SPECIAL CHALLENGES AND PROBLEMS IN A TECHNICAL INFORMATION SERVICE SERVING THE MINERAL AND ENERGY INDUSTRIES

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ABSTRACT

This paper describes technical information services in energy, mining, metallurgy and mineral processing at The Canada Centre for Mineral and Energy Technology (CANMET) in Ottawa. The discussion focusses on efforts to improve technical communication to internal and external clientele in these fields through evolution of an all-embracing concept of information transfer in a research and development setting. Key elements of the information program are described, including: specialized machine-readable bibliographic files developed in-house; international technical information exchange in coal; and special marketing problems arising from the need to serve several different publics inside and outside government. The importance of informal scientific communication and interaction with the user is stressed.

RESUME

Le présent rapport décrit les services de renseignements techniques affectés aux domaines de l'énergie, des mines, de la métallurgie et du traitement des minéraux au Centre canadien de la technologie des minéraux et de l'énergie (CANMET) situé à Ottawa. On discute principalement des efforts apportés à l'amélioration de la communication technique avec les clients internes et externes en chacun des domaines mentionnés, par l'évolution d'un concept compréhensif de diffusion de l'information dans les milieux de la recherche et du développement. Parmi les éléments dominants du programme d'information notons: dossiers bibliographiques spécialisés, assimilables par une machine et améliorés sur place; l'échange d'information technique sur le charbon au niveau international et les problèmes particuliers de commercialisation qui émanent de la responsabilité de servir un public varié soit à l'intérieur ou à l'extérieur du gouvernement. Le rapport souligne l'importance d'une communication et d'une interaction scientifiques officieuses avec les clients.

CANMET, the Canada Centre for Mineral and Energy Technology, is a research and development branch of the federal Department of Energy, Mines and Resources. Through the efforts of its 270 engineers and scientists, it aims to promote the efficient extraction and use of Canada's mineral and energy resources. A variety of research projects is underway, many of which are timely and very much in the public eye — for example, domestic heating, coal utilization, effluent treatment and radioactive waste disposal.

CANMET's national objectives are ultimately realized through the information transfer that is an integral part of the research and development process. Furthermore, CANMET conducts applied research, much of which deals with specific problems such as those of a regional nature; in this context the information and technology transfer functions take on special importance, and research and information staff are charged with the responsibility of seeing that the research finds its intended application.

In 1967, the management of the former Mines Branch, now CANMET, established a Mining Information Centre in recognition of the need for improved technical information transfer in mining. In keeping with CANMET's increasingly broad technical responsibilities, the Centre has been expanded in recent years and now also offers information services in energy (fossil fuels), physical metallurgy, and mineral processing. In 1975 a new unit, the Technology Information Division, was formed to draw together the enquiries service, the editing and publishing functions, and the library.

Like the former Mining Information Centre, the Technology Information Division serves both CANMET staff and outside personnel. These constitute two distinctly separate publics requiring separate approaches to marketing and service. Canada's mineral and energy industries present a special communications challenge to information specialists because of their size, geographical diversity, dynamism and national importance. This paper describes some of the problems and challenges encountered and gives examples of activities that help to meet these challenges.

EVOLVING NOTIONS OF INFORMATION

One task facing the division is to define its information transfer roles and functions in terms of CANMET's broader objectives — something that any organization must tackle in the evolution of an effective information program. This involves studying and delineating the needs and peculiarities of both CANMET research staff and external clients, including industry, other government agencies, research organizations, and universities.

Within CANMET, the division's role is seen in terms of a larger concept of technology transfer that is an integral part of the research and development function. For example, the important but poorly docu-

mented contributions made through informal communications and "invisible colleges" are essential considerations; the division strives to both enhance and complement these informal means of communication, recognizing that they can't – nor should they – be replaced by any combination of documentation and mechanisation. This means meeting the needs of CANMET staff as well as assisting in the transfer of new technology and research information – essentially "filling in the gaps" in the R & D process. On the other hand, the division is also expected to exercise leadership in evolving new notions and techniques of information and technology transfer.

If the end product of research and development is information, then communication of that information must be a crucial function of the R & D organization. If we are communicating, what is the goal of the communication? Perhaps it is best seen as a contribution to technical progress, a concept defined by G.P. Sweeney (1977) in terms of two components: first, innovation per se, the first application of some aspect of scientific knowledge with economic success, and second, the adoption of the best technical practices. Both these components are central to the evolution of CANMET's information program. Furthermore, if we accept, as Sweeney does, that a primary role of government in technical progress is to act as a stimulus to technical communication, then the importance of establishing a well-defined information program becomes even more apparent.

