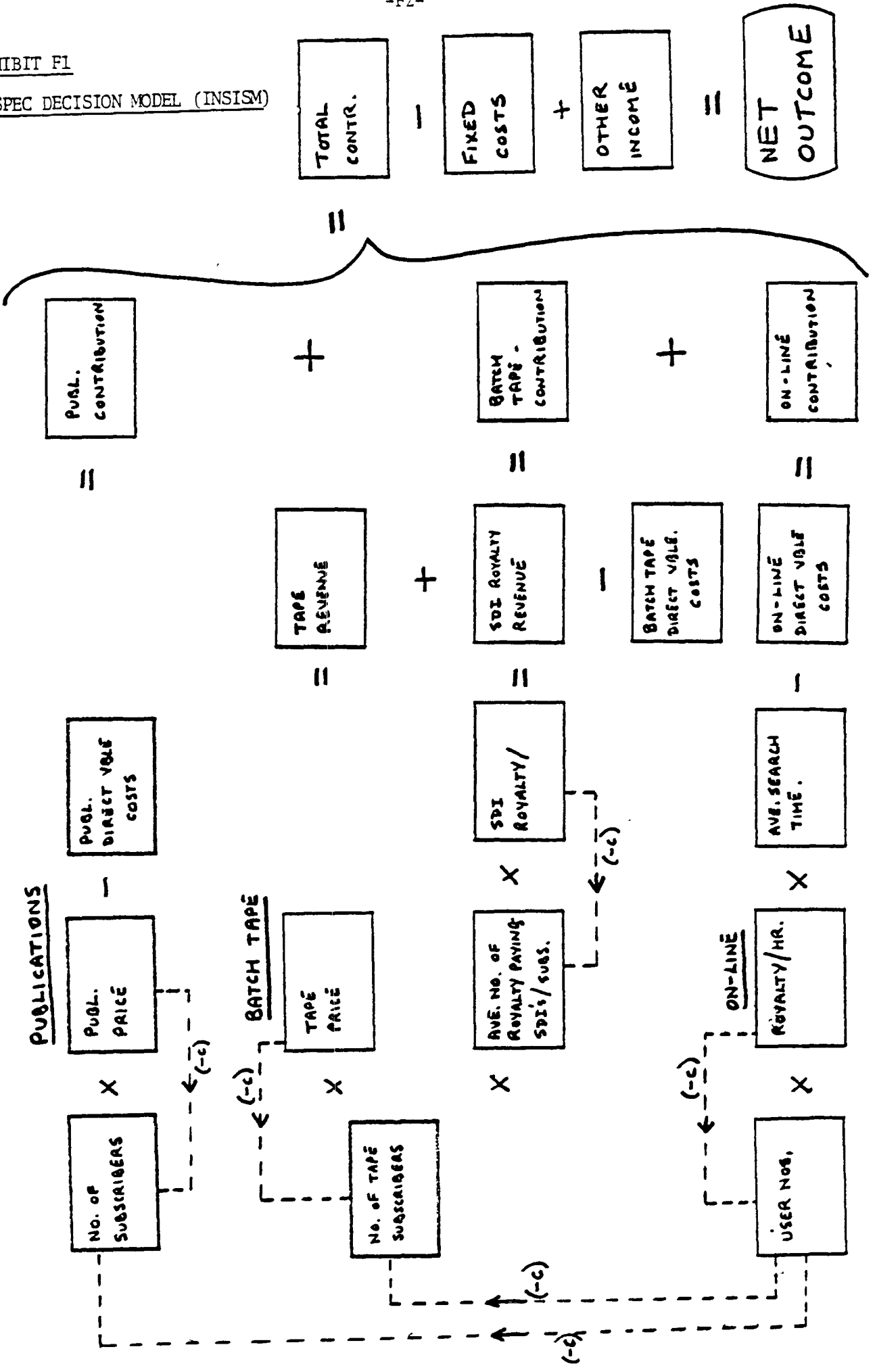
- (a) examining the variation of balances between income components under optimistic/pessimistic scenarios, and
- (b) examining the sensitivity of the various income streams to the input parameters, i.e. determining which parameters have the most significant impact on income, and seeing how this shifts over time.

