

- An Experiment with Undergraduates", Symposium on Chemical Literature Searching in the Undergraduate Curriculum; Second Chemical Congress of the North American Continent, San Francisco, CA, Aug 25, 1980; Abstr. ACSC-7. See also, "Focus in CAS Report"; Chemical Abstracts Service: Columbus, OH, 1984; No. 15, Jan.
- (18) Gaus, P. L.; Borders, C. L., Jr.; Powell, D. L.; Surbey, D. J. *Chem. Educ.* 1983, 60, 1048. See also reference 22.
- (19) Approximately 35% of U.S. colleges and universities offer a formal course in chemical literature. This percentage has been constant for about 20 years; moreover, the total enrollment appears to be small: Ramsay, O. B.; Colman, R. P. "Status of Academic Instructional Programs in Chemical Literature and Chemistry Information Retrieval", Symposium on Chemical Literature and Information Retrieval in the Chemistry Curriculum; 184th National Meeting of the American Chemical Society, Kansas City, MO, Sept 15, 1982; Abstr. CHED-48. Sarkisian, J. E. "The Status of the Teaching and Use of Chemical Information in Academia", Symposium on Teaching and Use of Chemical Information in Academia; 178th National meeting of the American Chemical Society, Washington, DC, Sept 10, 1979; Abstr. CINF-1. See also Powell, A.; Schlessinger, B. S. *J. Chem. Educ.* 1971, 48, 688.
- (20) Kirschner, S. "Chemical Literature Information Retrieval Instruction in Departments without an Expert", Symposium on Chemical Literature and Information Retrieval in the Chemistry Curriculum; 184th National Meeting of the American Chemical Society, Kansas City, MO, Sept 15, 1982; Abstr. CHED-51.
- (21) *Chem. Eng. News* 1983, 61, No. 46, 54.
- (22) "Undergraduate Professional Education in Chemistry: Guidelines and Evaluation Procedures", ACS Committee on Professional Training; American Chemical Society: Washington, DC, 1983; pp 13, 19.
- (23) Experiment undertaken by S.H.W. and E. L. Eliel at the University of North Carolina, Chapel Hill, NC, beginning Jan 1983. Similar programs operate at Central Connecticut State College, New Britain, CT; at the Hebrew University, Department of Organic Chemistry, Jerusalem, Israel; and at the University of Rochester, Rochester, NY. See Kozlowski, A. W.; Shine, T. D. "Library Labs for Sophomore Organic Students", Symposium on Chemical Literature Searching in the Undergraduate Curriculum; Second Chemical Congress of the North American Continent, San Francisco, CA, Aug 25, 1980; Abstr. ACSC-4 and Wolman, Y. "Integrating Chemical Literature and Information Retrieval into the Chemistry Curriculum at the Hebrew University"; Abstr. CHED-61 [see also, Wolman, Y. "Chemical Information: A Practical Guide to Utilization"; Wiley: New York, 1983] and Somerville, A. N.; Kende, A. S. "Computer Searching in the Chemistry Curriculum"; Abstr. CHED-63, both papers presented at the Symposium on Chemical Literature and Information Retrieval in the Chemistry Curriculum, 184th National Meeting of the American Chemical Society, Kansas City, MO, Sept 15, 1982. A more general description of the program at the University of Rochester, "Information Searching in the Chemistry Majors' Curriculum", Abstr. ACSC-5, was presented by the same authors at the San Francisco meeting cited above. Yet other programs of instruction in use of the chemical literature integrated with the normal curriculum were described at the San Francisco Symposium.

Measuring Incremental Costs of Information[†]

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An attempt was made to establish a rational basis for information services budgets within a medium-sized specialty chemicals firm. Year-to-year comparisons of expenses for personnel, books, computing, and subscriptions showed that, over a 6-year span, the percentage contribution of computing costs to overall expenses increased dramatically while all other categories remained constant or decreased. Because assignments and responsibilities for the information services function changed significantly during the study period, incremental costs could not be calculated. Factors that influence the cost of information are discussed.

Earlier attempts at measuring the cost of providing information in industry^{1,2} have both highlighted the inherent difficulties and shown great variability in results. The measurements taken for this study have led us to the conclusion that incremental figures are not meaningful for our situation, for reasons detailed below. This paper is presented, then, to help others in similar situations to better quantify their own programs.