Many authors have recognized the central role of information transfer in the innovation process (Globe et al 1973; Robertson 1973; Rothwell 1975; Rothwell and Robertson 1975). More specifically, the importance of informal communication in the evolution of new technology is receiving increased attention. Ganz (1976) for example, cites studies at Georgia Tech and M.I.T. that concluded that "people and not formal channels of communication are more effective for transmitting technical information" and that "scientific and technical information suppliers should concede that the formal channels of communication are not that useful to researchers in organizations and that informal channels will continue as the dominant form of communication". This notion puts information specialists in a bit of a quandary. At CANMET we are well aware of the significance of informal contacts and these are encouraged and facilitated in every possible way. At the same time we recognize the value of formal methods. Our view is that formal and informal communication can probably get along without one another, but if the two are combined in a well-planned, carefully-monitored information program, the result is mutual benefit – the whole, in other words, is greater than the sum of the two parts.

A corollary is that, when supported by a referral network the information transfer process functions more effectively if the information service is part of the laboratory; the information specialists must be a part of the R & D staff. This is the principle that guides the evolving concept of information transfer at CANMET. Such an arrangement benefits the laboratory scientists in their own involvement in

technology transfer as well providing the opportunity for information staff to make use of their scientific and technical expertise. We think it can even help to improve communication among the researchers themselves.

The second aspect of technical progress, namely adoption of the best technical practices, can be best illustrated in CANMET's case by an example. The Pit Slope Project is a multi-year, multi-million dollar effort culminating in the production of a state-of-the-art manual for open pit mine design under Canadian conditions. The project, co-ordinated by CANMET, is an outstanding example of government-industry-academic cooperation, designed to advance the application of modern technology in Canada and thus make the Canadian mining industry more competitive. Furthermore, CANMET has recognized that publication of the manual does not represent completion of the project; the crucial task of technology transfer is yet to be completed, and is taking the form of a series of seminars across Canada to communicate the methods described in the manual to mining industry personnel. Thus communication is the final step in the process, and the step that will provide the best measure of the project's success.

The project started with the basic recognition that technological information was reaching the mining industry only in bits and pieces, if at all. The manual combines all the most recent information on open pit mining technology in one place. Clearly, this job of organizing information, along with the intensive efforts of communication that followed publication of the manual, is a way in which government agencies such as CANMET can play a major role in technological and economic progress in Canada.

PRODUCTS AND SERVICES

The Technology Information Division offers a variety of services and products in addition to the usual range of library services and technical reports. The Technical Inquiries Section, staffed by engineers and scientists and working hand-in-hand with the other two units — the library and the publications section — offers retrospective literature searches, current awareness profiles, referrals, interpretive reports and reviews, and a variety of other products in response to the varying information needs of users. Among the special activities carried out by the Section are file-building and international information exchange.

File-building

Several years ago the recognition that commercially available bibliographic services were inadequate in two of CANMET's main subject fields — mining and mineral processing — led to the formation of the Mining Information Centre and eventually to the establishment of two data bases.

The mining data base, known as MINTEC, contains about 17,000 computer searchable citations. About 2,500 documents are added each year, coming mainly from about 100 serials as well as proceedings and technical reports, including much narrowly-circulated report literature dealing specifically with Canadian problems. A thesaurus of terms used to control input and retrieval was published in 1969 and is kept up to date by continous revision (Romaniuk 1969).

The mineral processing data base, MINPROC, is similarly constructed. The initial computer-based index file is now being upgraded to include abstracts. An expanded thesaurus of terms is nearing completion.

Both computerized files use the same computer programs. The programs were designed to provide all the required facilities, i.e. storage, retrieval, search, update, and photo-ready printout. Input data are loaded by cards, but can also be entered from paper tape. Output can be channelled to a line-printer, or magnetic tape. The system has been in use at CANMET since August 1973 (Soukup et al 1975).

As anyone experienced in data base construction knows, it is a challenging task, and can be very demanding in terms of time and resources. Expecially time-consuming is the acquisition of such items as "fugitive" technical reports which help to make MINTEC and MINPROC particularly useful. We look on these data bases as special products, and, at the same time, as invaluable resources which make a big contribution to the utility of the information provided by CANMET, especially when constructed and exploited, as they are now, by professional engineers and scientists.

