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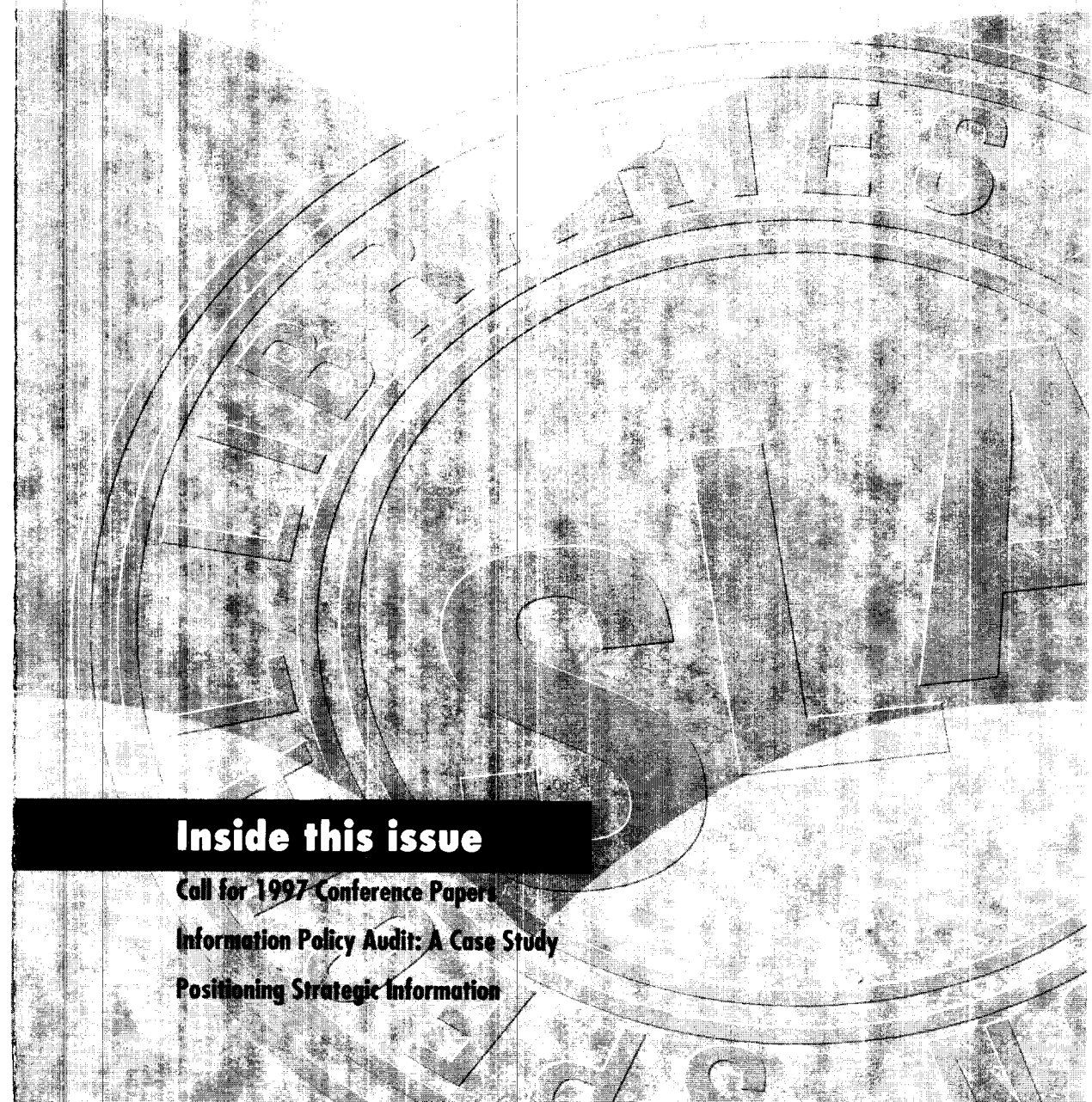

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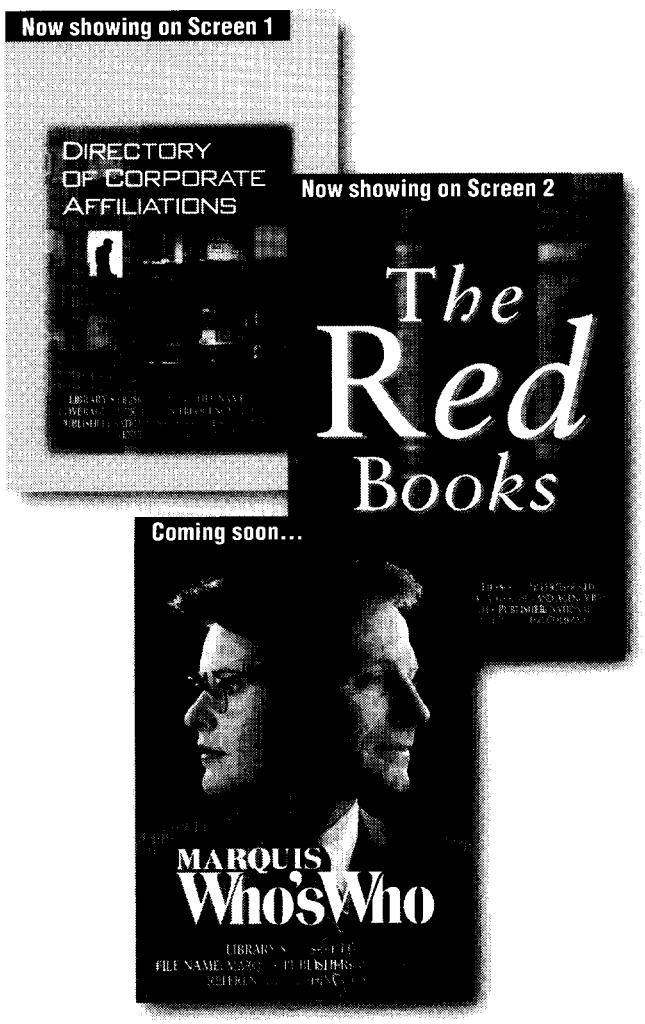

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On the Scene

special libraries

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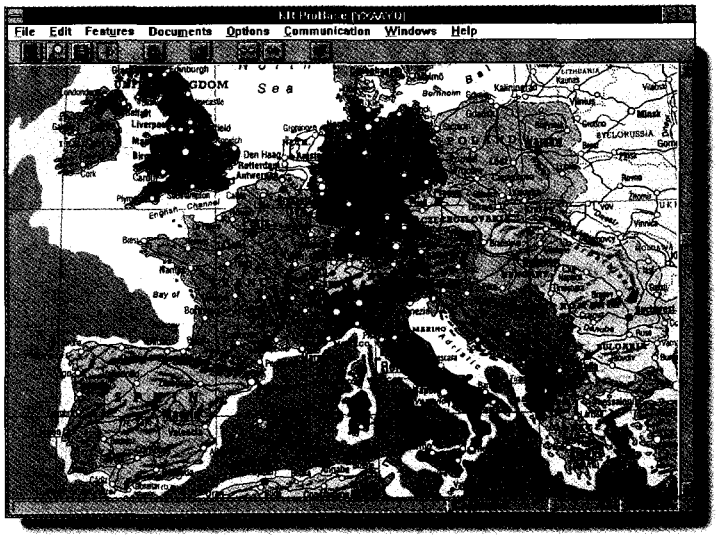

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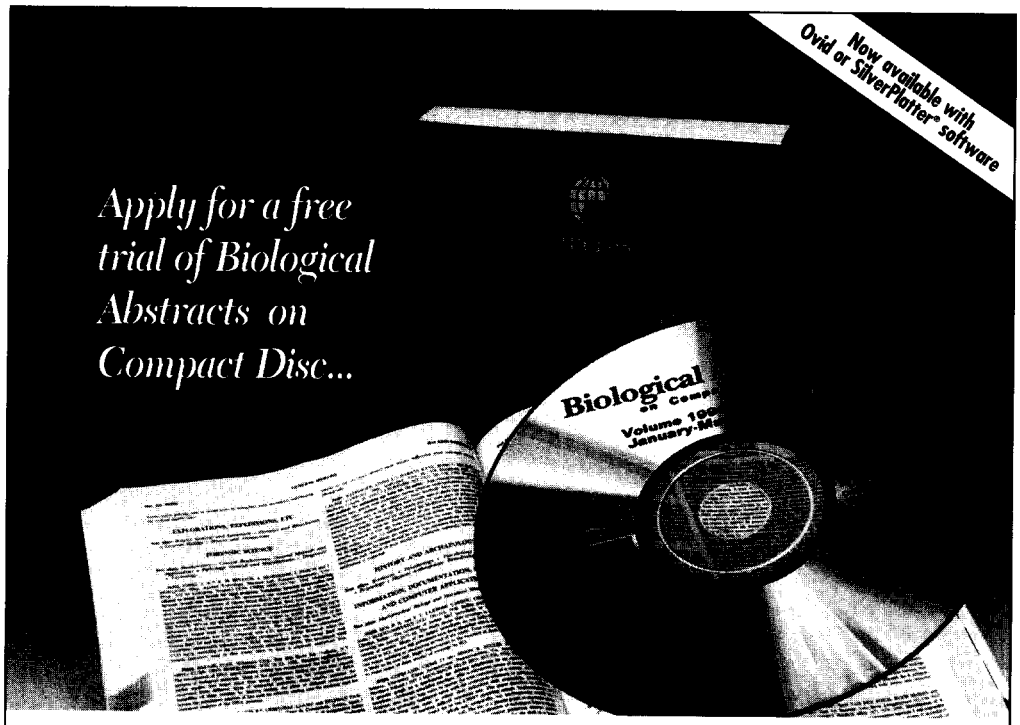

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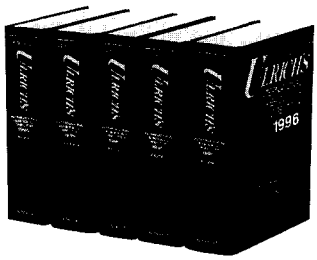

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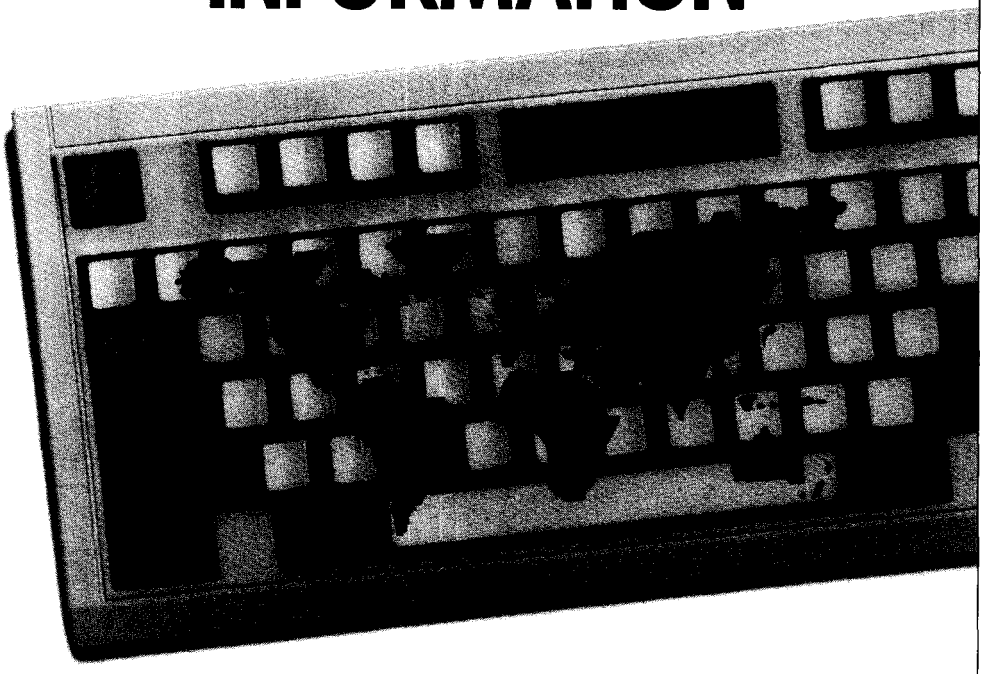

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Museum Libraries: The More Things Change . . .

by Esther Green Bierbaum

• *Les données d'un sondage de 152 bibliothèques de musées choisies au hasard révèle que, selon trois mesures de l'état organisationnel (financement, personnel et utilisation), et malgré son amélioration sous certains rapports depuis un sondage de 1982, leur situation laisse toujours à désirer dans leurs organisations mères respectives. Cet article parle du cadre du musée et de la manière dont les bibliothécaires spécialisés peuvent soutenir leurs collègues des musées.*

• *Los datos de una encuesta de 152 bibliotecas en museos seleccionados al azar indican que, aunque en algunos aspectos su situación es mejor de lo que era en una encuesta en 1982, todavía no les va bien dentro de sus organizaciones matrizes, de acuerdo a tres medidas del estado de las organizaciones—los fondos, el personal, y el uso. Este artículo presenta información sobre el ambiente de los museos y sobre algunas maneras en las cuales los bibliotecarios especiales pueden apoyar a sus colegas en los museos.*

Data from a survey of 152 randomly-selected museum libraries indicate that, while in some respects their situation is better than it was in a 1982 survey, by three measures of organizational status—funding, staffing, and utilization—they still do not fare well within their parent organizations. The article discusses the museum environment and some of the ways special librarians can support their museum colleagues.

Museum: An organized and permanent nonprofit institution, essentially educational or aesthetic in purpose, with professional staff, which owns and utilizes tangible objects, cares for them, and exhibits them to the public on some regular schedule.

American Association of Museums,
Professional Standards for Accreditation, *1989.*

Introduction: Museums and Their Libraries

Museums and libraries have similar missions: they acquire, describe, and make accessible to us the records of our human experience. But what happens when a museum is the parent organization of a library? What is then the role of the library within the museum? What is its relationship to the parent museum? And what is the status, or perceived importance, of the library?

Past investigators have described the role of the museum library in special library terms: to provide information to support the work of the museum, especially its research. However, the *status* of the library—that is, its importance or influence—is less clear. Indeed, documentary evidence suggests that the museum community itself gives museum libraries short shrift. For example, less space is given to the library in the American Association

of Museums (AAM) accreditation standards than to any other facility or service.[1] The 1992 AAM survey of 8,179 American museums included one question about library facilities, burying it in section E.57.A, "Public Programs."[2] Museum libraries do not yet appear to be an overwhelming concern for the museum profession.

A survey that I conducted in the early 1980s of 369 natural history, science, and technology museums looked at three measures of library status: funding, staffing, and utilization.[3] My findings at that time indicated that the library in these museums—when a library existed—was, in Danilov's apt phraseology, "underfinanced, understaffed, and underutilized."

After a decade of incredible changes in library organization and services, I wanted to find out whether the status of the museum library had also changed. This time, seeking a broader representation of museum types, I added art, history, and general museums to the natural history and science museums.

Methodology of the Study

The Official Museum Directory, 1994,[4] lists approximately 7,300 institutions, self-selected and self-described, but fulfilling the criteria of the AAM definition. Three hundred and fifty museums were randomly selected from the *Directory* on the basis of the following criteria:

1. self-described as an art, general, history, natural history, or science museum or as a historic site or a nature center; and
2. listing a library among institutional facilities.

The Smithsonian Institution and federal museums were not included because of their administrative and fiscal complexities.

Of the 170 (48 percent) responses received from museum libraries, 6 were unusable, while 12 reported that there was no library—this despite the directory listing. The final survey population consisted of 152 museum libraries. Table 1 compares the occurrences of types of museums in the sample with the 1992 AAM national data. The differences between the sample in this study and the AAM comprehensive survey are not statistically significant at the .05 level (Chi square=7.456; df=4); that is, the sample for which I report data is very like American museums overall.

Results of the Study

In this article I describe and discuss the data

Table 1

Responding Museums by Type*

Type	Number	Proportion	
		Sample	All Museums**
Art	43	.28	.27
General	21	.14	.10
History	62	.41	.36
Natural History/Nature Center	21	.14	.21
Science/Technol.	5	.03	.05
	152	1.00	.99

* Sample selection based on library reported in *Directory.*
** AAM data.

relevant to the organizational status measures of funding, staffing, and utilization. Data analyses are descriptive, furnishing a profile of the sample population.

In previous research I described four levels of museum library organization. They worked well in communicating with both librarians and non-librarians, and I used them again. The four levels are:

Level I. a collection of books and magazines gathered in one place and available to staff;[5]

Level II. a collection of print and nonprint materials in an area primarily dedicated to their storage and use;

Level III. a collection of print and nonprint materials in a dedicated place, with information about the collection contained in a catalog; and

Level IV. a collection of cataloged print and nonprint materials in a dedicated area, with someone designated to be in charge.

The levels progress from what is, essentially, a non-library to a fully organized and professionally directed information collection. Frequencies of the various levels appear in table 2. There is no way to know whether the responses that claimed no library despite their Di*rectory* listing were actually from Level I collections—what one director termed "a resource room, not a library." On the other hand, it is apparent that a goodly number of museums (24 percent in this sample) simply gather books and materials together and then list "library" as one of their facilities. Off-setting the frequency of museum "libraries" at the collection-only stage is the prevalence of catalogs: 61 percent. (Again, the operative term may be subject to local interpretation.)

While sampling may be an unmeasurable artifact in the differences between the 1982 and present data, it is heartening to note that more libraries at present have someone in direct oversight, and more have catalogs, even though the proportion of Level I libraries is greater.

The first indicator of the library's status is its funding level, since dollars tell tales, even in the not-for-profit setting.

1. Museum Library Funding. Libraries are, for the most part, not generously endowed by their museum parents. Table 3 shows the number of libraries in various ranges of budgets, the figures covering materials and operations but not salaries.

Table 2

Levels of Library Organization in Survey

Level of Organization	Number *(Proportion)*	Proportion in 1982
I. Collection	37 *(.24)*	.10
II. Collection + place	22 *(.14)*	.46
III. Collection + place + catalog	31 *(.20)*	.26
IV. Collection + place + catalog + person	62 *(.41)*	.18
Total	152 *(.99)*	

While a few libraries are relatively wealthy, one-half receive less than $1,500, and the 69 in that group may include additional zero-sum operations over and above the seven voluntarily reported. One respondent wrote, "*Way* under!" beside the $1,500 figure; another queried, "What budget???" Because of few responses in some data cells, the relationship between the organizational level of the library and its budget is statistically tenuous. Only at the non-library Level I, where 91 percent of those "libraries" fall in the under-$1,500 category, is there a clear connection between funding—or lack of it—and library organization. Six percent of the respondents could not furnish the budget range—a drastic improvement over the 1982 sample in which 35 percent professed ignorance of the library's funding level!

To some degree the data in table 4 reflect the general financial state of the majority of museums in the sample, nearly 60 percent of which scrape along on less than $350,000 a year, a sum which includes salaries and wages. Table 4 cross-tabulates the state-of-the-budget in the sample museums with the budgets reported by their libraries. (Museum budget figures come from 86 museum directors who responded to a separate protocol.)

If library funding were associated with overall museum funding, table 4 would exhibit a linear relationship, with the intersection of each museum budget category and its corresponding library budget level displaying the greatest frequency of occurrence. While there are too few cases in too many of the cells to test for statistical association, visual inspection does show that congruence occurs at the highest and lowest levels of museum and museum library funding; that is, 57 percent of the over $80,000 libraries reside in museums with more than $3 million budgets, while 71 percent of libraries under $1,500 are found in museums with budgets less than $100,000. The institutions in the $1-3 million budget range are especially stingy with their libraries relative to the overall institutional resources. A reasonable explanation for this apparent miserliness may lie in the fact that nearly one-fourth of the institutions in this budget category are natural history or science museums; that is, these

Table 3

Library Budgets (Excluding Salaries)		
Budget Ranges	**Number**	**Proportion**
Over $80,000	10	.06
$25,000 - $79,999	11	.07
$10,000 - $24,999	10	.06
$ 1,500 - $ 9,999	36	.24
Under $1,500	69	.45
$0*	7	.05
Subtotal	143	
Not Indicated	9	.06
TOTAL	152	.99

*Datum volunteered.

museums are more likely to be relatively well-funded, but less likely to support libraries.

