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Cost-Effective Operation for an Agricultural Information Center†

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The recent economic climate for the industrial world requires that all facets of operation be examined and honed to greatest efficiency. Information services must respond to an increasing demand to provide more services for an expanding research and development staff and maintain reasonable budget increases in spite of recent sky-rocketing costs of information products and services. Unit cost reduction methods have been developed and implemented to control escalating operating costs. Methods for cost control and cost reductions are described, specifically, systematic review and control of subscription renewals and book acquisitions and an innovative procedure for closer control of on-line database usage to countermand rapidly rising costs of scientific databases.

INTRODUCTION

Information is expensive. If you have it, it is expensive to process. It is also expensive to maintain so that it is easily accessible to users. If you do not have the needed information readily available, it may be even more expensive to acquire and usually impossible to obtain on short notice.

The success of any technical information service function is measured in a large part by its ability to provide high-quality services and products in spite of increases in the cost of products and operations.[1] This paper discusses how we are dealing with this problem in Technical Information Services, referred to as TIS, at American Cyanamid's Agricultural Research Division in Princeton, NJ. But first, some information about the Agricultural Research Division, its client/user population, and its mission.

AGRICULTURAL DIVISION—ITS CLIENT/USER POPULATIONS

At the Agricultural Research Division, referred to as ARD, we have scientists, managers, and support staff involved in research and development of products for animal health and nutrition and also of products related to plant science; these are insecticides, herbicides, and plant-growth regulants. Research and development responsibilities of ARD are worldwide. Our development staff is responsible for both domestic and overseas research in the Americas, Europe, Africa, the Middle and Far East, and Australia. The TIS user community also includes the administrative group of the Agricultural Division, who handle domestic and overseas marketing, technical services, and sales.

In general, the principal users of technical information and our library collection are bench scientists and other scientists, who comprise about 60% of the total research and development population. Many requests made to TIS by ARD personnel may originate outside our division from persons in the development or marketing groups or from our patent attorneys.

FACILITIES AND COLLECTION

The Agricultural Research Division is housed in a facility built in 1961. The Library contains literature, patents, company research and development reports, and laboratory notebooks necessary to support the work of the Agricultural Center. These resources are enhanced by our use of five major computer systems that collectively provide access to more than 150 databases relevant to our work.

TIS STAFF AND FUNCTIONS

TIS staff is comprised of information scientists, librarians, and support staff. Our three areas of responsibility include Library Operations, Patent and Literature Services, and Research Information. Our information scientists are either graduate chemists or graduate biologists with advanced degrees or advanced training in their subject field and in information science.

The mission of TIS is to provide informational support to ARD through acquisitions and maintenance of the Library collection and, most importantly, by responding to daily requests for specific information (Figure 1). The results of these requests take the form of products that vary with the nature or complexity of the question. For example, searches are usually very complex, may cover more than 10 years of literature, and may take many months to prepare.

About 2 years ago, we discontinued our current awareness bulletins called "Items of Current Interest" (ICI). These were a cut-and-paste operation of references and abstracts selected by the information scientists from Library periodicals. These current awareness bulletins were time and labor intensive and expensive.

We now have a computer-generated current awareness service, Selective Dissemination of Information (SDI), on selected topics. These SDI's arrive via mail from the supplier and are circulated to interested persons. SDI's are obviously more efficient, and recipients are very pleased with them. At

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1. Literature or Patent Searches
2. Reference Question Responses
3. Memos of Record
4. Patent Bulletins
5. SDI (current awareness) Service

Figure 1. Types of TIS products.

AVERAGE PER SDI	$9
RANGE PER SDI	$3 - 33
SDI SERVICE PER RECIPIENT	$5
TOTAL PER MONTH	$270

Figure 2. SDI current awareness updates: computer costs per month.

DEVELOPMENT TIME PER SDI	1-10 HOURS
DEVELOPMENT PERIOD PER SDI	ONE DAY - 3 WEEKS
MAINTENANCE TIME PER MONTH	
PROFESSIONAL	3.5 HOURS
CLERICAL	9 HOURS

Figure 3. SDI current awareness updates: development and maintenance time.

present, we circulate 33 subjects to 57 persons, averaging 7 persons for each SDI.