By "incremental costs" we mean the increased resources needed to support new employees or, more appropriately, new customers or users of Technical Information Services (TIS). This implies that, at some time, there was a stable base of users and a basic set of services from which all measurements are made. Since the cost of services should be known, a simple calculation would give the cost per user from which changes could be observed. Unfortunately, not all employees are users, even though TIS has a corporation-wide charter, so fixing the denominator of the calculation is difficult.

The Technical Information Services group at Henkel resides physically and organizationally within the Research and Development Division (currently called "The Technology Group") and is the only technical information group in Henkel. Its corporate scope, however, requires involvement in nontechnical or business information—finance, marketing, personnel, legal,

etc. Traditionally, the budget for TIS expenses has come entirely from the Technology Group no matter who was served. For Fiscal 1983, however, we began to allocate the "nontechnical and non-Minneapolis" information expenses. Of course, those who received the new allocations raised questions about actual costs, which initiated the present study. We hoped that a measure of incremental costs would also help us to respond to additional demands for services imposed by the acquisition of existing chemical firms. Finally, we sought a reasonable model on which to base subsequent budgets.

Our first approximation of information costs was based on a look at our past. In the 5 years from 1978 through 1982, the TIS group had grown from a staff of 5 (three professional, two clerical) to 11 (seven and four, respectively), and our annual expenditures had tripled. We began our analysis by dissecting our annual expense reports to see if our hunches about where this money was going were accurate.

Since it is commonly held that personnel costs account for the largest portion of services budgets, we compared people costs (wages, salaries, and fringe benefits) to total expenses from 1978 forward (Figure 1) and then calculated their percent contribution (Figure 2). The overall flatness of the slope in Figure 2 (52% in 1978, 50% in 1982) was surprising in light of the addition of six staff members during the 5 years.

Three other major contributors to TIS costs were identified: collection development (books), on-line and other time-sharing expenses, and subscriptions. A final category, "all other", was added, and the percentage contributions were calculated

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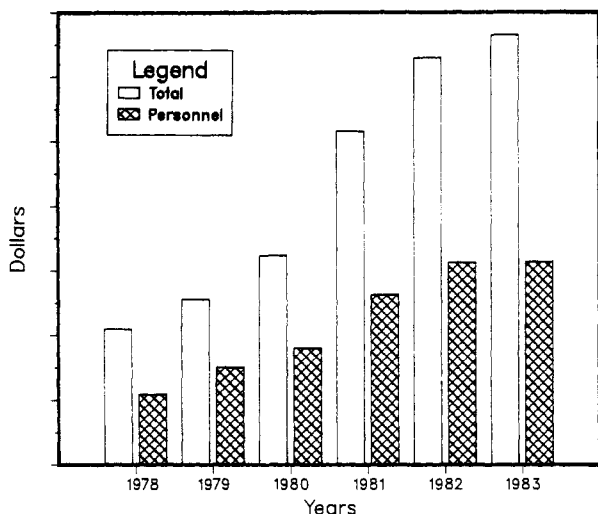


Figure 1. Personnel expenses vs. total expenses.

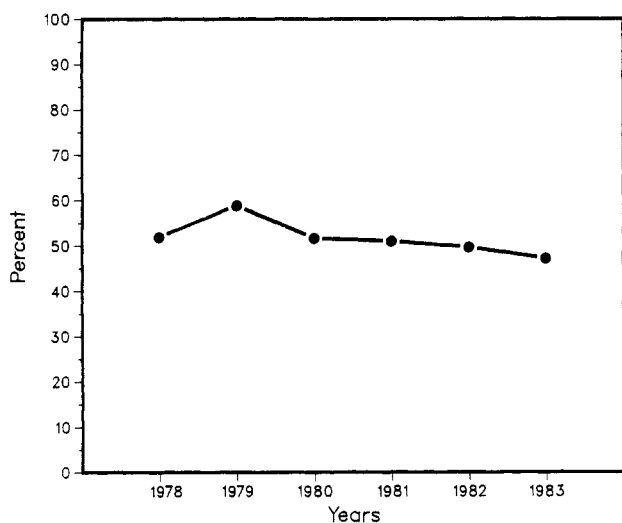


Figure 2. Personnel cost as percent of total.