Nor is the museum budget strongly related to the library organizational level. For example, while a majority (65 percent) of Level I libraries are found in the under-$350,000 museum budget categories, those budget ranges also house 46 percent of the Level IV libraries. A similar anomaly is found at the highest museum funding levels, where 25 percent of the Level I, virtually non-library libraries languish in museums whose budgets exceed $1 million. As previously noted, there is also a lack of congruence between the budget of the library itself and its organizational level.

Overall, then, there is a pervasive paucity of financing for museum libraries that is virtually independent of museum budgets. Funding, as a measure of library status, is hardly encouraging.

A less-direct indicator of funding and status is a department's ability to partake in workplace enhancements such as technological advances, which may include anything from purchasing multi-buttoned telephones to LAN-linked computer workstations. All respondents to the question (N=126) indicated that the museum's administrative or membership offices are computerized. The benefits of word processing and other non-bibliographic computer applications are enjoyed by 72 (57 percent) of their libraries, but only 56 (44 percent) of the registration or accession procedures are computerized. In view of the consistent administrative use of computers, museum management does not appear to be passing along the benefits of computerization to other areas

Table 4

Library Funding in Relation to Museum Budget

	Library Budget Categories (in $1,000s)						
Museum Budget Categories	**>$80**	**$25-79**	**$10-24.9**	**$1.5-9.9**	**<$1.5**	**No Response**	**Total**
> $3 million *(.08)**	4 *(.57)*	0 *(.00)*	2 *(.28)*	0 *(.00)*	1 *(.14)*	0 *(.00)*	7 *(.08)*
$1 - 2.9 million *(.16)*	1 *(.07)*	1 *(.07)*	1 *(.07)*	2 *(.14)*	6 *(.43)*	2 *(.14)*	14 *(.16)*
$350 - 999 thousand *(.15)*	0 *(.00)*	1 *(.07)*	1 *(.07)*	7 *(.54)*	4 *(.31)*	0 *(.00)*	13 *(.15)*
$100 - 349 thousand *(.34)*	0 *(.00)*	2 *(.07)*	0 *(.00)*	5 *(.17)*	21 *(.72)*	1 *(.03)*	29 *(.34)*
< $100 thousand *(.24)*	0 *(.00)*	1 *(.05)*	0 *(.00)*	4 *(.19)*	15 *(.71)*	1 *(.05)*	21 *(.24)*
Missing data *(.02)*	0 *(.00)*	1 *(.50)*	0 *(.00)*	1 *(.50)*	0 *(.00)*	0 *(.00)*	2 *(.02)*
Total	5 *(.06)*	6 *(.07)*	4 *(.05)*	19 *(.22)*	47 *(.54)*	4 *(.05)*	86

*Proportion of museums in budget category.

of the museum. (Table 7 will show that libraries fare as badly as registration when it comes to catalog automation.)

2. Museum Library Staff and Service Levels. *Library Staff Size and Employment.* A second indicator of organizational status is the size of the staff, the terms of their employment (full-time or part-time; salaried or volunteer), and the services offered by this staff. In the museum library, the primary role of the person in charge of the library is not necessarily that of librarian; the librarian's hat may be one of several doffed and donned successively by the person responsible for the library. Table 5 shows the frequency of these shared responsibilities.

In contrast to the 1982 study, the largest number of libraries are in the hands of persons termed "librarian" or, alternatively, "archivist." (In deference to the nature of the museum environment, the terms were brought together in the survey. Several respondents took the trouble to strike out one or the other.)

Table 6 shows the various staffing patterns: salaried and volunteer, full-time (FT) and part-time (PT). The term of employment most often cited is part-time; 70 percent of the salaried leadership serve on that basis. (They may, of course, serve part-time in another capacity in the museum.) The large numbers of volunteers—an average of more than 6—present an even more difficult circumstance because they tend to be overlooked by administrators doing nose-counts. Indeed, in more than half of the responses, the museum director's library staff census disagreed with the librarian's by a factor greater than +1 or -1 person; that is, the administrator cited more than one person too many or too few in the employment categories. Hence, where available, the librarian's staffing data are cited in table 6.

Thirty-five (23 percent) of the libraries reported no staff or no staff data, figures closely matching the frequency of Level I organization. At the other extreme, the large and wealthy few may have a dozen full-time salaried staff. In between, we may infer, libraries at the other organizational levels have someone—volunteer or otherwise—minding the store from time to time. Yet libraries, to be successful within their parent museums, must compete with other areas and departments for financial and material resources, as well as time and energy. As with funding, library staffing patterns fail to exhibit institutional support for the library and put it at a competitive disadvantage within the organization.

Staff Services: Library Collections. Library "size" in terms of the collection is difficult to ascertain, despite the fact that "Books" as a category of library materials is universally well-understood. Data (in obviously rounded numbers) came from 139 respondents.

Table 5

Role of Person Responsible for Library		
Primary Role in Museum	**Number**	**Proportion**
Administrator	26	.17
Educator	9	.06
General staff	13	.08
Librarian/archivist	70	.46
Registrar/curator	29	.19
Not indicated	5	.03
Total	152	.99

Collection size varied greatly, ranging from 40 to 100,000, with an outrider of 300,000. Omitting this singularity so that N=138, the average number of books was 6,856, with a standard deviation of 14,352, and the median in the 1,500-4,999 range. Seventy percent of the libraries have collections numbering fewer that 5,000 books; 23 percent, from 5,000 to 50,000; and 6 percent, over 50,000. Not surprisingly, these largest collection are presided over by full-time librarians in well-financed museums and libraries which enjoy—by an 80 percent margin—the top two library budget categories. However, collection size is occasionally an artifact of history, as suggested by the fact that 2 (or 20 percent) of these large collections reside in libraries of the lowest budget ranges.

Responses to questions regarding serial *titles* and archival materials did not yield reliable data.

Staff Services: Collection Organization. The organization of the collection is another indicator of staff responsibilities and of library status and services. Table 7 exhibits the responses regarding the library catalog.

Nearly two-thirds (105) of the responding libraries have a card catalog; 93 (88 percent) of them type the cards in-house—a reasonable solution, considering the small size of the collections and limited acquisitions. Of the 12 that reported receiving cards from a vendor, nine purchased from bibliographic utilities, and three from the Library of Congress. The no-catalog responses match closely the number of self-described Level I libraries in table 1. Apparently, however, Level II libraries often have some sort of finding device, and "catalog" seems to be interpreted as, necessarily, a *complete* finding device. For example, one response reported a Level II organization—and then included the marginal note,

Table 6

Staffing in Museum Libraries

Kind of Employment	Reported Instances	Avg. # of Incumbents
Salaried/FT	49 *(.42)*	2.73
Salaried/PT	82 *(.70)*	1.79
Volunteer/FT	6 *(.05)*	1.16
Volunteer/PT	88 *(.75)*	6.67
Libraries reporting staff	117 *(.77)*	
Libraries reporting no (0) staff	27 *(.18)*	
Libraries omitting staff data	8 *(.05)*	
Total	152	

"All our *books* are cataloged."

The 11 responses reporting dual systems, card and online, indicate on-going retrospective conversion projects. Not surprisingly, seven of these responses come from libraries with a librarian in charge; in three instances the director had responsibility for the library, and in the remaining, the registrar did.

Cataloging standards reflect the professionalism of the library. The survey asked about the descriptive rules: Anglo-American Cataloging Rules (AACR2) or other; the classification scheme; and the subject heading list used for the catalog records. Of 124 respondents answering the question about bibliographic description, 57 (46 percent) could not supply the data. Of the 67 who could, 51 (88 percent) claimed AACR2 (or AACR1). The lack of response regarding descriptive standards suggests that non-standard records are abroad in the catalogs, a situation which does not augur well for future retrospective conversion.

Classification was the most widely reported aspect of cataloging; librarians and non-librarians alike apparently are able to cope with it. Although more libraries reported using Library of Congress Classification (LCC) than Dewey Decimal Classification (DDC) (49 to 46, or 41 percent to 39 percent), the difference is not significant. Larger libraries tended to use LCC. Five reported using both; 5 collections are not classified; and 13 use "other." The question gave little pause; only 5 could not respond.

When it comes to subject headings, "Big Red" (Library of Congress Subject Headings, or LCSH) was the hands-down favorite over Sears (66 to 13, or 62 to 12 percent), while 3 used Art and Architecture Thesaurus, 9 used combinations, usually of Sears and LCSH, and 15 resorted to "other," especially locally-devised lists. Eighteen did not supply the data.

We see that—with the exception of the rules for description—museum libraries adhere to conventional standards in their catalogs. However, when 65 (or 70 percent) of those producing cards in-house do *not* observe standard cataloging rules, there is—as we have noted—a potential barrier to the online environment and the library's ability to communicate with other libraries and other museums. It is in this area of catalog management—the lack of future MARC (Machine Readable Cataloging) compatibility—that museum libraries have their greatest need for leadership. "Other" cataloging will not satisfy networking requirements.

Table 7

Types of Museum Catalogs		
Kind of Catalog	**Number**	**Proportion (Total Response)**
Card	105	.64
Online, PC based	12	.07
Online, *mainframe*	10	.06
No catalog	35	.21
No response	01	.01
All instances	163	.99
Both card and online	(-11)	(.06)
All libraries	152	

Staff Services: Reader Services. A final aspect of museum library staff responsibilities is that of reader services. Here we find a high level of activity. For the most part, the library service hours are those of the museum; museum staff routinely have self-service privileges. Nor is the general public excluded from the library. Indeed, except for check-out, museum members are hardly more privileged in the library than the public, as table 8 indicates.

Reference services of varying degrees and circulation of materials (though mainly for museum staff) are conventional library services offered by libraries of all organizational levels. Because they require computers, online and Internet services (including document delivery) are the least frequently offered services. Marginal notes or responses to the narrative question indicated that a number of libraries are overcoming an in-house lack of modem facilities through cooperative ventures with local academic and public libraries and consortia—a clear (though small) example of museum libraries reaching out beyond their walls to benefit their patrons.

Online services are offered most often by art museum libraries (37 percent), followed by libraries in history (22 percent), natural history (18 percent), and general museums (15 percent). Rather surprisingly, only one science-technology library offers online services. Internet access is the most frequently cited online service. Only 10 libraries offer CD-ROM, and that use is almost exclusive to libraries in art museums (60 percent), whose parent organizations are expanding their use of CD-ROM devices. Neither online services nor CD-ROM are statistically related to the museum budget.

Table 8

Information Services Offered by Libraries

Information Service	Service Recipients: Museum Staff	Museum Members	General Public	
Ready reference	103	93	102	
Extended reference	84	63	64	
Materials check-out	84	31	15	
Online searching	30	17	15	
Bibliographies	43	27	51	
Document delivery	29	12	11	
Specialized ref. (SDI)	65	45	46	
Library use instruction	53	46	47	
Online instruction	12	2	2	
Internet service	16	5	6	
Other	6	5	5	
Total responses				139
No response				13
Total				152

There are several measures of departmental status within an organization. One is funding; another, staffing and services. By the first of these measures, the museum library's status is not exactly stellar; by the second, status is ambiguous (to say the least), but the services offered by library personnel, especially to museum staff, somewhat redeem the situation. A third measure is utilization.

3. The Museum Library and Museum Administration. This third indicator of the status of a department measures the degree and extent to which management shows awareness of the department, for example, by using its services. The museum directors were asked how frequently they turned to various resources for help in decision-making; "Museum library," "Academic library," and "Public library" were embedded in the list of possible resources. Table 9 tabulates the directors' frequency of use of the museum library. The small frequencies in several cells obviate tests for statistical significance.

Awareness of the library leads to use; when the museum administration has library oversight, 47 percent of the directors often or always turned to the library; only 15 percent reported they never use it. (Perhaps, aware of what is in the collection, they know that it won't help them?) When a librarian had oversight, the director's "often/always" rating drops slightly, to 42 percent; on the other hand, "never" plummets to 6 percent. While directors may not be avid patrons of the museum library, the frequency of their "never use" response was far greater for academic and public libraries, at 22 and 31 percent, respectively. Doubtless, convenience is one reason for this response pattern; it is easier to consult materials that are in the same building. The specificity of the collection's subject matter may be another; there are fewer extraneous choices on the shelves.

The flip side of administrative library use appears in table 10, where we have the librarians measuring the administrators' use of the library.

The survey question asked the library respondents to rate the library use of various departments and persons in the museum; docents, museum members and boards of trustees were also listed. The data indicate that, in the view from the librarian's desk, museum administrators—at 10 "Often/Always" rankings—are far from the primary users of the library, being out-rated by curators (65), educators (56), and even museum members (25). However, when the museum administration is responsible for the library, 61 percent rated the director as a top user—a rating some-

Table 9

Museum Directors' Assessment of Their Library Use

Librarian's *Primary* Museum Role	Self-Rating of Library Use: Never	Sometimes	Often/ Always	Total
Administrator	3 *(.15)*	7 *(.37)*	9 *(.47)*	19 *(.99)*
Librarian	2 *(.06)*	18 *(.51)*	15 *(.42)*	35 *(.99)*
Registrar/ curator	1 *(.06)*	11 *(.69)*	4 *(.25)*	16 *(1.00)*
TOTAL	6	36	28	70

what at variance with the 47 percent top use of table 9. Taking the assessment at face value, we note again that familiarity leads to use. Librarians—and registrars and curators who have charge over the library—take a somewhat more jaundiced view of the administrative level of library use—although librarians were more generous than registrars!

Utilization as a status measure within the organization—especially use by those who matter when it come to defining institutional status—garners a low grade for the library.

Summary

The status of the museum library within its parent organization cannot be painted in glowing colors; it is a pattern that dates back to 1976, when Hull and Fearnley deplored the lack of money and support for the museum libraries they studied. Data from the present sample of museum libraries tell it over again: by the status measures of funding, staff, and utilization, museum libraries as a group are—as one respondent put it—"not your high priority around here."

There are, of course, some encouraging areas of improvement. In the present sample, more librarians were sufficiently in charge to know their budgets; more libraries had catalogs; and many libraries offered a wide range of services to museum staff, members, and visitors. On the other hand, fewer librarians were full-time than part-time staff, and their innocence of standard cataloging raises questions about the currency of their competencies. Moreover, a decade of information technology seems to have passed them by; several of even the largest of the collections had card catalogs.

Some Lessons Learned and Actions Suggested

Librarians inside and outside the museum world have viewed museum libraries with a mixture of despair and derision. For example, Hull and Fearnley suggested bringing in more professional librarians, allocating them budgets and giving them the "authority to administer as they see fit"—an excellent example of a non-solution, given the museum environment. I should prefer, instead, to consider that environment and the ways the special library community might contribute to the fulfillment of the museum library's potential.

The museum environment. Special libraries are the creatures of their parent organizations and, with the large exception of art museums, the museum community for the most part has not valued its libraries, perceiving them as a low priority rather than an essential institu-

Table 10

Librarians' Assessment of Administrators' Library Use

Librarian's Primary Museum Role	Frequency Rating of Administrators' Library Use: Never	Sometimes	Often/ Always	Subtotal	No Response	Total
Administrator	0 *(.00)*	5 *(.38)*	8 *(.61)*	13	6	19
Librarian	8 *(.23)*	25 *(.71)*	2 *(.06)*	35	0	35
Registrar/curator	8 *(.53)*	7 *(.47)*	0 *(.00)*	15	1	16
TOTAL	16	37	10		7	70

tional resource. Some of this attitude is local, stemming from the background and training of the director and staff; but some also comes from a lack of leadership in the museum profession itself. For example, there is no permanent library group within AAM similar to the Committee on Documentation (CIDOC) in the International Council of Museums—although a concerted effort was made about 10 years ago to form such a group. Further, library facilities are a minor aspect of accreditation; lack of them does not result in a failure to accredit. It is only logical that, until and unless information services are a requisite for accreditation, museums are going to invest in departments and services that *do* further accreditation or enhance institutional status in the community of museums.

These are not easy times for the museum administrator any more than for librarians. Administrators are also being challenged—perhaps as never before—to do more with less: to rethink missions, to reconsider collection policies, to reconfigure facilities, and to allocate resources amidst shifting and diminishing funding sources. Small wonder, then, that *evaluation* and *change* are watch words in the museum literature.

But the reality check for the museum library is lower status and less value; more "same" than "change." At first glance it might appear that the museum librarian is in the best position to break the cycle of no money/no library/no support/no money. I use the term *librarian* here in all its infinite museum glory and variation—and that takes us back to the crux of the issue: libraries need librarians who are information professionals. Obviously, housekeeping is a necessity, and the troops of part-time volunteers do an excellent job of it. But libraries need more than housekeepers if they are to be proactive providers of first-line information to museum management, staff, and members. They need someone to set goals, to plan, to assess programs and make changes—the very issues with which their directors wrestle.

These aspects of library management—essentially, determining the information needs of the users and then setting out to provide for them—are not beyond the capabilities of dedicated volunteers and part-time staff if they are made aware that there is more to a museum library than keeping the doors open and the shelves neat.

Some possibilities for the special librarian. Special librarians who are interested in museums or involved in them as members, volunteers, or visitors can act locally—and thus influence nationally. Inquiries about the library, or praise for an aspect of the facilities (the reference service, for example), can effectively focus administrative attention on the library when directors or board members hear the inquiries or commendations.

Volunteering in the library is a further concrete expression of interest in it. From this vantage point, the special librarian can learn more about the museum environment and—indirectly, without criticism or disparagement—offer the benefit of experience in corporate settings. For example, rather than letting library staff dismiss administrators as low-users, the special librarian can show them how to determine the information needs of the director and administrative staff, and then teach them how to fill those needs. Such a project models information politics: a proactive stance and attention to the needs of budget-makers.

Special librarians have expertise to share in other areas, such as the writing of mission and goal statements, the development of strategic plans, and the selection of cataloging software. They can also encourage their museum colleagues to participate in chapter activities, particularly continuing education and professional development.

Other possibilities for involvement may be found in the museum office and in collections management. The museum profession is gradually shedding the myopic outlook and assumption of self-sufficiency (not to mention raw competitiveness) that long were hallmarks of museum "differentness"; members are increasingly exploring resource sharing and interconnections. As with libraries, information technology and straitened circumstances are bringing some unintended fruits, such as proposal for a common (and MARC-like) records standard.[6] Database and computer expertise are often welcome in these areas, and, more-

over, demonstrate to administrators that librarians do more than dust books and check them out. Importantly, as museum libraries join networks and participate in consortia, they will be modeling connectivity for the parent organizations.

Finally, special librarians can help their colleagues recognize, even when no one else does, that they are part of an *information system*—that is, the museum itself—and to plan and act accordingly. Such a realization will underscore the importance of continuing efforts toward automation and seamless information sharing, so that collection data and bibliographic data become equally accessible.

Together, museums and libraries preserve our cultural heritage; but for libraries in museums, both role and status are still in question. Special librarians who have enjoyed their museum experiences and who value museums can bring their skills and expertise to these libraries, and so serve their communities by supporting the information resources and services in these institutions.

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References and Notes

[1] The role of the museum library (as opposed to its status) has, over time, been fairly consistently defined as "research," or "supporting the work of the museum's staff." See, for example: White, Minnie Taylor. "Guideposts for a Science Museum Library." *Special Libraries* 24: 83-85 (May 1933); Sommer, Frank H. "A Large Museum Library." *Special Libraries* 67:99-103 (July 1974); Root, Nina J. "Role of the Museum Library." *The Role of the Library in a Museum,* ed. Rhoda Ratner. Washington, DC: The Smithsonian Institution, 1980; and Bojin, Minda A., and Leslie H. Tepper. "The Role of the Museum Library in Support of Educational and Outreach Programs." *Museum Librarianship,* ed. John Larson. Hamden, CT: Library Professional Publications, 1985.