Computer-generated SDI's can be very expensive. The best way we have found to control the costs of SDI's is to avoid developing them on broad subjects, which would generate large numbers of references. Cost-efficient SDI's are those on specific topics that produce not more than 30–40 references per month. Our average is about 30 "hits" per SDI. An SDI on the broader subject of herbicides would have hundreds of references a month and be prohibitively expensive. Our average cost per SDI is $9, ranging from $3 to $33. This averages about $5 per month per person for a total expenditure of $270 per month (Figure 2). For general subjects like herbicides, we utilize abstracting service publications such as *CA Selects Herbicides* produced by Chemical Abstracts Service. In order to control the cost of SDI's, the amount of clerical time needed to process them must be kept to a minimum. The development time for each SDI profile ranges from 1 to 10 h over a period of 1 day to 3 weeks (Figure 3). When the SDI's arrive in the mail, covers are attached that identify the subjects, and they are circulated to the users. Our maintenance or handling time in TIS for all SDI's is about 3.5 h of professional time and 9 h of clerical time. Some subjects are run in more than one database, but no attempt is made to eliminate the duplicate references between the databases. The advantages of SDI over ICI are outlined in Figure 4. From this comparison, it is obvious that the SDI's are advantageous over ICI as they are selected from a greater literature base and are more economical of TIS effort at a reduced cost.

REVIEW OF OPERATIONAL AND PRODUCT COSTS

Planning to meet present and future needs of research and development staff has been difficult. The size of the research and development staff doubled during the period 1973–1982, while TIS staff increased only by one full-time clerical person to handle our Good Laboratory Practices responsibilities. It is evident from Figure 5 that there has been a decided increase in the research and development staff while TIS staff has remained constant at five information scientists.

SDI	ICI
Computer Info Services	TIS Library Services
Thousands of Journals	About 700 Journals
Info Specific to R/D Needs	Relevance Limited by Serendipitous Selection
SDI Easily Amended as R/D Needs Change	Change in Info Request Does Not Improve Quality of Retrieval
Staff Time Reduced in Handling: 1 Info Scientist, 1 Tech. Assistant	Broadened Scope of ICI Created Need for More Staff to Produce Bulletin

Figure 4. Advantages: selective dissemination of information (SDI) over items of current interest (ICI).

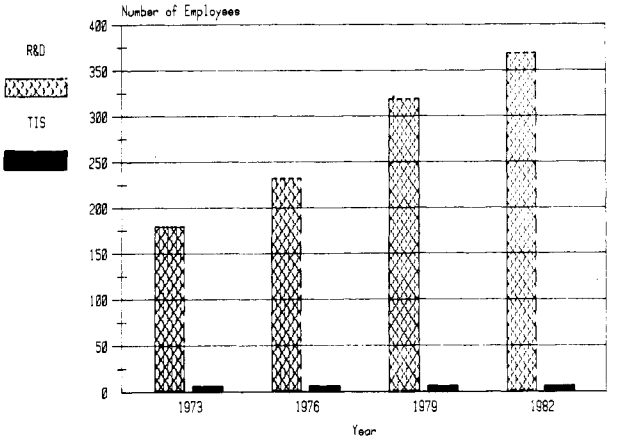

Figure 5. ARD scientific staff vs. TIS (1973–1982).

Our three computer terminals allow us access to the huge worldwide literature resources of on-line database systems. This capability has significantly helped us to compensate for a minimal staff while keeping up with the information explosion and the increasing level of service to ARD. This growth in the research and development staff has put a heavy burden on TIS to be extremely efficient, so that we may derive the greatest benefit from each person's work in the group as well as the greatest benefit from each budgeted dollar. We believe we have done this to the best of our ability by cost-benefit analysis carried out on an on-going basis. The 10-year period 1973–1982 will be used as a base for budget data presented here.

COST CONTROL[2,3]

Budget planning begins in May for the following year. In TIS we maintain some routine internal accounting of expenditures as a check on possible discrepancies or unexpected charges. Each year's budget is developed from the history of existing expenditures by adding the cost of major items planned for the coming year and by consideration of expected cost increases including inflation and fluctuating foreign exchange rates. On the basis of constant dollars, we have been able to serve an increasing research and development staff and still maintain the TIS budget on a relatively level basis (Figure 6).[4] Figure 7 shows the relationship of the TIS budget to the total research and development budget; this ratio is a measure of TIS productivity. It is obvious that the TIS budget as a ratio of the total research and development budget has decreased from a high of 3.3% in 1976 to 1.7% in 1982.