International Technical Information Exchange

As part of its expanded research and development effort on coal, Energy, Mines and Resources Canada participates in the work of the International Energy Agency (IEA) relating to coal. The projects, which involve technical information transfer between member countries of IEA, are in four areas: coal economics; coal resources and reserves assessment; technical information exchange; and mining technology.

Because of its expertise in the field, CANMET was designated to handle liaison and information exchange for the Technical Information Service and the Mining Technology Clearing House. A coal information officer at CANMET acts as the Canadian national correspondent, and has the responsibility to feed Canadian information to the IEA. As well, the officer is responsible for assuring that information from the IEA reaches appropriate personnel in Canada.

The Technical Information Service of IEA aims to report on world-wide developments in coal technology and to facilitate exchange of information between participating countries. The basis for the service

is a computerized data base with input of abstracts from member countries. The Canadian correspondent contributes abstracts of literature originating in Canada, Australia and South Africa, the last two being non-members whose work however is of much international interest. The data base is being used to produce a monthly abstracts journal entitled Coal Abstracts.

The objectives of the Mining Technology Clearing House fall into three areas: compilation of ongoing registers of research and development projects; investigation of specific technical problems or proposals (including the preparation of state-of-the-art reviews); and promotion of international collaboration on R & D work.

International information exchange is inevitably complicated, being characterized by long time scales, language difficulties, and confusing differences in conventions and customs. The IEA work presents a special challenge for CANMET staff because the projects are hoped to provide substantial input into much-needed progress in the rapidly growing Canadian coal industry. The success of such projects as the IEA services depends to a large extent on the establishment of good channels of communication with prospective users.

REACHING THE USER

As a relatively new evolving unit, the Technology Information Division is facing the task of marketing as a primary step in developing the smooth flow of information to its main "clients" — CANMET staff and the mineral and energy industries.

Marketing and promotion are currently the subject of increasing interest among librarians and information scientists (Angoff 1973; Bellardo & Waldhart 1977; Ferguson 1977; Hall 1974; Hoey 1973; Jackson 1973; Lawrence et al 1974; Schmidt 1977; Stern et al 1973). But the techniques are not well-developed or widely accepted, partly because information science as a discipline is young and rapidly changing, and partly because librarians and information scientists have traditionally considered "aggressive" marketing incompatible with the low-key, unassuming, frugal image of the information worker as public or corporate servant. Fortunately this view appears to be changing; hopefully the change will render information services more visible, more dynamic, and ultimately more effective. Although the current restraint program of the federal government prevents us from undertaking a large-scale promotion program, much attention is given to the need to make the potential benefits of the service known across the country, in keeping with CANMET's national responsibilities.

In an article on promotion of on-line services, Douglas Ferguson (1977) defines marketing as "an organized way of offering on-line services that includes user interests, data bases, communication methods, imaginative design of services and products, and feedback that improves

what you are doing". Ferguson also identifies five essential questions in the development of a marketing perspective:

(1) Who am I trying to reach?
(2) What are their interests?
(3) What can I create to serve their interests?
(4) Under what conditions can I offer services and products? and
(5) How can I communicate with my natural audiences and how can they communicate their needs to me?

Ferguson's first question has to do with identification of publics and markets — always an initial step in any marketing or public relations project. At CANMET we have two main markets — internal and external — which can be subdivided, or segmented, as shown in Fig. 1. Having thus identified them, we must study each according to its needs and characteristics, and the approaches and characteristics by which it can best be served — in other words, answer Ferguson's other four questions. We must understand the market before we can expect to reach it.

Three points should be noted in connection with Ferguson's five questions. First, there are many ways to segment the market. In Fig. 1, we have given but one example — we could, for instance, have further divided the industry segment according to the type of industry. Second, Ferguson's third question emphasizes the importance of creating products to satisfy needs, rather than the other way round. And finally, note the importance that Ferguson attaches to communication — the essence not just of effective marketing, but of effective information services.