[2] *Museum Accreditation: A Handbook for the Institution.* Washington, DC: American Association of Museums, 1990. The six questions on the institutional evaluation form (out of more than 100) that are directed to library facilities emphasize research support and collection organization.

[3] American Association of Museums. *Report.* Washington, DC: American Association of Museums, 1992, p. 157. Art museums were omitted in that study because they have an active library organization in ARLIS/NA (Art Libraries/North America).

[4] Bierbaum, Esther G. "The Museum Library Revisited." *Special Libraries* 75: 102-113 (April 1984).

[5] Danilov, Victor. "Libraries at Science and Technology Museums." *Curator* 20: 98-101 (June 1977).

[6] American Association of Museums. *The Official Museum Directory,* 24th ed. New Providence, NJ: R.R. Bowker, 1994.

[7] This phenomenon of a library as a "shelf of books in a[n]...office" is noted by other observers. See: Kenyon, John R. "Museums Libraries." *Manual of Curatorship: A Guide to Museum Practice,* 2nd ed., ed. John M.A. Thompson. London, England: Butterworths, 1992, p. 585.

[8] It may be noted in this connection that the wealth of museums does not vary greatly according to museum type, except for two extremes: art museums tend to fall in the over-$1 million categories (47 percent), while history museums are poorer, with 42 percent operating on less than $100,000 a year. Otherwise, museum types in this sample are distributed across budget categories.

9 The data exhibit a change from earlier research: the lesser role for the museum educator in the affairs of the library. Secondary analysis suggests that this variance is an artifact of sampling: history museums, represented in large numbers in this sample, are less likely to have staff educators than are the science museums that were the previous sole focus of interest.

[10] For a discussion of museums and museum library connectivity, see: Bierbaum, Esther G. *Museum Librarianship: The Provision of Library and Information Services.* Jefferson, NC: McFarland, 1994, p. 129-139.

[11] Hull, David, and David D. Fearnley. "The Museum Library in the United States: A Sample." *Special Libraries* 67: 289-298 (July 1976).

[12] I took this situation into account in *Museum Librarianship* (1994).

[13] Hull and Fearnley.

[14] See, for example: Bearman, David, and John Perkins. *Standards Framework for the Computer Interchange of Museum Information.* Silver Spring, MD: Computer Interchange of Museum Information Committee (CIMI), Museum Computer Network (MCN), 1993.

Information Policy Audit: A Case Study of an Organizational Analysis Tool

by Edwin M. Cortez and Edward J. Kazlauskas

• *Il s'agit ici d'une enquête empirique basée sur une étude pilote centrée sur l'existence et l'efficacité des politiques générales au sein des organismes. Les sortes et sources d'informations employées dans la planification de la stratégie, l'innovation et les modifications, ainsi que les politiques gouvernant l'accès et la confidentialité, sont examinées. L'étude se focalise sur l'utilité d'un modèle dans l'expertise d'une politique d'information. Un modèle éventuel basé sur la documentation et cette recherche est présenté à titre d'exemple.*

• *Esta es una investigación empírica basada en un estudio piloto y centrada en la existencia y la efectividad de las políticas de información dentro de una organización. Se examinan los tipos y las fuentes de información usados para la planificación estratégica, la inovación, y el cambio, así como las políticas que controlan el acceso y el manejo confidencial de la información. El enfoque del estudio es la utilidad del modelo para llevar a cabo una auditoría de políticas de información. Se presenta para la consideración un modelo posible basado en la literatura y en esta investigación.*

This is an empirical investigation based on a pilot study centering on the existence and effectiveness of information policies within organizations. Types and sources of information used for strategic planning, innovation, and change are examined, as well as policies governing access and confidentiality. The focus of the study is on the utility of a model for conducting an information policy audit. A possible model based on the literature and this research is presented for consideration.

Introduction

In order for organizational management activities to be conscious, deliberate, and collaborative efforts, they must be supported by an effective information infrastructure with rationale and protocols. This infrastructure must be based on well-conceived policies that govern the creation, collection, analysis, flow, use, storage, and retirement of information—*information* meaning data applied to achieve organizational objectives, including the process of "becoming informed."[1]

While such policies are important to any organization, they are particularly important to those engaged in strategic planning, innovative decision making, and managing change. Together these three activities form the basis for information organization and use for problem solving, analysis, forecasting, evaluation, modeling, and research. Since organizational change may follow many different scenarios, each with its own information-dependent requirements, it is important to have flexible information policies in place that accommodate an array of organizational dynamics affecting change, especially with so many organizations involved in downsizing and reinvention. The effort and type of information expended

in managing change may differ and should be proportional to the scale of change. For example, some changes are anticipated and planned for. Others are unexpected and spontaneous. Still others are evolutionary and happen in stages. Information policies are needed to appropriate information resources necessary for strategic planning and the innovative decision making process. It is also important to effectively monitor these resources to ensure their adequacy given the turbulence or scale of change.

It is important, too, for management to have the means and tools for assessing the effectiveness of organizational information policies, for developing new policies, and for planning the overall process, including managing innovation. This article comprises empirical research based on a pilot project for a larger-scale piece of work. The investigation centers on the existence and effectiveness of information policies within organizations. Of particular interest to the study are policies which govern internal organizational information processes, as well as external sources which flow into the organization and provide information on the remote environment. Specific policies examined were those directing the flow of messages containing data, theories, ideas, opinions, and so on, delivered through a variety of approaches, such as communication devices, conference and meeting presentations, personal discussion, books, journals, databases, pictures, and multimedia. Investigation focused specifically on policies which aid the organization in controlling the processes surrounding information, using information for strategic planning, and introducing innovation and managing change.

Research Questions

The study targeted the following areas: 1) the organizational role of the department concerned with the control of information for strategic purposes, including managing change; 2) organizational information needs and processes; and 3) information as a conduit to innovation. These targeted areas were the basis for developing an "information policy audit" model. The overall research question asked was, "Can such a model extend generally to the information arena in assessing the efficiency and effectiveness of organizational information policies?" In this initial phase of research the pilot investigation included one case study.

Background

The definition of innovation has evolved over the years from a somewhat narrow focus of introducing a new product to market, to a wider interpretation which includes changes in services, marketing, and systems of management. Thus, from the researchers' perspective, innovation is the application in any organization of new ideas, whether they are embodied in products, processes, and services, or in a system of management and marketing through which the organization operates.[2]

There is now abundant evidence that most governments recognize the importance of information and that the innovative capacity of a nation is built upon the innovative capacities of the firms and organizations within it. Thus, in order to be competitive and prosper, it is important for nations to have innovative organizations. Innovation is important to an individual firm for much the same reason. Without it, the firm cannot compete and is left behind by its rivals.

A central ingredient to innovation is information. Various models of the innovation process call attention to this point.[3,4,5,6,7] These models attest to the existence of a number of ingredients in innovative organizations, including receptiveness to information, increased flow of both internal and external information, and the fusion of various information inputs—such as market information and the results of user needs and technology assessments—into innovative ideas. Empirical studies have noted that in more prosperous enterprises, there is a greater awareness of information and the ability to manage it; these give an organization its competitive edge.[8,9,10]

Since managing change suggests entering the unknown, gathering and analyzing information that will help managers make decisions and perhaps predict outcomes is a practical consideration. This approach is

founded on the belief that most organizational shifts are open to rational analysis and forecasting. In doing marketing analysis, for example, a business looks to the forces which exist beyond the company's immediate environment. The type of information needed to understand the direction of these forces may be economic, political, socio-cultural, technological, and so on. Knowing the source or type of information is useful in constructing an intelligent appraisal of the market and the forces that influence it. Planners are then able to draw strategic links between these external forces and the most profitable direction for managing organizational shifts. For more than two decades there have been attempts to formalize and structure this process. Pettigrew and Whipp report on a variety of themes which trace this pattern since the 1960s.[11]

Given the spiraling structural changes occurring in all types of today's organizations, this process for gathering, organizing, interpreting, and sharing information continues to be vital for coping with and managing organizational change. The necessary information covers not only the macro-environment, but also internal organization information which may deal with personnel, budgeting, finance, and the like. Of course there are categories of information which overlap more explicitly between internal and external sources, such as technological and legal information.

In most instances, managing change means planning for it in a conscious and deliberate manner. However, as Hanson points out, not all changes are planned, or occur all at once.[12] Some are spontaneous changes and occur when unexpected measures need to be taken as a result of a failure or breakdown in a process, operation, or system. Clearly, in these situations, the information necessary to enact the required change needs to be timely, accurate, and readily accessible. Other changes are evolutionary and occur over time, gradually transforming a process, operation, or system, such as an accumulation of planned upgrades to a computerized system. Here, in addition to the information requirements outlined above, getting the right information at the right time should be the standard.

Researchers have also identified models involving adaptation to change and the stages that individuals or organizations must pass through before innovation is fully accepted.[13,14,15] Common to all of these models is understanding people and organizational dynamics, including the forces that drive or resist change, and the strategies for dealing with conflict. Also implicit in these models is an effective means for getting and using the kind of information that will convey meaning, through a reliable source, in an accurate and timely manner. This is essential for managing change, introducing innovation, and minimizing the difficulties associated with organizational transitions.

Information Audit

The term *information audit* is adapted from communications literature, and alludes to the term *communication audit.* Its analogy to the financial audit of an organization is obvious. In this research, the term *information audit* is a generic term used to designate a number of strategies for studying the effectiveness of information flow within an organization. The process for conducting this type of audit is also adapted from communications literature. It can be defined as a fact-finding, analysis, interpretation, and reporting activity that studies the information policies, structure, flow, and practice of an organization.[16] The purpose of the audit includes the collection of data concerning the efficiency, credibility, and economy of the organization's information handling activities and practices; the provision of adequate policies which oversee these activities and practices (including those that govern guidelines, functions, and budgets); and the development of recommendations for action tailored to the organization's specific situation.

While there is no universally accepted strategy for an information audit, the particular technique or set of techniques chosen for a given audit will depend on factors such as the specific objectives to be achieved and the amount of time and money available. It is also important for the audit format to be based on a sound understanding of the problem in its

foundational context. For example, in investigating the relationship between innovation and information (one objective of this study), the text by Maguire, Kazlauskas, and Weir provides a useful foundation. [17]

The audit can encompass the entire organization, concentrate on one location or functional area, or focus on some aspect of organizational dynamics as it relates to information. Again, in this study the emphasis was on information and managing organizational change. The audit can be concerned with the organization's external information flow, its internal information flow, or both.

There are a number of points during an organization's life when an audit of the effectiveness of its information flow is advisable. This may occur during a major technology migration program, a budget crisis, or when there is growth or downsizing in the organization. If economically feasible, the audit should become a management routine for checking the effectiveness of information flow within the organization, uncovering bottlenecks, distortions, or other problems.

Methodology

Case Study

The organization for this case study was a mid-size private law firm. This organization was selected because of the relatively large amount of information traffic it deals with, its need to use information to gain competitive advantage, and its proclivity for making innovative decisions. The researchers anticipated that these organizational characteristics and their relationship to the use of information for strategic planning and managing change could be applicable to other organizations experiencing change—the types of change that might result from downsizing and reinvention, or the introduction of new technology. This type of change could also result from organizational realignment—say from a horizontal to a vertical market, for example, to better meet consumer demands.

Structured Interviews

Individual and group interviews were used to gather attitudinal and perceptual data. These interviews supplemented and expanded on data gathered through a survey questionnaire and helped in identify the organization's natural information gatekeepers and processors. They will also be used in modifying the questionnaire for future studies. The law librarian and office administrator were interviewed together. One attorney, a partner in the firm, was interviewed separately. The interviewer followed a particular format, covering the following areas:[18]

- Description of the job by duties and functions. This included decisions that are made as part of the job, the information needed to make those decisions, where and from whom this information should be obtained, the formal and informal policies in place that enable the individual to get the needed information, and the need for any policy changes, eliminations, additions, etc.
- Identification of the law firm's information processing strengths and weaknesses. The interviewer asked each interviewee to be specific, working from the larger to the smaller work units in the firm.
- Description of the formal and informal information channels through which the interviewee receives information about the law firm. The interviewer investigated the types of information the person received and how often it was received. The interviewer also attempted to identify which information the interviewee perceived as being of low value, and from where and whom this information came.
- Specification for areas of improving information flow—what still needs to be done.
- Description of how decisions are made throughout the law firm, the types of conflicts that arise, the major reasons behind them, and how they are resolved. The types of decisions that were targeted involved innovation, budget and financing, personnel, and strategic planning.
- Description of the role information plays in organizational changes. As examples,

the interviewees were asked to comment on specific procedural changes, changes brought about by technology, or changes in behaviors.

- Description of the interviewee's information exchange relationship with immediate supervisors, co-workers, middle management, top management, and subordinates (if applicable). The interviewer attempted to solicit behavioral examples of trust, openness, and so on in the relationships described.
- Identification of performance measures used in the law firm's attempt to achieve its goals, including how the interviewee knows when the firm has met or fallen short of its goals.

A small and unobtrusive tape recorder was used for these interviews. Each interviewee was assured that information would be treated confidentially. Since the interviews were taped, the researcher was able to eliminate the need for detailed note-taking, allowing for better concentration on the tone as well as the content of the interview.

Survey Questionnaire

With this being a pilot study, conducted within a limited time-span, it was decided that the initial stages of the research should involve a self-completion questionnaire. The purpose was to establish some general trends involving information processing as part of the strategic planning process. As the central depository for information and information exchange, the library was the best source for identifying the most qualified individuals for completing this questionnaire. A detailed questionnaire was devised, consisting of three sections. These included: 1) the jobs and tasks surrounding information processing as part of the firm's overall strategic planning activities, and how these activities related to the rest of the firm; 2) the type of information gathered and how it was analyzed; and 3) the degree of reliance on this information and its analysis for decision making—particularly in areas involving innovation and change. When appropriate, topics were measured both by attitude ("How do you feel about...?") and by perceptions of fact ("How often do you...?"). Open-ended questions were also included.

Findings

The survey questionnaire yielded some interesting and useful results. As a pilot study, these results will be helpful in directing the next phases of the research. Specifically, there are several themes identified in the survey responses which the researchers believe to be important insofar as they reinforce established precepts in information science, and are within the framework for understanding how organizations and individuals acquire, process, and use information. These include the following: 1) private sector organizations (as opposed to public sector organizations) are less concerned about cost and format in getting information, especially if these variables have a negative impact on the timeliness and accessibility of the information; 2) personal communication (face-to-face) is the preferred mode of information exchange, but not always possible. In the case study it was revealed that while face-to-face communication was preferred and desirable, it was not always possible given busy schedules and other constraints. Instead, it was not uncommon for whole information transactions to take place using voice mail, with individuals never coming together. The variables governing the mode for information exchange are nature and size of organization, type of information, and personal preference; and 3) the type and sources of information identified in the survey fit generic categories widely described in the research literature. These include personnel and financial records, budget and marketing information, and information on technology and legal issues. These data are gathered through formal and informal "networks," conferences, meetings, professional literature, and the grapevine.

Within the case study organization there was no one department (or individual) charged with strategic planning or the responsibility of overseeing the resources used in this process. Instead, the law firm made use of an executive committee composed of partners, including the managing partner and the office administrator. The committee did not exactly repre-

sent a matrix of the firm, since only attorney partners were represented. The office administrator was used primarily as a resource and as a liaison to other employees of the firm. The office administrator did function as a filter of information available to the committee, as well as to individual members of the firm's staff.

As was hoped, the data gathered through the one-on-one interviews highlighted, clarified, and further expanded the data that were gathered by the survey questionnaire. For example, while the survey instrument indicated a commonalty of information needs and issues among organizations, the interviews revealed some uniqueness based on type of business, industry, or organization. For example, at the law firm, the need for information confidentiality went beyond internal policy issues and included some very specific requirements regarding codes of ethic, rules of evidence, and court mandates. An important finding, however, which can be generalized for all organizations concerned with information security, is that different modes of information exchange may need different types of information policies for safeguarding information and protecting confidentiality. The example given during one interview was the different procedural policies in place for sending a fax transmission, compared to the procedure for sending a memo concealed in an addressed envelope. An extension of this—described by more than one interviewee—was that training personnel to safeguard information needs to be targeted to specific technologies. Of particular concern to the law firm was training needed in introducing networked PCs and e-mail.

Policies concerning access to information was another area highlighted in both sets of interviews. Access to information is governed by type of information and class of personnel. For example, partners in the firm have access to all information, including financial, while associates have access to all information *except* financial. Information access policy appears to exist on a need-to-know basis. This was very clear in the case of the firm's management committee's need to have budgeting information for strategic planning.

The latter half of the interviews concentrated on the use of information for strategic planning and managing change. The interviewer chose two activities identified by the survey respondents. These topics were well-suited for discussing planning and the management of organizational innovation. The first activity dealt with technology and involved plans to introduce a LAN network for the attorneys and support staff. The second activity was marketing for practice areas, such as business or insurance law. The interviews identified some baseline requirements for information that dealt with innovation or change. First, there was the matter of purpose and benefit. The interviewees all felt that the most important information was that which describes why change is necessary, who will benefit, and what is the likely amount of investment in terms of time and effort. The timing of making this information known was deemed important as well. In order to have "early adopters," background information should be made known before specific change is being entertained. Knowing what is currently happening in a particular area is thought to be important for converting "early adopters."

Approaches to information gathering should be global, i.e., information about the total impact of the innovation or change should be known. In the case of the technology program, one interviewee expressed a strong opinion that any newly formed information policy should take into account all technologies as they interrelate to such issues as confidentiality, privacy, and access to information.

Another baseline requirement for information in strategic planning and managing innovation is its "usefulness." As defined by one of the interviewees, this means that the information should be in a format with sufficient detail to truly lead to insight concerning the innovation or strategic decision. The individual used words such as meaningful, explicative, and informing to describe this requirement.

Finally, the interviews were helpful in identifying the array of sources for locating strategic information. These sources appear to be problem specific. For example, information useful in planning marketing strategies is best

gathered through informal networks, such as those found at conferences and professional meetings. The "grapevine" is also an important source for this type of information. Information sources for dealing with strategic planning and technological innovation were identified as coming from vendors, professional literature, workshops, consultants, and conference programs.

The law firm in this case study was just beginning to implement a comprehensive technology program and develop a strategic approach to marketing. With its technology program, the law firm has hired a consulting company experienced in dealing with technology transfer in law firms. The job of the consultant will be to review the law firm's work and determine how it will be effected by the technology. With their strategic marketing program, the firm continues to rely heavily on referrals, hosting functions, and individual initiatives—such as attorney and staff lecturers, teaching, and conducting seminars.

Discussion

The primary goal of the research was to develop an examination and accountability model for assessing the efficiency and effectiveness of organizational information policies. The investigation focused on policies relating to the management of information for purposes of strategic planning and innovation. The policies also helped create a tool for analysis. For special librarians, who must play an expansive and proactive role in the organization and who are involved in helping it achieve its overall mission, such a tool—together with the technique for conducting an information policy audit—may be helpful. It could be used for gathering corporate intelligence, preempting strategic decisions, and generally improving the librarian's contribution as a member of the organization's strategic management team.