Periodical Subscription Review. One of the largest single items in our budget is periodical subscriptions. The *Bowker*

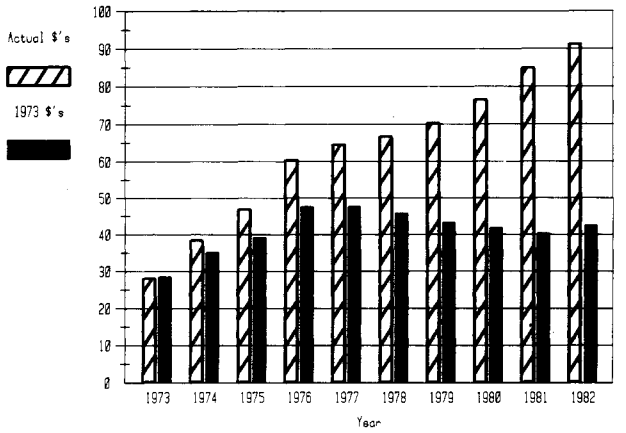

Figure 6. Budget in constant vs. actual dollars (reference year 1973).

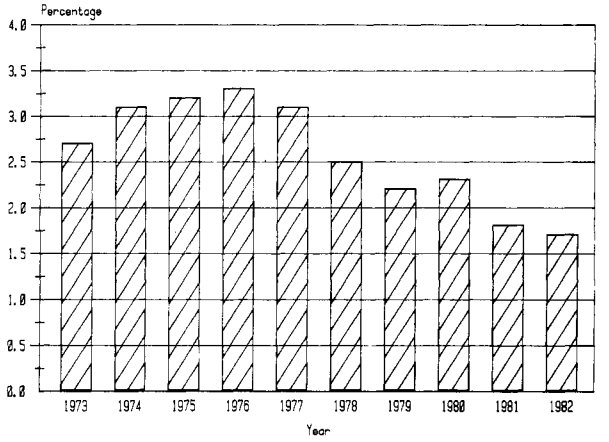

Figure 7. Annual budget: TIS as percentage of ARD (1973–1982).

Annual reports that between 1972 and 1981 the cost of periodicals in chemistry and physics increased by 3.9-fold.[5,6] Since we could not justify that rapid an increase, it was necessary to take a close look at current subscriptions, as well as the need for new titles. Each year our current titles are reviewed with particular emphasis on additions made during the previous 2 years.

Prior to 1974, a list of current periodicals was circulated asking readers which titles they wished to continue. Nothing was ever dropped by this method. From 1974 to 1980, our review consisted of annual meetings with representatives of each research and development department to evaluate journals that could be canceled in trade for new journals more pertinent to our current needs. We tried to keep this exchange on a dollar trade basis but with great difficulty. Figure 8 indicates that our periodical budget fluctuated, but with a strong upward trend. In constant dollars, however, it has been relatively stable.

In 1981 we revised our methods, and with the help of the computer we produced a table grouping all our current periodical titles by broad subject categories. Each year, this chart is distributed to all ARD supervisory staff. Each title is rated on a scale of 0–3 (0 being of no interest and 3 of greatest value). Thirteen sections in research and development are requested to respond. The totals are tabulated by the computer, and the result is a listing in order of rank.

After calculating the dollars we could afford to budget in the coming year for periodical subscriptions (based on the criteria established for the Division), we then determined where the line must be drawn.[7-10] Also taken into consideration was the expected cost of new titles. Any titles that had at least one "3" were not subject to cancellation.

When this plan was implemented in 1981, we reduced our current subscriptions for 1982 by 116 titles and added only

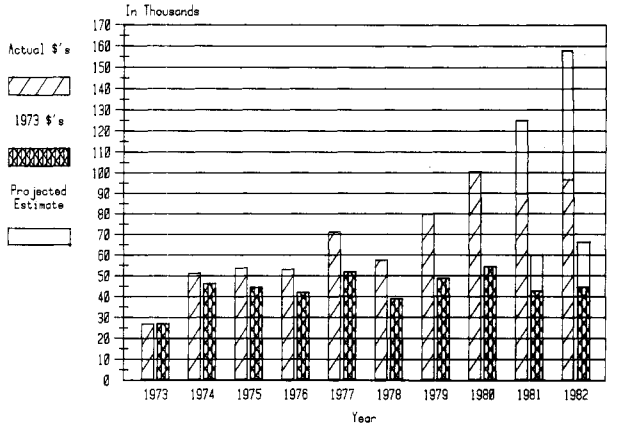

Figure 8. Periodical costs: actual vs. constant dollars (reference year 1973).