(Figure 3). Clearly, on-line and computing costs were the fastest growing expense items. Facility-wide computing costs became a part of the TIS budget when a two-person systems group was added to our responsibilities in 1982. Both were at the professional level and are included in the increase mentioned previously. We considered this to be a natural fit with our current and expanding responsibilities as well as a proper progression toward integration of all information services. There is no mainframe at the Technical Center, and microcomputers have not yet appeared in each laboratory or office, so all of our nonbibliographic file manipulation and database use of computers is done by remote-access time sharing. Therefore, this expense represents the sum of on-line bibliographic searching and on-line "traditional" computing.

This new assignment is typical of tasks assigned or assumed resulting from a series of complex changes in user populations, organizational changes, and increased demands that have occurred in the recent past for TIS. While they are exciting, such changes preclude construction of an accurate year-to-year comparable services/comparable dollars picture.

Figure 4 shows how the scope of TIS responsibilities has grown since 1978 when only "traditional" library services were available to users. One result of increasing the variety of services available is a blurring of definition of the user population. Some services are quite specific to only a few users while others are broadly applicable across the corporation. When the more specialized services also are the more expensive ones (on-line PERT charts for example), it is difficult to

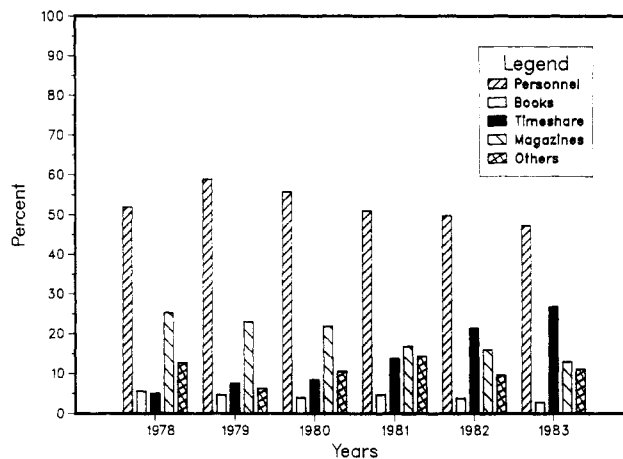


Figure 3. Expenses for 1978-1983.

YEAR ADDED

1978	LIBRARY - BOOKS AND JOURNALS
	LITERATURE SEARCHING
	CENTRAL FILES AND ARCHIVES
	INTERLIBRARY LOAN
1979	TECHNICAL TRANSLATIONS
	INTERNAL DATABASES
1980	CA/SDI BULLETINS
	NON-MINNEAPOLIS LOCATIONS
1981	OCLC CATALOGING
	GRAPHICS SEARCHING - CAS ONLINE, DARC
1982	SYSTEMS ANALYSIS
	COMPUTER GRAPHICS
	PERT/CPM CHARTS
	INTERNAL BULLETINS

Figure 4. Changing TIS responsibilities: 1978-1982.

prorate the cost across the entire potential user population. Yet, these services are, in fact, available to anyone who can show a legitimate need. Ultimately, a figure for cost-per-use is possible, but a cost-per-user figure is not.

We have stated some of the difficulties in calculating incremental costs of information. Even with these difficulties, it is useful to mention the important factors that influence the cost of information so they can be taken into consideration when measurements are attempted. At Henkel, the following have been most influential:

Awareness. As services are marketed and sold more aggressively, use increases as does overall costs. However, unit costs may decrease where economies of scale can be realized.

Newly Introduced Services. As with awareness, introduction of new services increases corporation use of information services, which drives up costs. In this instance, new services can be introduced both by outside vendors and by information services staff. These costs are truly incremental, whereas awareness of existing services may not increase basic costs.

Relative Age/Experience of User Population. Younger employees, new to the work force and generally more information sophisticated, make much higher demands on the information services function than their older colleagues. Overall costs will increase in the coming years.

Increasing Corporation Activities. As the corporation engages in mergers or acquisitions, more users are added to the customer list, and costs rise. Also, as the company grows and develops new markets or new products, the supporting information base is forced to grow, and overall costs of information services must grow proportionately.

Inflation.

Each corporation or institution will cope with these factors uniquely in response to the relative importance and magnitude

of each. It remains for the information scientists to develop a broadly applicable algorithm by which to effectively compare the costs of information, both on a year-to-year and institution-to-institution basis.

REFERENCES AND NOTES

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