The findings of the pilot study point to the possible utility of an assessment tool that measures and helps to evaluate the effectiveness of information policies held at the organizational level. To begin with, initial research indicates that such policies should be established within certain parameters, using some common criteria. There are three areas of particular interest to the researchers. They relate to the central research question dealing with the use of an analysis tool to aid in organizational planning, innovation, and change. First, since information for strategic decision-making in this case study arrived through many different formal and informal channels, any organizational information policy should be flexible and open, so that information may emerge from across the organization. This would also suggest that any group or department within an organization charged with strategic planning should have wide organizational representation. Second, the high value accorded to accessibility and currency of information, together with the little regard for its costs, indicates that information is clearly regarded as an important strategic resource. Research on how best to marshall this resource, in the context of modern organizations and current realities facing management, is an important area for further investigation. For example, one immediate challenge facing today's organizations is how to develop long range strategic plans in a culture full of uncertainty and flux. How can information, and the policies that direct it, be created and used for better and more reliable long range strategic planning—for dealing with universal organizational concerns such as problem solving, communication, personnel, and innovation? Moreover, once established, how should these policies be monitored, analyzed, and assessed for effectiveness? Third, the research in this study indicates that strategic information is problem specific and requires "refinement" to tailor it to specific requirements. What kind of information policies might drive this process? Are there inherent contradictions between attempts at policy formulation, collecting information in a piecemeal way, and using strategic information for ad hoc decision making?

There have been recent attempts to formulate practices involving the conduct of an information audit.[19] These attempts, together with the kind of research presented here, are intended to move the process away from eclectic designs, and to arrive at one which is

systematic, cost effective, and reliable. One strategy is to migrate and modify existing audit systems found in the field of communication. The International Communication Association (ICA) audit system, for example, would be a good candidate. It uses some of the tools and approaches described in this study, such as questionnaire surveys and one-on-one interviews. Two other techniques used, which have potential for use in an information audit, are network analysis and personal diaries. These approaches could help track and account for information flows, and record individual and idiosyncratic information episodes. This kind of information audit model could yield a wide array of products, including: 1) an organizational profile of perceptions of information use, seeking patterns, practices, and relationships; 2) a map of the operational information network, identifying potential bottlenecks and gatekeepers; 3) individual testimonies of successful and unsuccessful experiences dealing with information; and 4) an organizational and individual profile of actual and perceived information processing behaviors, enabling researchers to draw comparisons and make recommendations.

Conclusion

The purpose of this pilot study was to test the feasibility of an assessment and evaluation tool for information policies created at the organizational level. A major premise of the study is that organizations involved in strategic planning view information as a valuable resource, and that policies that guide its acquisition, creation, transfer, processing, and use should be evaluated for their effectiveness. The data gathered through the case study support this premise and further suggest that information policies play a key role in organizational planning, innovation, and change. Furthermore, the initial investigation indicates that any technique or approach for examining organizational information policies should be multi-dimensional, flexible, and comprehensive. An overall methodology for conducting an information policy audit is described, and some of its elements are successfully applied. Feedback from the research will be used to improve this methodology before continuing with the broader research agenda. The next phases of the research plan will investigate the anatomy of innovative organizations, and how they view strategic information; the effects of corporate restructuring on information use and processing; and the application of a fuller information policy audit model to organizations undergoing transitions due to restructuring or innovation.

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Technical Communications in Engineering and Science: The Practices within a Government Defense Laboratory

by Marilyn Von Seggern and Janet M. Jourdain

• *Ces dernières années, les recherches ont identifié les différents besoins d'information des ingénieurs contre ceux des scientifiques. Alors que la plus grande partie de cette recherche a porté sur les différences entre les organisations, nous avons interrogé les ingénieurs et les scientifiques dans le cadre d'un seul laboratoire de recherche et développement de l'armée de l'air américaine sur la manière dont ils rassemblent, utilisent et produisent les informations. Les résultats du sondage de Phillips Laboratory confirme les suppositions antérieures relatives aux distinctions entre l'ingénierie et les sciences. Parce que le nombre de réponses provenant du personnel militaire était supérieur à celui du personnel civil, le sondage est également devenu une occasion d'établir le profil d'un segment peu connu de la population ingénieurs/scientifiques. Outre l'effet que la mission fixée par Phillips Laboratory pourrait avoir sur les ingénieurs et les scientifiques qui en sont membres, l'étude identifie d'autres facteurs qui causent des variations dans les communications techniques et les activités liées à l'information.*

• *La investigación en las décadas recientes ha identificado las necesidades diferentes de los ingenieros en comparación con los científicos. Mientras que la mayor parte de la investigación examinaba las diferencias entre las organizaciones, nosotros encuestamos a los ingenieros y científicos dentro de un único laboratorio de investigación de la Fuerza Aérea sobre sus prácticas de acumulación, uso, y producción de información. Los resultados de la encuesta del Laboratorio Phillips confirman las suposiciones previas sobre las diferencias entre la ingeniería y la ciencia. Porque los empleados militares respondieron con una tasa mucho mas alta que el personal civil, esta encuesta también presentó una oportunidad para describir un segmento poco conocido de la población de ingenieros/científicos. Además del efecto que pueda tener la misión declarada del Laboratorio Phillips sobre los ingenieros y científicos miembros del mismo, se identifican otros factores que causan las diferencias en la comunicación técnica y las actividades relacionadas con la información.*

Research in recent decades has identified the varied information needs of engineers versus scientists. While most of that research looked at the differences among organizations, we surveyed engineers and scientists within a single Air Force research and development laboratory about their information gathering, usage, and production practices. The results of the Phillips Laboratory survey confirm prior assumptions about distinctions between engineering and science. Because military employees responded at a much higher rate than civilian staff, the survey also became an opportunity to profile a little-known segment of the engineer/scientist population. In addition to the effect Phillips Laboratory's stated mission may have on member engineers and scientists, other factors causing variations in technical communication and information-related activities are identified.

Introduction

The technical communication and information-related activities of engineers and scientists have been a topic of study and discussion for more than 40 years. There is little to challenge the notion that both groups rely heavily on information, and engineers and scientists themselves generally acknowledge that information is their most significant product. Aside from these fundamental conclusions, there has been scant progress in studying the varied role of information for engineers in comparison with its role for scientists. Research into the functions of information for these groups has lagged behind other user studies largely because the majority of research on information needs and use has focused on scientists alone or on

heterogeneous groups of engineers and scientists working together. Such studies have not contributed significantly to differentiating the information behaviors of the two groups. This unique study compares engineers and scientists at the same laboratory.

Additionally, there is little known about the technical communication and information-related activities of engineers and scientists working for the Department of Defense as military employees. Surveys and other studies have included this group with engineers and scientists working for industry, academic institutions, or other government organizations. In the few studies concerning defense engineers and scientists, the majority of respondents were civilian.[1,2] Because two-thirds of the respondents in the present survey are military engineers and scientists, preliminary conclusions can also be drawn concerning the technical communication and information-related activities of this segment of the research community.

Literature Summary

Previous studies have assumed that scientific discovery progressed smoothly and naturally to technological advancement and that the literature of both science and technology was similarly used and produced.[3] Kline writes that even the name given to the innovation process, *R&D,* "implies the linear model: the phrase itself suggests a direct and unique path from research to development and product."[4] This thinking links engineering and science, at times nearly equating the two. Engineers and scientists are seen as interacting, complementary forces driving the innovation process. Engineers and scientists are thus seen as comparable in their goals, work orientation, and communication practices—an assumption which became the foundation of current U.S. science and technology policies and practices. Closer examination, however, supports the position that the two fields of engineering and science and technology advance independently of each other, with the literature of each cumulating independently as well.[5,6] More significantly, it became apparent that engineers and scientists do not have the same information gathering and usage patterns.[7]

While acknowledging that scientific literature is unique from engineering literature, both are recognized as equal cornerstones of innovation. The two branches of knowledge are thus permanently linked together as *scientific and technical information* or *STI.* Questions about the use of STI have increased recently as a result of the "rising interest and concerns regarding industrial competitiveness and technological innovation."[8] These studies confirm what many have suspected—that communication of STI by engineers and scientists plays a critical role in the innovation process. The studies have also increased curiosity about how that information is gathered and used by engineers versus scientists. Several extensive reviews of the literature provide background and state-of-the-art research on communication by engineers.[9,10]

Differentiating Engineers from Scientists

Engineering is defined as "the application of scientific knowledge to the creation or improvement of technology for human use."[11] This explains the notion of engineering/technology as an *applied science.* In this process, engineers may engage in many diverse activities including the generation of new ideas, problem definition, problem solving, information seeking, experimentation, calculations, management of personnel and teams, and production of reports.[12] The work environment of the engineer is likely to be in industry or government where 1) project choice is determined not by the individual but by management, 2) teamwork may be required at many stages, and 3) goals focus on company or organizational success. The engineer tends to find professional success within the organization through increasingly responsible, challenging assignments or management positions.

Science is the search for knowledge through observing, thinking, experimenting, and validating.[13] Discovery is conducted for its own sake and is documented through the universally accepted published record, the literature of science. Scientists are likely to work in an independent environment where they 1) select questions for investigation based largely on personal interest, 2) publish results to claim

discovery and gain personal recognition and status in the profession, and 3) participate in the broad exchange of ideas on scientific questions for the sake of knowledge itself.[14]

Studies show that, in general, engineers tend to rely on in-house information such as personal or colleagues' collections, informal sources, internal technical reports, technical handbooks, standards and specifications, and trade publications. Engineers rarely use the library to acquire information. Personal contacts and sources are likely to be inside the organization due to the proprietary or classified nature of the projects at hand. Easy access to sources of information, rather than quality of the information gathered, is a prime reason for their selection.

Important sources of information for scientists are the more traditionally "academic" information-gathering methods such as the use of references and bibliographies in key articles, tables of contents services, and abstracting/indexing systems. However, informal communication is also a critical source of information. Among scientists, information exchanges tend to take place with people outside their organization—the "invisible college" concept.[15] Accessing formal scientific literature through libraries plays a much larger role for scientists than for engineers. Scientists also spend more time reading and documenting research results for publication. The distinction between the information use patterns of scientists and engineers might most simply be stated: while scientists tend to focus on primary source information for generation of additional primary source conclusions, engineers tend to utilize and produce information which is farther removed from the basic scientific process.

Study Location, Design, and Methodology

The research reported here was conducted as a Phase I activity of the NASA/ DoD Aerospace Knowledge Diffusion Research Project. This project was attempted in order to understand the flow of scientific and technical information at the individual, organizational, national, and international levels in the aerospace industry. The goal of Phase I activities has been the investigation of the technical communications in aerospace among aerospace engineers and scientists.[16] While similar studies have been conducted at two NASA Research Centers, the National Aerospace Laboratory in the Netherlands,[17] and Russia's Central Aero-Hydrodynamic Institute,[18] this particular study was designed to obtain data from one specific subpopulation of Defense Department engineers and scientists in aerospace research, those of the Phillips Laboratory.

Location

The Phillips Laboratory is part of the United States Air Force's Materiel Command, the Air Force agency responsible for research, design, testing, production, and procurement of all equipment and systems entering Air Force service, from uniforms to aircraft. Phillips Laboratory is responsible for designing and testing all space- and missile-related technologies of Air Force interest.

Phillips was established in late 1990 during the Department of Defense's resizing and mission realignment program as one of the Air Force's "super" laboratories. Phillips was created by merging the Air Force Space Technology Center and it's three subordinate laboratories: Astronautics, Geophysics, and Weapons. In 1994, Phillips had a workforce of just over 1,900 members (1,263 civilians and 638 military) with the engineer/scientist population numbering 994. Of these engineers and scientists, 631 were civilians and 363 were military. The annual laboratory operating budget for 1994 was $600 million.

Merging the older organizations to create Phillips resulted in a geographic dispersal of laboratory directorates which has a bearing not only on the day-to-day administration of the organization, but also on the types of research being done at each site. Headquartered at Kirtland Air Force Base in Albuquerque, NM, other major facilities of the laboratory are located at Hanscom Air Force Base, 20 miles northwest of Boston, MA and at Edwards Air Force Base in the Mojave Valley, CA. Other subsidiary facilities are as far-flung as on Maui, HI, and in the Florida panhandle.

The primary research areas of Phillips are

aligned geographically with the parent organizations from which the laboratory descended. At the Kirtland Phillips site, where 1097 employees—approximately 60 percent of the laboratory—are located, work is conducted on high energy plasma and microwave technologies, electromagnetic pulse hardening, space systems survivability, aircraft-based technologies for acquiring and tracking ballistic missiles during their boost phase, applications for lasers and imaging systems, spacecraft structures and their power systems, space experiments, and space/launch environmental testing. The site at Hanscom, which has some 414 employees (making up nearly 25 percent of the laboratory), conducts research on the environment between the Earth and the Sun and the effects of that environment on space systems and operations. The final 15 percent of the laboratory are located at the Edwards site. The 368 employees located at Edwards conduct research and testing on advanced motors and propellants for space and launch vehicles.

Of the entire Phillips workforce, 53 percent of employees are identified as "engineers and scientists." A breakdown of engineers and scientists at each site is not available because the Air Force does not distinguish engineers from scientists when citing the number of employees assigned to an organization. Survey response, however, provides some information: the engineer/scientist ratio was 15/85 at Hanscom, 77/23 at Edwards, and 58/42 at Kirtland. The proportion of engineers and scientists to administrative, support, and management employees is fairly consistent at all three Phillips sites, with just over half of the workers at each location officially classified as engineers and scientists.

Research Design and Methodology

The study described here was conducted at Hanscom, Edwards, and Kirtland Air Force Bases using self-administered (self-reported) mail surveys. The instrument used to collect the data was tested and used previously in several other NASA/DoD Aerospace Knowledge Diffusion Research studies. It was slightly adapted for use at Phillips. The survey population included engineers and scientists at the three sites: 350 at Hanscom, 250 at Edwards, and 400 at Kirtland. A total of 305 surveys were distributed with 228 received for an overall response rate of 75 percent. The response rates of Hanscom, Edwards, and Kirtland were, respectively, 71 percent, 66 percent, and 79 percent. The survey was conducted during May, June, and July, 1994. Selected results from the survey are presented here.

Assumptions

Based on an analysis of the literature of technical communication and information-related activities of engineers and scientists, as well as what is known about the research environment of Phillips Laboratory, the following assumptions were made:

1. researchers at Edwards and Kirtland prefer working in groups more than researchers at Hanscom;
2. the library/TIC is more important (in terms of performing professional duties) to researchers at Hanscom than those at Edwards or Kirtland;
3. a higher percentage of researchers at Hanscom use the library/TIC than at Edwards or Kirtland; and
4. the primary research literature is relied on more by researchers at Hanscom than by those at Edwards and Kirtland.

Findings and Discussion

Demographics

To provide a respondent profile, survey participants were asked questions about educational training, present duties, educational level, years of professional work experience, employment affiliation, membership in professional/technical societies, and gender. These findings are in Table 1.

When asked to characterize their educational training by discipline, nearly 85 percent of Hanscom respondents consider themselves scientists. By contrast, 77 percent of Edwards respondents refer to themselves as engineers by training. At the Kirtland headquarters of Phillips, the response is more evenly divided, with 58 percent of respondents referring to themselves as engineers and 42 percent con-

Table 1

SURVEY DEMOGRAPHICS						
	Hanscom		Edwards		Kirtland	
Factors	**%**	**(n)**	**%**	**(n)**	**%**	**(n)**
Educational Preparation						
Engineer	15.2	(5)	77.2	(44)	58.0	(80)
Scientist	84.8	(28)	22.8	(13)	42.0	(58)
Current Duties						
Engineer	12.1	(4)	64.9	(37)	49.3	(68)
Scientist	84.8	(28)	21.1	(12)	40.6	(56)
Management	3.0	(1)	14.0	(8)	10.1	(14)
Professional Duties						
Research	84.8	(28)	43.9	(25)	52.9	(73)
Administration/Management	12.1	(4)	40.4	(23)	31.2	(43)
Design/Development	3.0	(1)	15.8	(9)	13.8	(19)
Other	0.0	(0)	0.0	(0)	2.1	(3)
Education						
Bachelor's degree or less	9.1	(3)	45.6	(26)	23.9	(33)
Master's degree	39.4	(13)	38.6	(22)	39.9	(55)
Ph.D/Post Ph.D	51.5	(17)	15.8	(9)	36.2	(50)
Professional work experience						
1-5 years	3.0	(1)	35.0	(20)	13.1	(18)
6-10 years	27.3	(9)	17.5	(10)	21.0	(29)
11-20 years	21.1	(7)	22.8	(13)	33.3	(46)
21-40 years	45.5	(15)	24.6	(14)	32.6	(45)
41 or more years	3.0	(1)	0.0	(0)	0.0	(0)
Mean years work experience	21.3		13.1		16.7	
Employment Affiliation						
DoD Military	69.7	(23)	73.7	(42)	62.3	(86)
U.S. Govt. (DoE and Other)	15.2	(5)	15.8	(9)	23.9	(33)
DoD Civilian	15.2	(5)	8.8	(5)	12.3	(27)
Other	0.0	(0)	1.8	(1)	1.4	(2)
Gender						
Female	6.1	(2)	7.0	(4)	8.0	(11)
Male	93.9	(31)	93.0	(53)	92.0	(127)
Member of a Professional/ Technical Society	87.9	(29)	64.9	(37)	63.0	(87)

sidering themselves scientists. When asked to describe their present duties as either "engineer" or "scientist," the answers were nearly identical to those regarding their academic preparation.

Responses differed among the three sites when participants were asked to designate their principal role within Phillips. At Hanscom, 85 percent stated that their primary duty was research, with 12 percent responding that it was administration/management. At Edwards, 44 percent stated their primary duty was research, while 40 percent said their duties were primarily administrative/management (the remainder said their focus was on design/development). At Kirtland, the duties were divided into 53 percent research, 31 percent administrative/management, and 14 percent design/development. While the overall Phillips workforce is fairly evenly divided into three segments with regard to educational level, the distribution of master's degree and Ph.D. employees varies significantly from base to base.

Differences in professional work experience among the bases were varied, with 35 percent of Edwards respondents having only 1-5 years of experience as opposed to 3 percent at Hanscom and 13 percent at Kirtland. Edwards and Kirtland otherwise show similar years of work experience, but vary considerably from Hanscom where 45 percent of engineers/scientists have 21-40 years of experience. In other respects, there is little to distinguish the populations at Hanscom, Edwards, and Kirtland from each other, with the exception of Hanscom, where there is a slightly higher number of memberships in professional societies. Also noteworthy is the DoD military employment affiliation of 70 percent of respondents at Hanscom, 74 percent at Edwards, and 62 percent at Kirtland. Overall, only 37 percent of engineers and scientists at Phillips Laboratory are military employees.

Regarding the professional alignment of the Phillips workforce, there appears to be a distinct relationship between the disciplinary focus and research behavior at each of Phillips' principal facilities and the geographic setting in which they are located. Situated in the richly academic area of New England, the Hanscom researchers overwhelmingly consider themselves scientists when describing their academic preparation. By contrast, the vast majority of the Edwards researchers, close to the more production-oriented, aerospace manufacturing mecca of southern California, refer to themselves as engineers by training. At the Kirtland headquarters of Phillips, the academic orientation of the workforce is more evenly divided between engineers and scientists. This split at Kirtland seems appropriate with Kirtland's close proximity to two of the Department of Energy's national laboratories, Los Alamos and Sandia—the former basic research-oriented and the latter (actually located on Kirtland Air Force Base) an advanced engineering facility. The primary orientation of the research population at each of the Phillips' sites is reflected in the libraries at each of the sites: a research library at Hanscom, and technical libraries at both Kirtland and Edwards.

The educational background of the Phillips workforce illustrates the fact that more scientists seek degrees to the Ph.D. level than do engineers. The educational level also seems to relate to the civilian/military mix at each site. Hanscom—where more than half of the respondents are holders of doctorates/post doctorates—is the Phillips site with the highest proportion of civilian employees. At both Edwards and Kirtland—which have younger, more predominantly military workforces—respondents most frequently reported bachelor's or master's degrees as their highest educational achievement. The most likely explanation for this difference is the historically validated tradition of the military as a youthful profession. On average, the military researchers of Phillips are younger than their civilian colleagues, and have not yet had the opportunity to reach the highest academic level of their chosen fields. The military education system's emphasis on engineering over other academic disciplines may also account for the higher percentage of self-identified engineers at Edwards and Kirtland than at Hanscom.