It is important to appreciate that the model is not an econometric forecaster, but rather a device to permit calculation of what might happen, based purely on the assumptions of the user. The results of an analysis using the model can only be as good as the data. Using the model as a tool to construct the scenarios and assess them, the process is iterative, analysis leading to reexamination and amendment of the input data.

A user guide to the model has been prepared, titled "Inspe Information Services Model - INSISM - Users Guide". The document is available, and access to the system can be arranged, through ICSU AB. A facility for risk analysis using the model is available, i.e. determination of probability distributions for the outcomes, based on assigned probability distributions for the input variables.

EXHIBIT F1

INSPIC DECISION MODEL (INSISM)



APPENDIX G

SOME COMMENTS ON LONGER-TERM RESEARCH

The main long-term need is for fundamental research into detailed usage patterns.

There are still gaps in our knowledge of online usage at the micro level, and in our ability to reconcile such data with what we know about usage at an aggregate level.

There are also much bigger gaps on the print side, and on the relationship between print and online, e.g. the frequency and purpose of print usage, the follow-up to online searching, etc. The following comments give one view of the best way of reducing all these gaps.

The emphasis should be on quality, not quantity of data. In any case, some kind of quota sampling will have to be used, to keep costs down: so many large users, and so many small; so many long-established online users (e.g. selected from the Wanger, et al (1976) sample), so many new ones, and so many print-only users; so many each from industry, government and academia; from N. America and Europe; and so on. By studying as wide a range of conditions as possible, and by replicating results, more will be learned than by investing in a few expensive surveys based on very large samples.

Research about present conditions should be largely behavioural- finding out what actually happens, not just what people think happens. Research about the future should also measure peoples' opinions (what they think will happen) and preferences (what they would like to happen). As regards the future, the need is not so much for more debate, as for the debate to be as systematic as possible.

Knowing more about current and likely future usage, and about user needs, will not only aid planning but also product development. The aim should be to exploit what is best in printed and electronic media, rather than setting them up in competition with each other.

Two developments will encourage research to be systematic and useful:

- a) Extension of the industry's bibliographic activities about itself, via the trade press, ARIST, the Aslib bibliographies etc. A fully-fledged bibliographic database, with abstracts as well as indexes, would be of great value.
- b) More emphasis by funding agencies on continuing, rather than ad-hoc, research, and on the quality of results, rather than their timeliness. There is a particular problem here for public sector agencies. When public money is being spent, it seems proper to insist on punctual delivery; and wasteful to buy the same thing twice. But in no field of scientific endeavour can good research be produced in this way.

Such a shift in emphasis need not involve an increase in total expenditure.

European Communities — Commission

EUR 6250 — The impact on user charges of the extended use of on-line information services

P. Barwise

International Council of Scientific Unions Abstracting Board (ICSU AB)

Luxembourg: Office for Official Publications of the European Communities

1979 — 87 pp., tables and figures — 21.0 × 29.7 cm

BCR information series

EN

ISBN 92-825-1009-3

Catalogue number: CD-NV-79-004-EN-C

BFR 220	DKR 38,80	DM 14	FF 32
LIT 6 200	HFL 15	UKL 3.70	USD 7.40

This study aims to assess the past and future impact of on-line retrieval on the revenues of bibliographic data-base producers, and the implications for future user charges.

An analysis of previous research, of recent revenue patterns, and of expert opinion, leads to the conclusion that subscriptions of printed abstracts journals and indexes have not so far been seriously reduced by the growth of on-line retrieval. The analysis also suggests great uncertainty, however, about the growth and impact of on-line bibliographic searching over the period 1978-1985.

A scenario-building model is developed to help data-base producers explore their own assumptions about the future, and illustrated using a fictional case-study. The case-study leads to the conclusion that on-line royalties are low in relation to the price of printed products, and are likely to be increased (in relative terms) by a factor of 2-2½ times, over the period 1978-1983. The report argues that real-life data-base producers will tend to come to qualitatively similar conclusions to those in the case study. One implication is that there is likely to be some easing of the rate of price increases for printed products.

Proposals are made for the routine collection of further facts, so that a better assessment can be made by 1981.

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