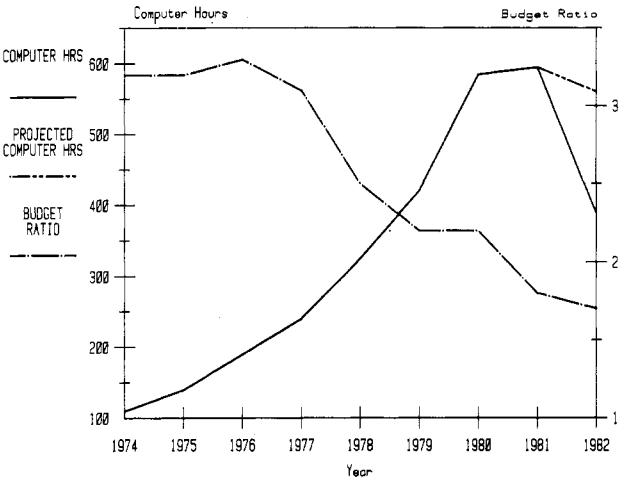

Figure 9. Computer time and annual budget: TIS as percentage of ARD.

17 new titles with a few reinstatements. For 1983, the results were not quite as drastic. This procedure has worked satisfactorily for 2 years, and we intend to continue it. The projection in Figure 8 also shows the estimated costs without this new method for evaluation and control.

Reassignment of Charges for Book Requests. In 1973, a means of reassigning charges for books with limited use was instituted. Direct charging to other departments within ARD for desk copies has resulted in greatly improved cost control, since approval by a department Director is required and the ordering department pays the bill.

On-Line Searching. The other major cost in our budget is for on-line searching. Over the years, budgeted allotment for computer database searching has increased substantially, and our use of computer databases has also grown.

We attribute our increased computer use to the increased number of new databases becoming available, the new areas of interest to ARD, the timeliness of on-line databases compared with some hard copy, and the speed with which selected information can be obtained from the computer vs. hard copy. The growth in computer hour usage since 1974 is shown in Figure 9. The dollars available to pay for all this work were not unlimited, and expenses were getting out of hand.

In 1974 with the advent of computer searching, the TIS average hourly rate was $134. A low of $67 in 1979 was of short duration (Figure 10). In 1982 our rate was about $119/h, an increase of 43% over 1979.[11] We needed to reduce our use by about 30% to keep the same outlay of dollars since computer costs were rising and suppliers were now charging for printing results on-line. We had to develop some method of control.[12] Consideration was being given to requiring au-

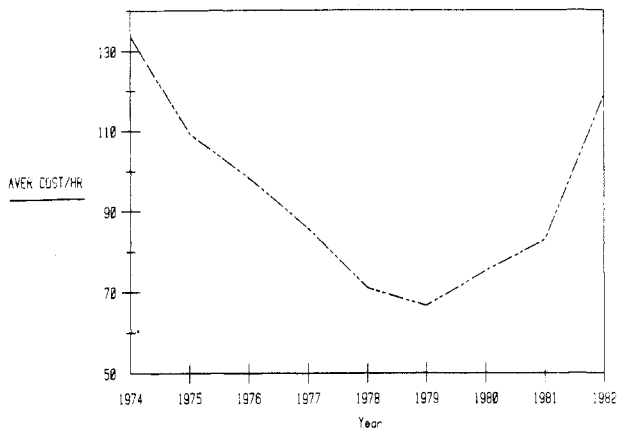

Figure 10. Computer costs per hour.

thorization by a Director for every search request. This was too limiting to the scientist; some would not ask for necessary searches. Scientists were permitted to buy chemicals and equipment but would need a Director's approval for a minimal computer search of considerably less dollar value. Rather than restrict use on a dollar basis, we have instituted a time limit. A computer search for more than 30 min of on-line database time requires the signature of a Director. Of necessity, the half-hour time would limit the number of citations printable on-line and also limit the number of databases searched. This procedure was implemented in May 1982 and is working successfully. Our projection for 1982 shown by the dashed line in Figure 9 would have been considerably higher without this new 30-min limit. Most queries do not require an extensive number of references or abstracts. A representative sample is sufficient and usually can be done in less than 30 min. By using this procedure, we have been able to hold our costs for computer searching to an acceptable level without reducing service—the best of all compromises.[13]

For queries received from persons outside our division, we require that each be approved by an appropriate Director regardless of the time involved. Also, we calculate the average hourly cost and charge the division involved for both the computer time and an hourly rate for TIS staff time.

A comparison of computer use with TIS efficiency suggests that the increased use of the computer has helped to reduce TIS costs and increase TIS productivity. This is demonstrated in Figure 9 by the dotted line showing the ratio of the TIS budget to the total research and development budget.

SUMMARY

To summarize, methods have been discussed that are in use at Cyanamid's Agricultural Research Division for cost control of some Technical Information Services functions. The major ones include (1) the annual survey of current periodical titles and the several procedures we have followed (the current one of ranking is the most useful), (2) charge back for books with restricted use as desk copies, (3) control of on-line database expense by limiting on-line time to 30 min without management approval, and (4) increased use of the computer for literature searching.

ACKNOWLEDGMENT

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