How education level relates to longevity within the Phillips workforce is unclear. However, it is clear that the Hanscom respondents

have substantially more professional experience than their colleagues at either Edwards or Kirtland with nearly half reporting 21 or more years of professional experience. This may be a reflection of the history of the communities near which the bases are located. The northeastern United States is a long-stabilized area, while the southwest is still a region of rapid and radical growth.

It is not surprising that the greatest percentage of the Phillips workforce at each site is civilian, rather than military. There has been a trend within the Department of Defense for the past 25-30 years to centralize and stabilize research and development activities. Part of this stabilization effort has been to reduce the numbers of military workers in such settings since the military personnel are likely to be more transient members of the workforce. These engineers and scientists did not reply to the survey in proportion to their presence in the laboratory, however. While more than two-thirds of the Phillips workforce are civilians, 70 percent of survey respondents were military members of the laboratory. This response result was completely unanticipated and can best be explained by several factors. Among these factors are that the military members of Phillips tend, on average, to be younger than the civilian workers. Therefore, they may have fewer purely research responsibilities to take them away from the laboratory premises, affording more time to complete the survey. Also, the military training and mindset of these respondents may make them more likely to complete any surveys as they would look upon it as more a requirement than an option.

Communicating and Producing Technical Information

Phillips respondents are largely in agreement about the importance of effective communication of technical information. As indicated in Table 2a, about 94 percent of participants at Hanscom, 93 percent at Edwards, and 91 percent at Kirtland responded that it is important. About half of the respondents at all bases report that there had been an increase in the amount of time spent producing technical information compared to five years ago. Only 12 percent at Hanscom thought the amount of time had decreased, while about a quarter of respondents at the other two bases thought it had decreased. More than 50 percent of respondents overall said that as they advanced professionally, the amount of time spent working with technical information received from others has increased as well.

In this survey, technical communication was defined as both the time spent producing oral and written communication, as well as time spent working with written and oral communication received from others. Phillips respondents noted that overall, this communication occupies approximately 32 hours, or 83 percent of a 40-hour work week. These findings appear in Table 2b. Results show a mean of 16.3 hours per week at Edwards and 18.3 hours per week at Kirtland being spent producing technical information. Hanscom respondents spend a mean of 14.9 hours per week working with technical information received from others compared to the high at Edwards of 16.1 hours per week.

Responses on collaborative writing practices at Phillips (Table 2c) indicate that Edwards engineers and scientists prefer writing alone more than the engineers and scientists at Hanscom or Kirtland. A mean of 69 percent of written technical communications at Edwards involve writing alone, and 33 percent of respondents write alone only. Hanscom participants write alone a mean of 57 percent of their written technical communications and prefer writing with a group of 2-5. Group writing is seen as more productive by those at Hanscom (45.5 percent) than at Kirtland (36 percent) or at Edwards (26 percent).

Little distinguishes the engineers and scientists from each base in terms of the respondents' assessment of the importance of technical information to their research or the amount of time spent preparing or working with technical information. The significant amount of time spent is possibly a reflection of the Phillips administration's emphasis on generating technical information, particularly in the form of technical reports, conference papers, and journal articles.

Although the characterizations of engineers

and scientists previously noted would suggest that scientists are more likely to work independently than are engineers, the results of the Phillips survey do not support this assumption. It is clear that the Hanscom respondents greatly prefer to work in groups when producing any type of technical information, compared to the more engineering-oriented populations at both Edwards and Kirtland. A possible explanation for this unexpected finding might be that Hanscom has a more collegial atmosphere than the settings at the other two Phillips sites. Not only is Hanscom located in the previously noted highly academic region, but the entire Hanscom contingent is also housed in just a few buildings which are within easy walking distance of each other. The physical setting at Hanscom is highly conducive to collaboration. This is in marked contrast to both Edwards and Kirtland where the elements of Phillips at each base are widely dispersed, with some related facilities as much as 40 miles from each other.

Another possible explanation for the tendency of the Hanscom respondents to produce technical information in groups more often relates again to the longevity of the Hanscom workforce. As noted earlier, nearly half of Hanscom's respondents have 21 or more years of experience in their given field. Based on this and their advanced academic credentials, it is possible to assume the Hanscom respondents feel more comfortable in their professional status, having spent earlier working years establishing their credentials and niche in the

Table 2a

TECHNICAL COMMUNICATION PRACTICES OF PHILLIPS LAB ENGINEERS AND SCIENTISTS: IMPORTANCE AND CHANGE OVER TIME

	Hanscom		Edwards		Kirtland	
Factors	**%**	**(n)**	**%**	**(n)**	**%**	**(n)**
In your work, communicating technical information effectively is:						
Important	93.9	(31)	93.0	(53)	91.3	(126)
Neither important nor unimportant	0.0	(0)	0.0	(0)	2.2	(0)
Unimportant	6.1	(2)	7.0	(4)	5.8	(8)
Mean*	4.6		4.6		4.5	
Compared to 5 years ago, the amount of time you spend producing technical information has:						
Increased	48.5	(16)	43.9	(25)	44.2	(61)
Stayed the same	36.4	(12)	21.1	(12)	29.0	(40)
Decreased	12.1	(4)	26.3	(15)	23.9	(33)
Not applicable	3.0	(1)	8.8	(5)	2.9	(4)
As you have advanced professionally, the amount of time you spend working with technical information received from others has:						
Increased	54.5	(18)	57.9	(33)	58.7	(81)
Stayed the same	36.4	(12)	24.6	(14)	29.7	(41)
Decreased	9.1	(3)	17.5	(10)	10.9	(15)
Not applicable	0.0	(0)	0.0	(0)	0.7	(1)

*A 1 to 5 point scale with 1=unimportant and 5=very important.

organization. Thus, they are less motivated to produce information independently to substantiate their professional reputations and are more willing to work with others. Also, the previously noted collegial atmosphere of the Hanscom area may contribute to a climate in which Hanscom's senior scientists spend a higher portion of their time mentoring their junior colleagues. The result of such cooperation may be the increased amount of group work on technical publications and presentations. By contrast, the professionally younger members of the Phillips workforce are clustered at Edwards and Kirtland, where the necessity of independent work to solidify professional reputations is likely higher. While Phillips management certainly encourages collaborative efforts in technical information production, it is generally not a requirement based on work assignments. As is likely in non-DoD research settings, some projects are more appropriate for group effort than others. This is reflected in Phillips' information production practices.

Types of Information Produced and Used

Respondents were asked the number of times in the past 6 months they had written or prepared various information types, alone or in a group (See Table 3a). Letters, memoranda, technical talks/presentations, and audio-visual materials are most frequently prepared individually at all three bases. More differences appear in information products prepared in groups. Hanscom respondents indicated that abstracts, letters, technical talks/presentations, DoD technical reports, and audio-visual materials are prepared in groups averaging 2 to 3.5 people. At Edwards and Kirtland, with only slight variations, group preparation centers on technical talks/presentations, letters, memoranda, and audio/visual materials. Group size at Edwards ranges on average from 2 to 6. Average size of work groups at Kirtland is 2 to 5 people.

Table 2b

TECHNICAL COMMUNICATION PRACTICES OF PHILLIPS LAB ENGINEERS AND SCIENTISTS: HOURS SPENT WEEKLY PRODUCING AND RECEIVING INFORMATION

Factors	Hanscom %	Hanscom (n)	Edwards %	Edwards (n)	Kirtland %	Kirtland (n)
Hours spent weekly producing technical information:						
0	0.0	(0)	1.8	(1)	1.4	(2)
1-5	9.1	(3)	12.3	(7)	7.8	(11)
6-10	18.2	(6)	19.3	(11)	18.8	(26)
11-20	45.5	(15)	42.1	(24)	39.1	(54)
21-40	27.3	(9)	24.6	(14)	31.9	(44)
Mean	16.9		16.3		18.3	
Hours spent weekly working with technical information received from others:						
0	0.0	(0)	0.0	(0)	0.7	(1)
1-5	12.1	(4)	12.4	(7)	7.2	(10)
6-10	18.2	(18)	47.4	(27)	44.9	(62)
11-20	54.5	(18)	47.4	(27)	44.9	(62)
21-40	15.2	(5)	21.1	(12)	18.8	(26)
Mean	14.9		16.1		15.5	

The three bases showed a marked difference in usage of varied types of information (Table 3b). Hanscom respondents in a six-month period use an average of 39 journal articles, 19 letters, 18 abstracts, 12 memoranda, and 13 conference/meeting papers, while Edwards' participants use an average of 26 letters, 25.5 audio/visual materials, 19 memoranda, 19 journal articles, and 17 technical talks/presentations. Those surveyed at Kirtland reported using an average of 20 letters, 19 journal articles, 14 memoranda, 12 abstracts, and 9 technical talks/presentations in a six-month period.

As with scientists and engineers in other Phase I studies, the majority of Phillips respondents at all three sites reported that they most frequently prepared letters and memoranda when working alone. Since these types of materials may be considered the least formal types of technical communication, it seems logical that they are the result of independent, as opposed to group, effort. Such items are also more likely to be for internal use within the organization, as opposed to more formal communications such as technical talks/presentations, technical reports, specifications, and other materials intended for wider audiences. It seems reasonable that as technical information products rise higher on a scale of formality—with an increase in potential audience—there will be a higher likelihood of group effort in preparing the information. Consensus among colleagues within the organization is an important validation of opinion/thought prior to its release outside the organization. This is perhaps especially true in a government setting, where it is essential that all information must meet strict review standards prior to public release.

The varied information product usage patterns at the three bases seem to reinforce the differences noted between scientists and engineers. At Hanscom, with its predominance of self-identified scientists, there appears to be a distinct preference for the most formal, and often most timely, form of technical information—journal articles. This preference may be related to the Hanscom respondents' heavier reliance on their library/TIC, indicating the scientists' overall habits of seeking information from formal, traditional information sources. The emphasis on journal articles as an information source at Hanscom may also be related to the increased likelihood that technical information is produced as the result of group effort. The sharing of information sources with collaborators is simplified in that

Table 2c

COLLABORATIVE WRITING PRACTICES OF PHILLIPS LAB ENGINEERS AND SCIENTISTS

Factors	Hanscom		Edwards		Kirtland	
	X̄%	(n)	X̄%	(n)	X̄%	(n)
Write alone 57.1	(19)	68.9	(39)	65.7	(91)	
Write with one other person	14.4	(5)	16.1	(9)	14.6	(20)
Write with a group of 2-5	26.4	(9)	13.5	(8)	15.8	(21)
Write with a group of more than 5	2.4	(1)	1.4	(1)	4.1	(6)
	%	(n)	%	(n)	%	(n)
Group is more productive than writing alone	45.5	(15)	26.3	(15)	36.2	(50)
Group is as productive as writing alone	27.3	(9)	19.3	(11)	18.8	(26)
Group is less productive than writing alone	18.2	(6)	21.1	(12)	22.5	(31)
I write alone (only)	9.1	(3)	33.3	(19)	22.5	(31)

library information is easily available to all members of the work group. By contrast, at Edwards, where group effort occurs less frequently, the emphasis on letters as information sources is understandable. Independent effort—and effort by researchers who have less professional experience and less access to a library/TIC than at Hanscom—may necessitate more correspondence with colleagues outside of the organization. As with other factors, while Hanscom and Edwards appear to diverge somewhat in their collective answers to this portion of the survey, the Kirtland respondents, with their even mixture of scientists and engineers, seem to strike the middle ground of relying almost equally on informal communications (letters) and formal technical communications (journal articles).

Undergraduate Coursework in Technical Communications

Respondents were asked if they have ever taken a course in technical communications/writing (Table 4a). Overall, 28 percent said they had taken a course as an undergraduate (12 percent at Hanscom as opposed to 47 percent at Edwards and 23 percent at Kirtland). After graduation, 33 percent at Hanscom, 7 percent at Edwards, and 15 percent at Kirtland had taken a course in technical communications/writing. An additional 18 percent overall had taken courses both as an undergraduate and graduate (18 percent at Hanscom, 21 percent at Edwards, and 16 percent at Kirtland). Overall, 38 percent of survey respondents indicated they had never taken such a course. Of the 61 percent overall who had taken a

Table 3a

MEAN NUMBER OF TECHNICAL INFORMATION PRODUCTS PRODUCED IN THE PAST 6 MONTHS BY PHILLIPS LAB ENGINEERS AND SCIENTISTS

	Hanscom			Edwards			Kirtland		
Information Products	Alone	In a group	Avg. no. in group	Alone	In a group	Avg. no. in group	Alone	In a group	Avg. no. in group
Abstracts	1.0	1.4	3.5	0.5	0.7	2.6	0.9	0.7	2.8
Journal articles	0.3	0.8	3.2	0.2	0.2	2.5	0.3	0.4	2.7
Conference/Meeting papers	0.5	0.9	3.3	0.8	0.5	2.6	0.7	0.7	3.1
Trade/Promotional literature	0.0	0.0	0.0	0.0	0.1	3.5	0.3	0.2	4.4
Drawings/Specifications	0.8	0.5	2.5	2.0	0.4	4.2	2.4	0.3	3.1
Audio/Visual materials	2.5	1.0	3.0	5.6	0.9	2.5	4.3	1.9	3.4
Letters	13.6	1.4	2.2	11.5	1.3	2.0	16.7	1.6	2.5
Memoranda	7.7	0.4	2.3	9.9	1.2	3.2	11.9	1.6	2.5
Technical proposals	0.2	0.6	2.5	0.3	0.3	2.6	1.0	0.3	3.0
Technical manuals	0.0	0.0	0.0	0.2	0.1	3.7	0.1	0.1	4.7
Computer program documentation	1.0	0.0	0.0	0.2	0.0	2.5	2.3	0.1	2.6
DoD technical reports	0.5	1.0	2.9	0.2	0.3	3.1	0.2	0.3	3.5
DoE technical reports	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NASA technical reports	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0
Technical talks/ Presentations	2.7	1.1	3.1	4.5	1.4	2.6	4.8	1.9	3.0

course, about a quarter of Hanscom and Edwards respondents and 17 percent of respondents at Kirtland said that this course had helped a lot to communicate technical information while from 33 to 44 percent said it helped a little and from 3 to 7 percent said it didn't help at all. When asked if undergraduate engineering and science students should have training or coursework in technical communications, 93 percent overall said yes and 4 percent no.

Respondents were also asked to select (from a list) which on-the-job skills should be included in an undergraduate technical communications course for science and engineering students (Table 4b). Those at Hanscom prioritized the most important topics as technical reports, oral (technical) presentations, journal articles, abstracts, and conference/meeting papers. Edwards respondents said oral (technical) presentations, technical reports, abstracts, conference/meeting papers, and journal articles, while Kirtland reported oral (technical) presentations, technical reports, abstracts, use of information sources, and journal articles as their choice of on-the-job skills to be included in a course.

The number of Phillips researchers who have had some formal coursework in technical communications is substantially lower than the number reported for NASA researchers in another Phase I study.[19] The most likely explanation for this variation may have to do with differences between the structures and missions of the Department of Defense and NASA. It may be that NASA places more emphasis on their employees having such coursework. The predominance of a younger workforce at both Edwards and Kirtland may account for some of the variation in this qualification for workers at the different bases (the availability of such courses at the undergraduate level may be too new a phenomena for the older researchers at Hanscom to have taken advantage of it during their early education). Also, required military schools which many of the Edwards and Kirtland researchers have attended usually include coursework on technical and busi-

Table 3b

MEAN NUMBER OF TECHNICAL INFORMATION PRODUCTS USED IN THE PAST 6 MONTHS BY PHILLIPS LAB ENGINEERS AND SCIENTISTS

Information Products	Hanscom	Edwards	Kirtland
Abstracts	18.4	7.5	11.7
Journal articles	39.4	18.6	19.1
Conference/Meeting papers	13.4	5.9	8.9
Trade/Promotional literature	3.2	8.0	5.8
Drawings/Specifications	2.1	7.4	4.2
Audio/Visual Materials	6.4	25.5	7.8
Letters	19.4	26.5	19.9
Memoranda	12.2	18.7	13.6
Technical proposals	6.3	2.5	2.9
Technical manuals	4.8	3.5	4.1
Computer program documentation	5.4	5.3	6.6
DoD technical reports	4.2	4.0	3.4
DoE technical reports	0.2	0.1	0.5
NASA technical reports	0.2	1.5	0.6
Technical talks/Presentations	8.2	16.8	8.9

ness writing not found in a typical college or university curriculum. The fact that Hanscom's civilian researchers were far more likely to have taken technical communications courses after completing their bachelors' degrees suggests that the importance of such formal training became apparent to the Hanscom researchers as they advanced in their careers.

The virtual unanimity of the Phillips respondents on the need for formal undergraduate coursework in technical communications echoes the same sentiments expressed by the NASA researchers.[20] Considering the emphasis placed on technical information as "an essential element of successful engineering practice"[21] and a primary product of scientific research, this is not a surprising finding. Knowing that the significance of their findings can best be judged through their communication of those findings, the only surprise is that some of the Phillips respondents felt that formal coursework in technical communications was unnecessary.

Use of Computer and Information Technology

Survey participants were asked if they use computer technology to prepare technical information (Table 5a). One hundred percent of the respondents use computer technology to prepare technical information. This agrees with other Phase I study results which found that 98 percent of U.S. (i.e. NASA) engineers and scientists used computers to process technical information.[22,23] At Hanscom, 67 percent always use it and 27 percent usually it, while at Edwards, 70 percent reported they always use it and 22 percent usually use it. At Kirtland, 75 percent reported always using computer technology and 21 percent reported usually using it.

Table 4a

COURSEWORK IN TECHNICAL COMMUNICATIONS/WRITING

Factors	Hanscom %	Hanscom (n)	Edwards %	Edwards (n)	Kirtland %	Kirtland (n)
Have you taken a course in technical communications/writing?						
Yes, as an undergraduate	12.1	(4)	47.4	(27)	23.2	(32)
Yes, after graduation	33.3	(11)	7.0	(4)	15.2	(21)
Yes, both	18.2	(6)	21.1	(12)	16.7	(23)
Presently taking	0.0	(0)	0.0	(0)	0.7	(1)
No	36.4	(12)	24.6	(14)	44.2	(61)
How much did it help you communicate technical information?						
A lot	24.2	(8)	24.6	(14)	16.7	(23)
A little	36.4	(12)	43.9	(25)	33.3	(46)
Not at all	3.0	(1)	7.0	(4)	5.1	(7)
Have never taken	36.4	(12)	24.6	(14)	44.9	(62)
Do you think engineering and science undergraduates should have training or coursework in technical communications?						
Yes	97.0	(32)	93.0	(53)	93.5	(129)
No	3.0	(1)	3.5	(2)	5.1	(7)
I don't know	0.0	(0)	3.5	(2)	1.4	(2)

When asked if computer technology had increased their ability to communicate technical information, 79 percent overall responded, "yes, a lot" while only 3.5 percent said it had not.

Choosing from eight types of computer software, respondents indicated (as shown in Table 5b) that they used word processing software the most (99 percent) followed by spelling checkers (90 percent), and scientific graphics (81 percent). Thesauri, desktop publishers, business graphics, and grammar and style checkers are used moderately. Usage patterns were virtually identical among the three Phillips sites. Respondents were also asked about their use of electronic/information technologies in communicating technical information. At all three bases, fax or Telex was used most heavily (91 to 98 percent) with electronic mail the next most frequently used (85 to 88 percent).

The nearly identical patterns of usage of computers and information technology at all three Phillips facilities is not surprising. Since R&D organizations and federal agencies both support and encourage the use of the latest technologies, any agency such as Phillips which is a government research center is more likely than most organizations to make the latest technologies available to its employees. As common office automation tools become easier to use—while having increasingly sophisticated capabilities—their use is likely to become so widespread that future studies may not focus on their use to such a degree.

Use of Libraries/Technical Information Centers

The survey asked a series of questions concerning the existence, importance, and use of libraries/technical information centers (TICs) at the three Phillips sites. All Hanscom respondents have access to a library/TIC although it is not in their building, while at Edwards, 7 percent have access in their building and 93 percent do not have in their building (Table 6a). At Kirtland, 1.4 percent have access in their building, 96.4 percent do not have access

Table 4b

RECOMMENDED ON-THE-JOB SKILLS TO BE INCLUDED IN A TECHNICAL COMMUNICATIONS COURSE FOR ENGINEERING AND SCIENCE UNDERGRADUATES

	Hanscom		Edwards		Kirtland	
On-the-job communications	**%**	**(n)**	**%**	**(n)**	**%**	**(n)**
Abstracts	81.8	(27)	87.7	(50)	78.3	(108)
Letters	66.7	(22)	68.4	(39)	60.1	(83)
Memoranda	57.6	(19)	61.4	(35)	56.5	(78)
Technical instructions	69.7	(23)	68.4	(39)	67.4	(93)
Journal articles	87.9	(29)	71.9	(41)	71.7	(99)
Conference/Meeting papers	78.8	(26)	77.2	(44)	68.8	(95)
Literature reviews	60.6	(20)	59.6	(34)	52.9	(73)
Technical manuals	48.5	(16)	63.2	(36)	54.3	(75)
Newsletter/newspaper articles	24.2	(8)	31.6	(18)	23.9	(33)
Oral (technical) presentations	87.9	(29)	94.7	(54)	92.8	(128)
Technical specificaitons	51.5	(17)	54.4	(31)	53.6	(74)
Technical reports	90.9	(30)	89.5	(51)	83.3	(115)
Use of information sources	63.6	(21)	70.2	(40)	73.2	(101)
Other sources*	3.0	(1)	1.8	(1)	0.7	(1)

* Hanscom: Literature searches; Edwards: Multimedia presentations; Kirtland: Program plans.

in their building, and 2.2 percent responded that they did not have a library/TIC within their facility. When asked about the importance of the library/TIC in terms of performing professional duties, about 73 percent of Hanscom respondents said it was important, compared to 49 percent at Edwards and 56.5 percent at Kirtland. Nearly 37 percent at Edwards felt it was unimportant as opposed to 15 percent at Hanscom and 13 percent at Kirtland.

Table 6b shows results on use of the library/TIC. Library usage at Hanscom is the highest of the three sites with a mean use of 16.5 times in the past 6 months, while Kirtland respondents had used their library/TIC a mean of 8.9 times, and Edwards 6.6 times. Respondents were asked to what extent the proximity of their work setting affects their use of the library/TIC. Overall, 41 percent of respondents indicated that it is important, 24 percent said it was neither important nor unimportant, and 33 percent said it was unimportant. Forty-seven percent of the Edwards respondents—who have access to a small branch library at their immediate worksite but must travel 40 miles to visit the main, more comprehensive, technical library on base—agreed that their proximity to a library/TIC (or, in their case, lack of proximity) had an important effect on their use of that library/TIC. In contrast, at Hanscom, where 87 percent of respondents said they could walk to their library/TIC in 5 minutes or less, over 57 percent of the respondents said the library/TIC's location had moderate to low influence on their use of its resources. Kirtland's respondents, whose work campus is neither as compact as Hanscom's nor as far-flung as Edwards', were more evenly divided on the importance of the library/TIC's proximity; 38 percent thought the location was very important, 27 percent thought it neither important nor unimportant, and 32 percent thought the location was not at all important.

The higher library/TIC usage rate and higher importance attached to the library/TIC among Hanscom respondents might be attributed to their self-identification as "scientists" rather than engineers as well as to the previously mentioned academic climate of the Hanscom environs. The years of experience in Hanscom's workforce (more than 50 percent of the survey respondents have more than 20 years of professional work experience in comparison with only a quarter of Edwards' respondents and a third of Kirtland's respondents) also suggests that a longer ingrained habit of research may be a factor leading toward increased library/TIC use.

Table 5a

USE OF COMPUTER TECHNOLOGY BY PHILLIPS LAB ENGINEERS AND SCIENTISTS

Factors	Hanscom %	Hanscom (n)	Edwards %	Edwards (n)	Kirtland %	Kirtland (n)
Use of computer technology to prepare technical information						
Always	66.7	(22)	70.2	(40)	75.4	(104)
Usually	27.3	(9)	22.8	(13)	20.3	(28)
Sometimes	6.1	(2)	7.0	(4)	4.3	(6)
Never	0.0	(0)	0.0	(0)	0.0	(0)
Has computer technology increased your ability to communicate technical information?						
Yes, a lot	87.9	(29)	77.2	(44)	78.3	(109)
Yes, a little	12.1	(4)	19.3	(11)	17.4	(24)
No	0.0	(0)	3.5	(2)	4.3	(6)

Our assumption that library/TIC usage at Hanscom will be higher can be explained by differences among engineers and scientists in information-seeking, information use, and research habits. However, it can also be explained by another widely-acknowledged information-gathering characteristic: the tendency for both engineers and scientists to view accessibility and convenience as a primary factor in gathering information.[24,25] The influence of the library/TIC's location on its usage cannot be overlooked in any of the Phillips settings, in spite of the near consensus at all sites that the proximity of the workplace to the library only moderately affects library usage. The fact that Hanscom's workforce is almost entirely housed in a single complex of buildings just across the street from their research library is an obvious explanation for higher library use by the Hanscom respondents. Lower use rates by survey respondents at Edwards are likely a result of the limited resources on hand at their branch library, which can only be supplemented by a 40 mile drive to the main technical library on base. The more moderate library/TIC use rates by Kirtland respondents can be explained, in part, by their dispersion among dozens of buildings, only a small percentage of which are within walking distance of their technical library. These effects of

Table 5b

SOFTWARE/INFORMATION TECHNOLOGIES USED BY PHILLIPS LAB ENGINEERS AND SCIENTISTS

	Hanscom		Edwards		Kirtland	
	%	(n)	%	(n)	%	(n)
Software						
Word processing	100.0	(33)	98.2	(56)	98.6	(136)
Outliners and prompters	12.1	(4)	14.0	(8)	13.0	(18)
Grammar and style checkers	36.4	(12)	35.1	(20)	37.7	(52)
Spelling checkers	81.8	(27)	93.0	(53)	90.6	(125)
Thesaurus	51.5	(17)	66.7	(38)	56.5	(78)
Business graphics	24.2	(8)	45.6	(26)	39.9	(55)
Scientific graphics	78.8	(26)	71.9	(41)	85.5	(118)
Desktop publishing	42.4	(14)	50.9	(29)	41.3	(57)
Information Technologies						
Audio tapes and cassettes	18.2	(6)	17.5	(10)	17.4	(24)
Motion picture film	9.1	(3)	19.3	(11)	14.5	(20)
Video tape	60.6	(20)	66.7	(38)	55.8	(77)
Desktop/electronic publishing	57.6	(19)	70.2	(40)	51.4	(71)
Computer cassette/cartridge tapes	63.6	(21)	45.6	(26)	42.0	(58)
Electronic mail	84.8	(28)	87.7	(50)	86.2	(119)
Electronic bulletin boards	48.5	(16)	70.2	(40)	46.4	(64)
FAX or TELEX	90.9	(30)	98.2	(56)	95.7	(132)
Electronic data bases	75.8	(25)	66.7	(38)	58.0	(80)
Video conferencing	42.4	(14)	52.6	(30)	50.0	(69)
Computer conferencing	0.0	(0)	5.3	(3)	5.8	(8)
Micrographics and microforms	21.2	(7)	24.6	(14)	24.6	(34)
Laser disc/video disc/CD-ROM	54.5	(18)	29.8	(17)	27.5	(38)
Electronic networks	69.7	(23)	77.2	(44)	61.6	(85)

proximity might also contribute to the slightly higher likelihood of the Edwards and Kirtland respondents to use computer networks to search their library's catalogs and/or library materials via computer; a time-consuming trip to the library can be better justified if a prior check indicates that the materials needed are indeed available for use in the library and not already on loan to a colleague. Also, while researchers have online access to their libraries via the SIRSI Corporation's STILAS at each site, the systems were not installed simultaneously and do not have the benefit of identical LAN architectures at each base, which would account for much of the variation in usage.

Sources of Information

Survey participants were also asked to indicate from a given list which information sources were consulted in solving a technical problem (Table 7). The source consulted most frequently at all bases was "personal store of technical information, including sources I keep in my office" (Hanscom 97 percent, Kirtland 99 percent, and Edwards 100 percent). In descending order the next most frequently used sources at Hanscom were co-workers at their organization, literature sources in the organization's library, colleagues outside the organization, an electronic database in the library, and a librarian or technical information specialist. After their personal store of information, the descending importance of other sources used at both Edwards and Kirtland were co-workers in the organization, colleagues outside the organization, literature sources in the organization's library, databases in the library, and a librarian/technical information specialist.

The consistent finding that personal information resources are used before consulting other sources is not surprising. This trend has been noted as common with the majority of all scientists and engineers in a variety of settings. The fact that DoD researchers are required to maintain comprehensive project files may even reinforce this tendency. A large store of rel-

Table 6a

ACCESS AND IMPORTANCE OF THE LIBRARY/TECHNICAL INFORMATION CENTER TO PHILLIPS LAB ENGINEERS AND SCIENTISTS

Factors	Hanscom %	Hanscom (n)	Edwards %	Edwards (n)	Kirtland %	Kirtland (n)
Does your organization have a library/technical information center?						
Yes, in my building	0.0	(0)	7.0	(4)	1.4	(2)
Yes, but not in my building	100.0	(33)	93.0	(53)	96.4	(133)
No	0.0	(0)	0.0	(0)	2.2	(3)
Importance in terms of performing professional duties						
Important	72.7	(24)	49.2	(28)	56.5	(78)
Neither important nor unimportant	12.1	(4)	14.0	(8)	28.3	(39)
Unimportant	15.2	(5)	36.9	(21)	13.0	(13)
Does not have library/TIC	0.0	(0)	0.0	(0)	2.2	(3)
Mean*	4.1		3.2		3.7	

*A 1 to 5 point scale with 1=unimportant and 5=very important.

evant information ready at hand in the official files seems an obvious first resource. The use of other informal information sources prior to consulting a librarian/technical information specialist follows the already noted pattern of scientists and engineers overall.

Use of Technical Reports, Domestic and Foreign

In identifying which categories of technical reports were used most frequently in performing their present professional duties, the respondents ranked U.S. Department of Defense

Table 6b

USE OF THE LIBRARY/TECHNICAL INFORMATION CENTER BY PHILLIPS LAB ENGINEERS AND SCIENTISTS

Factors	Hanscom %	Hanscom (n)	Edwards %	Edwards (n)	Kirtland %	Kirtland (n)
Use in the past 6 months						
0 times	3.0	(1)	17.5	(10)	14.1	(19)
1-5 times	33.4	(11)	47.4	(27)	44.1	(61)
6-10 times	21.2	(7)	24.6	(14)	17.4	(24)
11-25 times	33.3	(11)	7.0	(4)	14.5	(20)
26-50 times	3.0	(1)	1.8	(1)	7.2	(10)
51 times or more	6.1	(2)	1.8	(1)	0.7	(1)
Mean	16.5		6.6		8.9	
How does proximity affect your use?						
Important	42.4	(14)	47.3	(27)	38.4	(53)
Neither important nor unimportant	27.3	(9)	15.8	(0)	26.8	(37)
Unimportant	30.4	(10)	36.9	(21)	32.6	(45)
Does not have library/TIC	0.0	(0)	0.0	(0)	2.2	(3)
Mean*	3.2		2.9		3.1	

*A 1 to 5 point scale with 1=unimportant and 5=very important

Table 7

INFORMATION SOURCES USED IN PROBLEM SOLVING BY PHILLIPS LAB ENGINEERS AND SCIENTISTS

Sources	Hanscom %	Hanscom (n)	Edwards %	Edwards (n)	Kirtland %	Kirtland (n)
Personal store of technical information	97.0	(32)	100.0	(57)	99.3	(137)
Spoke with a coworker or people inside my organization	97.0	(32)	100.0	(57)	99.3	(137)
Spoke with colleagues outside my organization	90.9	(30)	94.7	(54)	92.8	(128)
Used literature resources found in my organization's library	93.9	(31)	80.7	(46)	89.9	(124)
Searched an electronic database in the library	75.8	(25)	77.2	(43)	70.3	(97)
Spoke with a librarian or technical information specialist	63.6	(21)	64.9	(37)	60.1	(83)

reports highest at all three Phillips sites (see Table 8.) The second most heavily used technical reports at all three are NASA reports. Technical reports from the U.K. and U.S. Department of Energy rank third and fourth in importance, respectively, for respondents at Hanscom and Edwards, while the ranking of these two categories is reversed by Kirtland researchers. Technical reports from AGARD, ESA, China, India, France, Germany, Japan, the Netherlands, and Russia are of lesser significance according to all survey respondents, and their ranking varies only slightly from one Phillips site to another. While nearly all of the

Table 8

USE AND IMPORTANCE OF FOREIGN AND DOMESTICALLY PRODUCED TECHNICAL REPORTS TO PHILLIPS LAB ENGINEERS AND SCIENTISTS

	Hanscom		Edwards		Kirtland	
Use	**%**	**(n)**	**%**	**(n)**	**%**	**(n)**
Country/Organization						
U.S. DoD	90.0	(30)	82.5	(47)	78.3	(108)
U.S. NASA	81.80	(27)	73.7	(42)	50.7	(70)
U.K.	69.70	(23)	45.6	(26)	41.3	(57)
U.S. DoE	45.50	(15)	43.9	(25)	45.7	(63)
NATO AGARD	27.30	(9)	38.6	(22)	8.7	(12)
ESA	33.30	(11)	14.0	(8)	12.3	(17)
China	12.10	(4)	8.8	(5)	5.1	(7)
India	18.20	(6)	5.3	(3)	4.3	(6)
France	36.40	(12)	31.6	(18)	23.2	(32)
Germany	45.50	(15)	26.3	(15)	31.2	(43)
Japan	33.30	(11)	28.1	(16)	26.1	(36)
The Netherlands	24.20	(8)	5.3	(3)	10.9	(15)
Russia	45.50	(15)	35.1	(20)	31.2	(43)
	Hanscom		**Edwards**		**Kirtland**	
Importance	**$\bar{X}$**	**(n)**	**$\bar{X}$**	**(n)**	**$\bar{X}$**	**(n)**
Country/Organization						
U.S. DoD	4.1	(33)	4.0	(57)	3.9	(134)
U.S. NASA	3.30	(33)	3.80	(56)	3.2	(133)
U.K.	2.6	(33)	2.5	(54)	2.2	(132)
U.S. DoE	2.4	(32)	2.4	(56)	2.6	(134)
NATO AGARD	1.5	(32)	2.1	(53)	1.4	(128)
ESA	1.7	(32)	1.8	(52)	1.6	(130)
China	1.4	(32)	1.60	(48)	1.3	(127)
India	1.6	(32)	1.5	(49)	1.3	(129)
France	2.0	(33)	2.1	(52)	1.7	(131)
Germany	2.2	(33)	1.90	(51)	1.9	(132)
Japan	1.9	(33)	2.0	(51)	1.8	(131)
The Netherlands	1.70	(33)	1.5	(51)	1.5	(130)
Russia	2.30	(33)	2.4	(51)	2.1	(132)

respondents reported that they had access to materials from all countries listed in the survey, over half noted that they did not use them. In assessing the importance of the various report categories on a scale of 1 (very unimportant) to 5 (very important) to their work, the respondents made the same preferences, ranking U.S. DoD reports as most important with a mean importance of 3.91, followed by NASA reports (3.37), and then U.S. DoE reports (2.52). Foreign materials were all rated as having lesser importance, with scores varying from a high of 2.36 for U.K. materials to a low of 1.38 for Indian reports.

Because the primary product of Phillips is technical reports, it is not surprising that U.S. DoD technical reports are used most often and are considered most important by the Phillips workforce. Their ready availability at the Phillips Research and Technical Libraries may have some influence on this preference. Also contributing to the preference for DoD reports is the likelihood that many are also housed in the personal libraries of the researchers who make these office collections of technical information readily available to their colleagues as previously noted. The importance of NASA technical reports over DoE reports at both Hanscom and Edwards is explained by the geophysics and astronautics foci at these sites. In contrast, DoE reports are justifiably more important to the Kirtland respondents who interact frequently with researchers from Sandia and Los Alamos National Laboratories as well as the Defense Nuclear Agency which are located on or near Kirtland Air Force Base. The most likely explanation for the preference for domestic over foreign technical reports is the fact that 95 percent of the respondents overall recorded English as their native language. Another explanation is that foreign reports are obtained through other channels than a library/TIC.

Conclusion

The responses obtained from survey respondents at Phillips Laboratory tend to support earlier research indicating that different technical communications and information-related activities exist for engineers and scientists. Because Phillips is a unique organization in that the majority of its scientists are grouped together, away from the majority of its engineers, it is easier to distinguish some of the variations in information gathering and usage behaviors than if this survey looked at multiple organizations. As reported elsewhere, scientists have a closer affinity for libraries and traditional information sources than do engineers. As also noted previously, there are a wide variety of reasons for this. Because of its special heritage and heterogeneous composition, Phillips highlights some of the more clearly delineated distinctions between the two disciplines. Fortunately, the evolution of Phillips Laboratory as a consolidation of older laboratories has permitted a concurrent evolution of the libraries at each site. As a result, these libraries ideally suit the specialized requirements of their particular clients.

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Positioning Strategic Information: Partnering for the Information Advantage

by Mary Lee Kennedy

• *Les informations d'ordre stratégique et tactique sont créées, rassemblées et utilisées de façon formelle et informelle dans le sein de n'importe quel organisme. Il y a un débat considérable sur la manière de formuler les décisions de stratégie et sur le genre de rapports entre les informations d'ordre stratégique et d'ordre tactique. Bien qu'il ne semble pas exister de définition des communications d'ordre stratégique qui soit communément comprise, l'article soumet quelques observations sur la gestion et l'information à l'heure actuelle. Le professionnel de l'information a l'occasion de donner de la valeur à l'organisme. Le succès dépend de deux choses : d'une part, comprendre comment circulent les informations d'ordre stratégique et tactique au sein de nos organismes et d'autre part, établir des stratégies pour fournir le cadre dans lequel ses avantages pour l'utilisateur seront maximisés. Ce mémoire introduit une définition des principes de l'information d'ordre stratégique, parle du lien critique entre les informations et renseignements confidentiels relatifs à la stratégie et à la tactique, discute du potentiel pour le professionnel de l'information et suggère quelques stratégies pour obtenir du succès.*

• *Dentro de cada organización se crea, acumula, y usa, de forma informal y formal, la información y la inteligencia estratégica y táctica. Hay un debate considerable sobre como se formulan las decisiones estratégicas y sobre los tipos de relación que existen entre la información táctica y estratégica. Aunque parece no haber una definición común de la información estratégica, se presentan algunas ideas actuales sobre el manejo y la información. El profesional de información tiene una oportunidad de proporcionarle algo de valor a la organización. El éxito depende del conocimiento del flujo de la información estratégica y táctica dentro de nuestra organización y del establecimiento de estrategias que proporcionan el marco para llevar al máximo los beneficios al usuario. Este informe introduce una definición de los fundamentos de la información estratégica, presenta la conexión crítica entre la información táctica y estratégica y la inteligencia, expone el potencial para el profesional de información, y sugiere algunas estrategias para el éxito.*

Strategic and tactical information and intelligence are created, gathered, and used both informally and formally within any given organization. There is considerable debate on how strategic decisions are formulated and what kind of relationship exists between tactical and strategic information. Although there does not appear to be a commonly understood definition of strategic information, some current management and information thoughts are presented. The information professional has an opportunity to provide value to the organization. Success depends on understanding how strategic and tactical information flow within our organizations and establishing strategies to provide the framework for maximizing its benefit to the user. This paper discusses the opportunity for the information professional, and suggests some strategies for success.

Introduction

In Hamal and Prahalad's book titled *Competing for the Future* (Boston: Harvard Business School Press, 1994), they analyze current concepts about competitiveness in the context of today's revolutions: "the environmental revolution, the genetic revolution, the materials revolution, the digital revolution, and, *most of all, the information revolution*" (pg. 27, italics are the authors'). The challenge to today's organization is to shift the emphasis from competing for today and, with the shift in new economy industries, to focusing on competing for tomorrow. The challenge to the information professional is clear: to create an information environment that ensures consumer access to dynamic intelligence mechanisms that can lead to "smart" tactical and strategic decisions.

For the information professional, this means competency in new and future technologies, communication strategies, content services, and working successfully with more sophisticated information consumers. This paper will deliver feedback to the information profession on strategies employed to establish information and intelligence services and products to corporate tactical and strategic decision makers. This perspective emphasizes a holistic approach to information research, analysis, and delivery, placed in the context of the company's culture, values, and vision.

Putting Information In Perspective: Culture, Values, and Vision

Culture is defined by the Oxford English Dictionary as, "the customs, civilization, and achievements of a particular time or people" (New York: Oxford University Press, 1992). In an organization it is the customs, lifestyle, and achievements of the organization. The culture reflects commonly held values. Values are one's principles or standards; what one considers of importance in life. Ultimately, visions depend on culture and values. The visions of an organization are the pictures of where the organization wants others to see it. Visions drive missions, which in turn drive goals and objectives.

The manner in which information exists and moves within an organization reflects that organization's culture and values. How information is gathered externally, synthesized, and combined with internal information also has a lot to say about the organization's culture and values. The value of information depends on how closely it is perceived to influence the ability to reach the organization's goals and objectives. As information professionals, there is a tremendous opportunity to lever the universe of information for the benefit of ourselves and our business partners. By partnering for intelligence, we can achieve our goal. The skeleton we can use to develop our strategies is the stated vision, mission, goals, objectives, and critical success factors of the organizations we work in.

The information professional has an opportunity to provide value to the organization by integrating our knowledge of internal and external information sources, information analysis and evaluation, and our strength in packaging the information to meet our business partners' stated goals and objectives. Success depends on understanding how strategic and tactical information flow within our organizations and establishing strategies to provide the framework for maximizing its benefit to the user.

It is my personal belief that the information profession will succeed and thrive in the information revolution by building intelligent partnerships with the decision makers and that this is our forte given our customer focus, our expertise in information content, our understanding of the application of information, and of this era's information vehicles.

The Big Question Is, How Do We Achieve Success?

There are four key elements that I believe are critical to opportunity development and exploitation:

- Alignment
- Resources
- Reach and Range
- Maneuverability

Alignment

Key to successfully staying on track and knowing when to change direction is understanding the business needs—especially how business performance is measured and what contributes to each measurement. This is often tied to the business' critical success factors. It means thinking like the decision makers. It means consumer contact is the critical path. It means information content management has to be driven by the business goals and objectives and must remain on target with them—proactively and accountably. All these are alignment.

There are some core definitions regarding the kinds of decisions that can help in establishing alignment. These can be grouped under strategic, tactical, and operational decisions.

In the for-profit sector, strategic business decisions answer the question, "What areas

provide competitive advantage or an opportunity for growth and profitability?" This is an information decision motivated by the desire to set business directions on the basis of which tactical decisions will be made. Examples of this type of decision would be "What are the next opportunity products or services?" or "What are the strategic arenas for growth?"

Tactical business decisions answer the question, "Now that I know the direction to go in, how does the company position itself for growth and profitability?" This type of information decision is directly motivated by the real prospect of profit or other success criteria. Examples of this type of decision would be "How do we achieve the desired market share?" or "How do we create a work environment that results in new product growth?"

An operational business decision answers the question, "How do we maximize the result of doing X?" It is a decision directly motivated by the need to complete a task in an optimum manner. An example of this type of decision is, "How do we increase the number of transactions that can be carried out in one hour?"

The opportunity for the information professional is in providing content and expertise for creating an environment to leverage the information needed to make strategic, tactical, and operational decisions. It often means combining our external information expertise with the internal information management environment.

Operational decisions are often focused on transactional data. Strategic and tactical decisions are made based on information and intelligence. We are best prepared to contribute to strategic and tactical decisions. In a study by Booz, Allen, and Hamilton in which they looked at 27 Fortune industrial and service 500 companies' CEOs (*Fortune*, April 18, 1994, pg. 13-14) they found that:

- CEO's still consider cost control their top priority;
- the accounting department reports directly to the chief executive officer at 85 percent of the companies polled, while research and development (R & D) does so only at 30 percent;
- for all the talk of empowerment, CEO's at a fourth of the companies still get involved in tactical decisions like pricing and packaging changes; and
- CEO's still evaluate their companies the old-fashioned way; on profits and stock performance.

Their findings tend to promote the concept that tactical, operational information takes precedence as the most significant information form.

A focused view of the place value of information in the organization helps to keep the information alignment strategy focused and flexible. Traditionally we have defined information by its source and format. For example, in our profession we talk about records management and external databases, CD-ROMs, the Internet, or how consumers focus on written, electronic, or verbal communication. In today's information environment, information source and format are converging and decision makers do not care how they are defined. The value of information is determined by how important it is to the decision that needs to be made. This makes it easier to decide where to align our efforts: where the information will most directly affect the decisions.

In specific, the value of information is determined by the impact it has on the outcome of the decision. The work by Joanne Marshall in the health and banking industries is a clear example of this (Marshall, Joanne. *The Impact of the Special Library on Corporate Decision-Making. Final Report.* Washington, DC: Special Libraries Association, 1993). In the banking study, over 99 percent or the 229 corporate executives and managers surveyed responded that the information provided by the company information centers and libraries is current, accurate, valuable, and has contributed to better decisions. More than half reported the information caused them to handle some aspect of an assignment differently than they would have otherwise, and three-quarters reported that the information helped them avoid making a poor business decision.

Tying into the strategic thinking of an individual or group is unique to that individual or group. Some alternatives that may work include:

- partnering with a number of groups such as product development groups,

management groups or cross disciplinary groups within a business unit:

- finding an internal champion;
- allying yourself with strategic decision makers in the organization such as marketing, corporate development, investor relations, or finance groups;
- indicating a desire to understand how the business works, listening, and asking questions of key decision makers;
- developing and distributing a briefing document on a key company, market, industry;
- reviewing and disseminating an information package on new product/process developments in key markets; and
- demonstrating expertise in use of technology tools such as Geographic Information Systems, search agents, or modeling software.

There are several tactical ways to achieve alignment. I have identified five. Each of the five processes described below requires an increasing level of interaction, cooperation, and commitment between the information professional and the business. Each requires the positioning and use of actionable information and intelligence. Each sets the ability for focused information activities that allow changes of direction driven by the business or consumer. Each stage is not mutually exclusive, but it is more difficult to reach stages 4 and 5 without addressing stage 3. The processes can be described as follows:

Stage 1. Localized efforts. Information packages are developed and used to meet ad hoc business requirements. In its simplest form it means providing filtered information, not lists of references or even full-text documents. The focus is on tactical information, i.e. information that defines whether the already identified opportunity is being met. This is principally an activity characterized by information on demand and is reactive in nature. E.g., Current awareness services, on-demand research, company financials.

Stage 2. Internal integration. Information is used to build common denominators across functional groups. The focus moves from isolated tactical decisions to meeting common information needs across business functions. E.g., competitive intelligence merged with a customer database so that sales, marketing, and product development groups can benefit from the mix of information available to them in a common system.

Stage 3. Business process design. Information is used to optimize processes rather than functions. The focus is on information needs assessment and design, specifically with respect to its contribution to business performance measurement. E.g., information needs analysis and evaluations reviewing the current business product line and its forecasted performance.

Stage 4. Imagineering the business. Selection and use of the most opportunistic information sources to infuse advantage into the business. The focus is on understanding where the business opportunities are and designing information environments to look for equivalent advantage. The focus here is clearly on strategic business directions. E.g., systematic information gathering, evaluation, and analysis of critical success factors, for reviewing "what ifs" and subsequent repositioning for business advantage. Environmental scanning, trends analysis, systematic review, and synthesis of key new technological developments and management strategies are all examples of the kinds of information applications at this stage.

Stage 5. Create and exploit business opportunities. Information is utilized that enables management to undertake novel business initiatives. Even at this stage the information that was useful in other stages may be the key. The difference is the decision, the significance to the decision makers and the packaging of the information. It can be a very simple tidbit of information or a complex analysis of business opportunities. E.g., a common form of this kind of information is the "executive breakfast." Information professionals have limited ability to impact the personal networking of our senior executives. One area in which we can have greater input is the provision of information services and products that identify opportunities or pitfalls in competing strategies. In many respects this eureka effect is very hard to systematize. On the otherhand, if the

information professional is an integral team member of the business team, it is part of the daily decision making process.

It is at the fifth stage that the corporation has the ultimate information mix and is positioned to have industry foresight and intellectual leadership, to foreshorten migration paths, and to reach the market position and share that it seeks. From the information process perspective, it is at the fifth stage where there is an integral relationship with the business.

Resources

The most critical component in delivering key content services and products is the people—their abilities, their core competencies, the match between these and the corporation's culture, vision and values, their dreams, their commitment, and the company's abilities, dreams, and commitment to them. Strategically developing and deploying an information environment that is relevant, reliable and timely requires senior management commitment, vision, leadership, and cross-disciplinary teamwork. The information professional must be included as a team member—ideally as the facilitator.

People skills, motivation, and enthusiasm are key to diagnosing information needs, evaluating resources, designing, and implementing the right solution. In order to do this in any given organization requires understanding the corporate culture, its official and unofficial intelligence points, and ultimately, the politics. Answers must be sought to questions such as:

- Is strategy driven by one strategist?
- Is it composed of subsystem strategies and strategists?
- Is the strategic decision-making process formalized and clear-cut, or is it a patchwork of initiatives that eventually accumulate in a stated corporate strategy?
- Is there a corporate strategy? If there is one, is it clearly stated and understood by the organization?
- Are there competing strategies?

The process of matching the information to the need or needs of the organization can become a very political activity in today's corporate climate where organizational change is a constant, and power can pass momentarily from one individual or group to another. Information professional must do their homework on the organization and maintain up-to-date "customer profiles." Just like any marketing activity in which there is an issue of supply and demand and competing groups, information and intelligence as today's most strategic commodity requires thorough market research.

Keeping on track in information delivery means working with multidisciplinary teams that represent the owners of the information, the information technologist, and the decision makers. My own opinion is that the structure of the team will not be static, and that even with a team leader, each individual will take on a leadership role at given times in a project. In three distinct exercises targeted at meeting one commonly held goal, the team behavior was distinct. In one case, the team started out focused on a stage two project and ended up composed of members looking at information from stage five. In the second exercise, the work team remained the same throughout the process. In the third case, the information professionals and the champion remained constant but the team members changed depending on the project step. No hard rules of "team" applied.

There is a universe of information and data. It is easier to find data today than probably at any other point in the history of humankind. The critical issue today is not what data is available, but how to make sense of everything that is available.

Information is an investment. Like any investment, it can have a poor or outstanding return. When information is applied towards the creation of knowledge and intelligence, it is a much more effective resource than when it is simply a "data dump" or information overload. People are tired of getting data and then having to filter and place value on sets of data. They want knowledge and intelligence.

Today, we have access to innumerable databases, be they real-time or historic. There are more and more intelligent agents, browsers, search engines, and analytical tools, and the trend is to utilize more of these at the desktop.

We are working on ways to turn data into voice transmissions and we can find our way around the world on the Internet and Freenets. Although there is a definite impact on our society with each new wave of technological innovation, what is evident is that if they are implemented based on their business functionality and with foresight, they are more likely to be useful than if they are centrally housed in a storage facility where there is little opportunity for knowledge management, sharing, and repurposing.

For example, organizations focus information gathering and collecting in core areas critical to their ability to maintain competitiveness. With the extent of information access and just-in-time delivery capabilities, they can secure peripheral information through many other mechanisms without incurring exorbitant collection costs. In compliance with copyright laws (and if maximally aligned) the information can be packaged and distributed to create an impact on decision making. EBSCO's table of contents and document delivery service is an example of this.

Resources mean packaging information based on specific business requirements. It means filtering, synthesizing, and summarizing information. A book put out in the early 90s suggested that librarianship was one of the few professions that was unwilling to be accountable for the authority of the information provided (McGee, James, and Laurence Prusak. *Managing Information Strategically.* Toronto: John Wiley and Sons, 1993). Whether one agrees with this or not, and whether it is pervasive or not, clearly we will need to be willing to consult on the value of the information that is received and packaging it for the next decision step.

Financial resources are significant. Obtaining financial resources means aligning our resources and aligning how they are employed. It means placing priorities on resources, both physical and human. The more the funder of the information values its impact and the more the funder can be convinced that the information investment places the corporation in an advantageous position, the greater the likelihood that the required financing will be achieved.

Reach and Range

Maximizing reach means getting information to anyone, anytime, anywhere.

Today this is less difficult than in previous years—much depends on what our software and hardware infrastructure are, defining how we want to exchange information, and then choosing the least expensive and the most effective method(s) to use. With applications like Notes, the Internet, upcoming Exchange, and other groupware products, and technologies such as capservers, satellite systems, wireless LANs, and modems, we can choose what makes the most sense in our environment. When looking into electronic distribution, it means making sure what you want to deliver will fit into any or all of the communication technologies available to the corporate customer.

Reach means access and that depends on adherence to standards, openness, and cooperation, both to and from any given set of access and source points. We have to make choices that are consistent with and that can influence the strategic directions of our IT departments. Better still, if we can be part of the teams that are setting the directions for technology standards, we are in a better position to ensure our information packages can be optimally delivered. For example, two of the most powerful opportunities open to us today are the ability to transfer information between software applications—sometimes without the customer even realizing it and the Intranet.

Reach means having people where the consumers are, and being able to make the most of economies of scale. Looking for ways to make use of one data or information source/package in a variety of applications can be a very powerful contribution. Executive information systems were based on the concept that information is pulled from one source and that at any point, the individual is able to drill down into more detail. Workbenches and desktop news delivery are real examples of making the most of economies of scale.

Reach requires data integrity and trust. One tactic used to ensure that information is where it needs to be is to "partner" an information specialist with a specific business group. The business group relies on our expertise in ensur-

ing data integrity and because there is co-ownership of the process, there is an avenue for trust. A strategy is then developed to address the needs of that particular business group.

The impact on the organization of managing and sharing tactical and strategic information and intelligence is definitely greater than the sum of its parts. Maximizing range means all information that is needed can be shared and, more importantly, it means enabling and promoting shared knowledge. Organizations need to develop a way to obtain information that affects their business and to integrate their internal intelligence networks with vital external information. This means having a shared network. In the past, corporations have failed because they lack the understanding that there is an inextricable link between information content (both internal and external) and information vehicles. In fact, smart strategies in both content and vehicle are what the information manager must ensure are employed.

Peter Drucker ("The Information Executives Truly Need," *Harvard Business Review*, January-February, 1995) points out that a few multinationals (Unilever, Coca Cola, Nestle) have been working "hard" on building systems to gather and organize outside information. He emphasizes the need to design such systems that lead executives to ask the right questions, rather than just feed them the information they expect. He further states that environment scanning for strategic changes and opportunity identification will become increasingly urgent. Specialists are required to know how to obtain the information from outside sources and how to organize it so that it questions and challenges a company's strategy. He also points out that supplying data is not enough. He concludes by stating: "The corporation that is now emerging is being designed around a skeleton: information, both the corporation's new integrating system and its articulation."

Maneuverability

In a 1994 issue of the magazine *CIO Canada*, Louis Lamoureux noted five dramatic changes in information processing:

"Computing power has shifted from corporate data centers to desktops. IT purchasing power and some development activities have shifted from the central information systems' departments to the user's. Newer applications are client/server-based versus mainframe based. Vendor dominance has shifted from the mainframe area to the desktop. Rapidly changing business conditions have reduced the useful life of applications" (Louis Lamoureux, "Considering the Big Picture," *CIO Canada*, November 1994, pg. 17-20).

It can safely be said that these trends still hold today, with the added influence of the Internet and Intranet. What does this mean for the information consumer? If one looks at the accessibility of information over the past few hundred years, it is fairly obvious that information is more broadly available now than ever before, and that the consumer is becoming more and more sophisticated.

I recently watched a TV program that suggested that half of the information technologies that would be used in the 90s had not even been invented yet. It is equally true that what information content exists, how we package it, and how it is employed will coexist and change along with these inventions.

What's next, and where in all of this is information content? Where is the actionable information? What will the consumer's information requirements become? How will we know if we are doing the right thing?

Maximum maneuverability means developing and implementing applications, products, and services with modularity, scalability, adaptability, portability, openness, autonomy, flexibility, data accessibility, interoperability, information appliance connectivity, and maintainability.

In multi-faceted organizations, it means delivering content across a continuum of architectures, not through only one architecture. It means being able to take parts of information and repackage them to meet new information requirements. It means tailoring delivery mechanisms to the consumer's information requirements. It means making sure we have the right resources, are delivering to as wide a range as possible, are influencing the IT strategy, and are aligning ourselves properly.

Modularity, scalability, and portability are

very important because they make it possible to share specific parts of information and to access the information when it is required. It means taking a dearth of data, customizing it to a particular need, integrating external and internal information, and using powerful, low-cost technology and analytical software for answer-oriented insights. E.g., the marketing group tracks potential customers, focusing especially on customers to whom proposals have been made. It is to the company's benefit to know who else within the corporation has or is working on other projects with the potential customer, what that customer's financial and public image is, what the customer's specific strategies are, and what, if any, sales history exists between the two organizations.

On another front, the product manager for a specific area may be evaluating potential in an area related to the target customer. However, this manager prefers to view the information from a product stance. Therefore, a product history would be useful from both intelligence gathering sources and external/public sources.

Add one more twist. Of the 1000 potential customers being addressed at this point in time, 100 are interested in product X and of these, 50 are in Europe. The product manager is off to France to address the product strategy for Europe and only wants the 50 European potential customer files. These are downloaded to the laptop. Flying across the Atlantic, a deal is made with the largest potential customer. On arriving, the product manager receives an e-mail message with notification of the sale, an update to the current customer file, a news release from the company, and a new product breakthrough from research. Through file transfer technology, the integrity of the customer file is maintained. The product manager is making a presentation to the European Advisory Committee so the manager cuts the part of the new data needed and reformats the presentation. The information is timely, relevant, and has integrity.

Ultimately it comes down to this: "The finest companies constantly seek to build their value on two dimensions: the value they provide to the customer, and the value they provide to their shareholders. These companies can differentiate among data, information, and intelligence, and have all three. Each is vital to building the bottom line," Margo Magid, director, strategic planning group, Citibank. (Stanat, Ruth. *The Intelligent Corporation: Creating a Shared Network for Information and Profit.* New York: AMACOM, 1990.)

We as information professionals have the opportunity to partner intelligently to position strategic and tactical information where it will have the greatest impact on the business' ability to build its value.

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Appendix 1

A common process for managing any project can be used for designing strategic and tactical information opportunities within a company. One suggestion is outlined below:

Strategic and Tactical Information Design Process

Purpose
The purpose of this process is to design and establish an information management environment (resources, vehicles, procedures) within the business group that will ensure relevant, useful and timely information and intelligence is available when, where, and how it is required to make tactical and strategic decisions.

Information Scope
1. Define business decisions: strategic and tactical.
2. Define information requirements to meet business decisions.
3. Set information category priorities.
4. For each information category, identify the information gap.

Identify and define information as it exists today and information as it is required. Includes information sources, destinations, forms (data, information, intelligence) and delivery mechanisms.

Information Analysis
For each information category:
5. Analyze information requirements and information flow.
6. Develop a blueprint that tracks information flow and associated sources.
7. Identify untapped information sources.
8. Evaluate investment in internal and external information sources.
9. Evaluate investment in information vehicles.

Prototype Development
For each information category:
10. Select initial, critical, information content. This includes identifying the owners, the endusers, and the business process.
11. Integrate internal and external information.
12. Match content to that required in other categories (if defined).
13. Match content to other existent information sources.
14. Select search/enduser interfaces (e.g., full text, point and click, drilldowns, keyword).
15. Select information technology infrastructure (e.g., feeds from EDM, customer database, desktop news, frontend, LAN access).
16. Design training process and package.
17. Document procedures.

Test
For each information category:
18. Evaluate information technology infrastructure.
19. Ensure information technology reliability, speed, maintainability, modularity, flexibility.
20. Test training process and materials.
21. Develop and test user feedback process.

22. Assure that the mix of information sources is optimal.
23. Allow for value-added elements to the information.
24. Redesign as required.

Rollout

25. Select presentation techniques (e.g., group presentations, newsletters, electronic bulletin boards, one-on-ones).
26. Carry out enduser training.
27. Carry out follow up and evaluate feedback.
28. Schedule modifications as required.

Ongoing Maintenance

29. Structure for resolution of information content, technical questions, and modifications.
30. Establish hotline support.
31. Establish commitment to investment strategy for ongoing resources (e.g., human resources, hardware, software, content, business processes, information champion).
32. Establish a budget.
33. Review and modify documented procedures as required.

The Higher Managers Are in an Organization, the Worse Information They Get

by Donald A. Windsor

• *Le plus haut placés sont les cadres d'un organisme, les pires sont les informations qu'ils reçoivent. Le bibliothécaire documentaliste ou l'informaticien est la source primordiale d'information publique et il fait preuve d'une grande expertise lorsqu'il interroge les utilisateurs finaux sur ce qu'ils veulent et ne veulent pas. Quand des intermédiaires sont placés entre les utilisateurs finaux et le bibliothécaire, ce processus important d'interrogation est entravé et souvent rendu inutile. Pire encore, il se peut qu'il soit mal dirigé par les intermédiaires. Le plus haut placés sont les cadres d'un organisme, le moins probable il est qu'ils pourront communiquer directement avec les professionnels de l'information. En conséquence, la qualité de l'information qu'ils reçoivent est en proportion inverse du nombre d'intermédiaires concernés.*

• *Cuanto mas importantes son los administradores dentro de una organización, peor es la información que reciben. El bibliotecario de referencia o el científico de información es la fuente primaria de la información pública y es muy adepto en la interrogación de los usuarios finales para determinar lo que quieren y lo que no quieren. Cuando se colocan intermediarios entre los usuarios finales y el bibliotecario, se estorba este proceso importante de interrogación, y frecuentemente se hace inútil. Todavía peor es que puede ser dirigido en direcciones incorrectas por los intermediarios. Cuanto mas importantes son los administradores dentro de una organización, menos probable es que interactúen directamente con los profesionales de información. Consecuentemente, la calidad de la información que reciben es inversamente proporcional al número de intermediarios involucrados.*

The higher managers are in an organization, the worse information they get. The reference librarian or information scientist is the prime source of public information and is very adept at interrogating endusers as to what they want and what they do not want. When intermediaries are placed between the endusers and the librarian, this important interrogation process is hampered and is often rendered useless. Worse yet, it can be misdirected by the intermediaries. The higher managers are in an organization, the less likely they are to interact directly with information professionals. Consequently, the quality of the information they receive is inversely proportional to the number of intermediaries involved.

Problem

The higher managers are in an organization, the worse information they get. This seemingly outlandish statement is my conclusion after practicing 28 years as an information scientist in a corporation. The reasons behind it are simple. Each layer in the managerial hierarchy dilutes or distorts information before passing it up to the next layer. Ergo, the more layers, the more damage to the information.

Most information comes from documents (or some other equivalent media), whether public (journals, books, newspapers, television. etc.) or private (records, notebooks, memos, letters, reports, etc.). The employees who are the most knowledgeable about and the most facile

with these information sources are at the bottom rungs of the company—usually workers or first-level supervisors in libraries, records centers, or specialized information services groups.

Yet, it is these very workers who have the best skills at interrogating their users as to exactly what information they really need. For example, all too frequently a client will ask for something as a broad generality. "I want all information on this subject." Such a request usually comes from not knowing how much information is really available. A true information professional will be able to use such a request as a starting point and then, by asking the right questions, focus the query, sometimes with pinpoint accuracy. In fact, information people delight in doing this because their clients become so obviously well-pleased. There is little personal motivation to providing information to an intermediary who cannot react with substantial feedback. Furthermore, there is scant motivation to provide information to some intermediary who is apt to take all the credit for it.

Since such true information professionals are normally in first-level positions, they are not in direct contact with upper management. Consequently, all of their interviewing skills are rendered useless when the one who really needs the information (the "enduser") delegates an intermediary to fetch it. The information professional tries to interview the intermediary, but since the intermediary does not really have a handle on what is needed, results are often distorted. When higher levels of management send intermediaries who, in turn, delegate other intermediaries, the situation becomes more muddled.

If the information professional could interrogate the manager face to face, the manager would get the best information possible. Since this direct contact between a manager and a first-level worker is a virtual taboo, the higher up managers are, the worse information they get.

Raw Information Not Wanted

Managers typically respond to this charge by stressing that they do not want raw information; they rely on their underlings for interpretation. This important distinction is indeed sometimes valid. However, my experience has shown that what is presented as interpretation can be either censorship or misinterpretation. Information depends upon the sources consulted. Managers have a tendency to ignore this basic fact. For example, when appraising competitor activity, there is a great distinction between an absolute lack of activity and what may be reported in certain databases. Since most companies try to keep the details of their cutting edge research secret, there is an expected gap between public and private information. However, when an intermediary merely reports the negative findings and does not mention the search limitations, a very serious business miscalculation could ensue. Why are top managers blindsided so often? They might not be if they consulted their librarian personally.

Good Information Means No Surprises

Another reason for poor information is the direction in which it is forced to flow. In a typical scenario, an upper manager may need some information. It is requested, through the layers as described above. Even if this manager gets exactly what is wanted, the information may still be deficient. Information is an incessant, dynamic continuum. The people (on the bottom) who monitor the flow of information on a day to day basis are often following certain trends. However, when a request for information comes to them as a "go-fer" assignment, they are likely to respond by providing exactly what was requested. They may not even associate the request with the trends they follow. Consider a case in which an upper manager is aware of four possible products which could pose serious competition. Up-to-date information is requested on these four products. However, suppose a new product is rapidly emerging. Or, suppose a new technology has emerged which could render these four products obsolete. The upper manager would only get information on the four products requested. Had there been a face to face discussion with the information provider, other possible competitive products and the new technology might have been uncovered.

Managerial arrogance assumes that managers know the big picture and their workers can "go-fer" the smaller details. Many times it is just the other way around, as managers find out about new information in embarrassing, sometimes disastrous, situations. A good way to manage is to strive for no surprises. However, using a "go-fer" approach to information is a sure way to be surprised.

Timing

Another way in which management is often tripped up is by ignoring information coverage until a project is almost completed. The best time to appraise information is at the inception of a project where a knowledge base can show whether or not the project has any chance of success. In most cases, a request for information comes from the project leader at a time when it is virtually impossible to stop the project. Saving face, having funds already committed, having people already hired, and even having contracts already signed can produce an inertia that makes the project leader very reluctant to "pull the plug."

Starting with the information is something we all learned writing term papers in high school, but somehow managers seem to forget it. Or, perhaps they do not forget it as much as their point of reference changes. Managers tend to conceive of information as what people tell them. This hearsay becomes their knowledge base. They do not appreciate that the printed word is often very different from the spoken word and that public information is very different from private information. Determining which is better is not as important as evaluating both. The time for such an evaluation is at the beginning of a project, as well as all along the way, certainly not just confined to the completion. The best way to handle this is to assign an information professional to the project team. The competitive advantage of such as assignment is so huge that I am bewildered as to why it is not done routinely. But since it seldom is, an important problem in information science is smoldering here. I believe it is due to a prejudice against librarian-types, but there may well be other causes.

Rear View Mirror

Yet another reason why managers get poor information is their retrospective approach. They tend to ask, in essence, what has been done on a subject. This is like driving a car by looking in the rear view mirror. All that is seen is what has already transpired. I have never been asked what is going to happen in a subject area. While no one can predict the future, certain trends are obvious and unstoppable. Information is a continuous flow, like a river. It does not take a great soothsayer to recognize them. Yet they can easily be missed if they are not actively followed. An information professional who follows a particular subject area on a daily basis gets in tune with the trends in that area. Managers would find it very profitable to plug in.

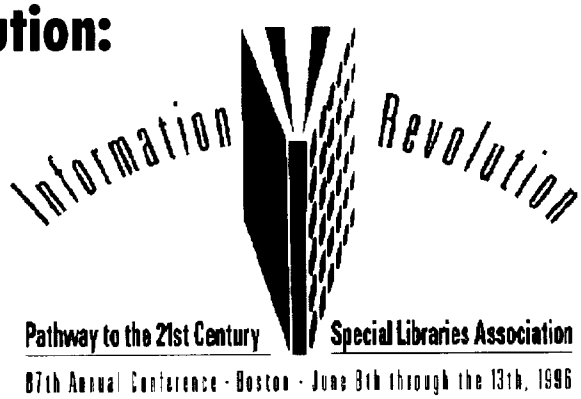
What To Do

Whenever information professionals have to deal through intermediaries, they lose. At best, they can only break even. So, how to turn this situation around to elicit a win? Make the intermediaries realize where they are—right in the middle—between a rock and a hard place. Since the enduser manager is probably a rock, you be the hard place. Ask the intermediaries the correct questions, the ones you would ask the enduser manager if you were face to face. Emphasize the different results that may be obtained with different assumptions and strategies. When the intermediaries have to return to their bosses often enough, they will realize their roles as obfuscating go-betweens. Furthermore, the enduser manager may even get to hear your name mentioned as the real source of the information. You may even get personal recognition through direct contacts. When that happens, everybody wins, you, the manager, and especially important, the company.

Donald A. Windsor is an information scientist who recently retired after working 28 years in a pharmaceutical research library. His address is P.O. Box 604, Norwich, NY 13815.

On the Scene

Information Revolution: Pathway to the 21st Century



The Special Libraries Association
87th Annual Conference
Boston, MA
June 8-13, 1996

Conference attendees will revel in history and explore our rapidly changing field as we forge a pathway to the 21st century. All conference attendees are guaranteed a high quality learning experience—CE courses, workshops, seminars, special speaker presentations, state-of-the-art exhibits, and much, much more. Look for the following key concepts to be discussed, highlighted, and covered at the conference: virtual libraries, electronic publishing, intellectual property and copyright, and effective enduser partnering. Come, join us in Boston this summer and help us direct the "Information Revolution."

Take advantage of Boston's status as an information mecca. Revel in history while exploring the rapidly changing information profession. For up-to-the-minute visitor information on Boston, visit *To: Boston,* the Greater Boston Convention & Visitors Bureau's World Wide Web site at www.toboston.com.

You can also check out the Boston Local Committee Web page at http://www.cybercom.net/~sla/ for the following information:

- A Guide to Boston: dining out, landmarks, tours, museums, nightlife, sports, universities, and so forth.
- Information about SLA's Boston Conference: member information, meetings, news, and so forth.
- Events of the '96 conference, which include those sponsored by SLA and the Boston Chapter.

Still more questions about Boston? SLA's Boston Chapter has created a listserv called SLA96-L to disseminate information and answer questions about the conference city. Send your questions and the local chapter members will do their best to answer them! To subscribe to SLA96-L, send an Internet message to: listproc@info.babson.edu. Leave the subject line blank. In the message text area type: SUBSCRIBE SLA96-L YOURFIRSTNAME YOURLASTNAME.

Finally, a wealth of information can be found in the *Preliminary Conference Program.* Copies of the publication were mailed to the full membership in March. Copies are available to other interested parties upon request. Please send your request to Conferences & Meetings, Special Libraries Association, 1700 18th Street, NW, Washington, DC 20009-2514; phone: 1-202-234-4700, ext. 645; fax: 1-202-265-9317; Internet: stacey@sla.org.

Please use the appropriate forms found in the *Preliminary Conference Program* to register for the conference and to acquire hotel accommodations.

Conference Alert!

Every year the conference keeps growing. Consequently, every year there should be more attendees requiring hotel accommodations. But unfortunately, every year we seem to lose a few people to non-conference hotels. The overall numbers just never add up. Every year we have more difficulty trying to account for those elusive attendees. Where are you? Where do you stay? We know that you register to attend the conference, and that you require hotel accommodations, but the SLA Housing Bureau cannot account for you when tabulating the number of guest rooms used by SLA during an annual conference. The bureau looks at all the hotels listed as conference preferred housing, and yet the missing attendees just keep eluding us.

You can do your part and help the association at the same time. Make sure you are counted! Please make your annual conference hotel reservations early and use one of the preferred hotels listed in the *Preliminary Conference Program.* We try our best to have enough hotel rooms available, however, because the missing attendees never get counted, we never know how many hotel rooms will be needed from year to year. This affects the association because it lowers the number of hotel rooms we can set aside for conference attendees. These lower numbers mean there's less chance of securing a reservation in a preferred conference hotel.

Have you ever sent in your reservation for a conference hotel only to discover that all the hotels have been filled, leaving you out at the airport? It's not a very pleasant feeling. I'll bet you wish you could just scream. I'll bet some of you do! Hotels need to know how many conference attendees needed and used hotel accommodations from past years before they agree to set aside guest rooms for SLA use. The higher the numbers provided to hotels, the higher the number of hotel rooms we are able to set aside for conference attendees. The better the statistics become, the better SLA's chance of getting enough hotel rooms for all conference attendees, and the better your chances will be of **not** needing to stay at the airport hotel.

Are we looking for that missing attendee who decides to stay with a friend? No. Are we looking for that elusive individual who must stay at a "non conference" hotel due to company policy? It would be nice to know about this, but again, no. We are looking for the attendee who decides to stay at a non-conference hotel "just because." We can then add additional hotels to our block in following years which would provide all meeting attendees an alternative housing selection. However, to do this properly, we need to present concrete statistics!

Lets resolve to work together to catch that elusive attendee and get them counted in the statistics! Doing your part will enable us to better serve the meeting attendee and the membership.

Hotel Accommodations

Co-headquarters Hotels:	**Single**	**Double**
Boston Marriott Copley Place	$158	$173
The Westin Hotel Copley Place	$168	$188
Additional Properties:		
Boston Back Bay Hilton	$142	$162
The Lenox Hotel	$121	$141
Copley Square Hotel	$109	$125
The Colonnade	$160	$175
The Midtown Hotel	$103	$113
Boston Park Plaza Hotel & Towers	$105	$125
The Copley Plaza	$159	$179

Conference Attendee Locator

We are pleased to announce that Inmagic, Inc. will again provide a conference attendee locator database onsite in the SLA registration area during the annual conference in Boston, June 8-

13. Attendees staying with friends or making their own conference housing arrangements instead of using the official SLA housing form (found in the *Preliminary Conference Program*) are urged to send information on where they are staying to Betty Eddison at Inmagic, Inc., 800 West Cummings Park, Woburn, MA 01801-6357. We urge all local attendees not requiring hotel accommodations to send a "listing" as well. Please include your name, organization, hotel or other contact location, telephone number, and arrival and departure dates. You may also e-mail the information to: inmagic@netcom.com. Please put the acronym SLA in the subject line. This will ensure that the information is delivered to the right person. Be a part of the action and stay in touch with your colleagues by including yourself in the database!

See you in June!

Call for 1997 Conference Papers

Information Professionals at the Crossroads:

CHANGE AS OPPORTUNITY

Information professionals are at a crossroads. Change is everywhere and is both a challenge and an opportunity. Some information service organizations have thrived in our changing world; others have not. Areas of change and opportunity include the roles of information services in the learning organization, in the global economy, in managing access to the World Wide Web, and in managing information and knowledge. The importance of shaping the vision, planning strategically, setting the direction, and leading the way to innovation and flexibility will be emphasized.

The "crossroads" theme is especially appropriate for the Seattle Conference given Washington State's roles in Pacific Rim trade and as a major exporter of airplanes, timber, and high technology products. The Pacific Northwest has been a crossroads since the early explorations of Lewis and Clark and the search for the elusive Northwest Passage.

You are invited to submit papers, posters, or multimedia presentations addressing the theme, "Information Professionals at the Crossroads: Change as Opportunity," for the 1997 Annual Conference in Seattle, WA. Papers accepted will be presented at the contributed papers sessions. Posters and multimedia presentations accepted will be presented separately from the contributed papers at the annual conference. Presentations which are specific in nature will be referred to the appropriate divisions for review.

Guidelines

May 1, 1996—Submit working title of proposed contributed paper, poster, or multimedia presentation to Ellen Mimnaugh at Internet: emimnaugh@cas.org; phone: 1-800-848-6538, ext. 2031; fax: 1-614-447-3713.

September 25, 1996—Submit abstract of proposed contributed paper, poster, or multimedia presentation to Ellen Mimnaugh via Internet at: emimnaugh@cas.org. If this is not possible, an ASCII file on a 3.5" diskette should be sent to: Ellen N. Mimnaugh, D85, Chemical Abstracts Service, P.O. Box 3012, Columbus, OH 43210. Electronic submission is required. Phone or fax will not be accepted.

April 1, 1997—Submit complete text of accepted contributed paper, poster, or multimedia presentation to the association office.

Length—Presentation of the paper should take no longer than 15 minutes.

Acceptance—Contributed papers, posters, or multimedia presentations will be accepted only if: 1) the abstract has been submitted and evaluated, 2) the author is a member of SLA, and 3) the author intends to present the paper, poster, or multimedia presentation at the annual conference. Abstracts will be judged on relevance to the theme, substance, and potential member interest. Applicants will be notified of acceptance by November 14, 1996.

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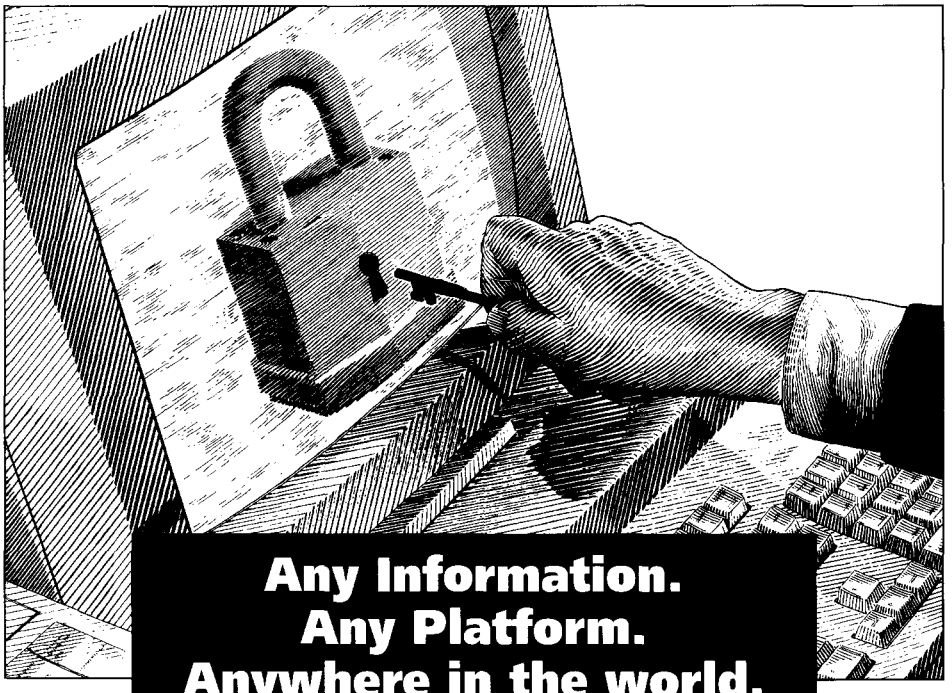

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