When it comes to promotion, many approaches and techniques are possible, based on various media, including word-of-mouth, direct mail, printed media, oral presentations, and audio-visual techniques. We have listed "word-of-mouth" first because it emphasizes the importance of personal contact in the promotion and success of an information service. At CANMET, word-of-mouth publicity is probably the most effective way of letting our own research staff know about the service, and is one reason why our information specialists are encouraged to interact with laboratory staff. Its importance was reflected in a study of the role of research associations (RA's) in providing information to industry which concluded that word-of-mouth was generally more effective than any literature in promoting information transfer, and even recommended that liaison officers be used who could act as salesmen for the RA's work. The same study concluded that the information officer should pay a little more attention to his image to establish a place for himself "in the market place" as information expert and link with industry (Payne and Cleaver 1976). Another study at the Ohio State University confirmed the conclusion that "a paramount concern in promoting an information service seems to be the face-to-face interaction of the information specialists with the prospective user. Without this key ingredient the effectiveness of any promotional effort is likely to be jeopardized" (Stern et al 1973). Word-of-mouth publicity was also a major factor in

BY AFFILIATION

BY OCCUPATIONAL GROUP	CANMET	Other EMR	Other Fed Govt	Prov Govt	Prov Res Council	Industry	Consulting Firm	University	Independent
Research	X	X	X	X	X	X	X	X	X
Production						X			
Management	X	X	X	X	X	X	X	X	
Policy		X	X	X		X		X	
Regulation		X	X	X					
Consultant					X		X	X	X
Teacher								X	
Student								X	
Prospector or other independent									X

FIGURE 1. Markets for CANMET Information Services

an effort to promote online search at Exxon Research and Engineering Company (Lawrence et al 1974).

Although we find word-of-mouth effective within CANMET, its value to reach our external clientele is limited by geography. It is still valuable, but obviously requires extra effort and expense. To supplement word-of-mouth communication in this case, we have experimented with several techniques, including:

- direct mailing of descriptive leaflets to selected "target markets", e.g. registrants at specialized conferences, or members of professional societies;
- articles in trade publications;
- displays and online search demonstrations at national and international mining, metallurgical, and energy conferences.

To date, these efforts have been only moderately successful; however, we believe that with improved format, repetition and reinforcement, these techniques can be viable marketing tools. Expressed another way, these efforts should not be carried out in isolation, but should be part of a carefully formulated marketing plan.

Reflection on the value of these tools points up the importance, not of the tools themselves, but of the approaches and attitudes on which their use is based. Perhaps we have overlooked a fundamental attitude – the need to emphasize the benefits the prospective user can expect to receive from the service. This was perhaps most aptly put by Theodore Levitt in The Marketing Mode: "Last year one million quarter-inch drills were sold, not because people wanted quarter-inch drills but because they wanted quarter-inch holes" (quoted in Ferguson 1977). We have recognized that it is also important to market and evaluate the service not just in terms of functional objectives but in terms of the goals of the organization. Thus, at CANMET, we try to put the emphasis not on technical data and bibliographies, but on research progress, productivity, profits and personal success; our goal is not just to supply information but to contribute to improvements in the extraction and utilization of Canada's mineral and energy resources. It is on this outlook that our marketing plan is based.

Another basic principle often overlooked in marketing efforts is the golden rule of salesmanship: put the customer first. There is a tendency in many organizations to boast about the beauty of the product or the capabilities of the organization rather than to gear promotional materials to the interests of the user. The user must be convinced above all that he will benefit from using the service. Hence the importance of researching user needs as part of the marketing plan.

To ensure that the plan is thorough and effective, Philip Kotler (1975), encourages use of a sytematic audit to identify weaknesses in the marketing program. Kotler also devotes a full chapter to what he calls "the responsive organization". Such an organization is characterized by a marketing orientation that permeates all levels of the staff,

a "whole new attitude toward the organization's various publics and missions". Although the development of such an attitude is probably easier in theory than in practice, it represents an essential goal for any organization offering products or services of any kind.

STRIVING FOR QUALITY

The notion of effectiveness of information systems is poorly defined, and is certainly an area ripe for increased research effort. The difficulty arises in part from a hesitancy to delve into the matter, because trying, for example, to assign a value to such an intangible commodity as information and the benefits it brings, is inevitably a frustrating experience. Nonetheless, if the growing field of information science is to evolve into a recognized, respected profession, evaluation of effectiveness must play a big part in the operation of invormation services.

The value of the service must ultimately be assessed in terms of the objectives of the service. The assessment thus takes place on two levels:

- in terms of the functional objectives of the service, e.g., "to provide quality information promptly and inexpensively";
- in terms of the objectives of the organization, e.g., "to advance scientific and technical knowledge in a given field".

Evaluation on both levels is impossible without adequate feedback from users. This in turn implies extensive communication between the information specialist and the user, the same type of communication that is so important in the marketing effort.

Numerous organizations have found user-interaction and follow-up to be an essential component of success in an information service (Lawrence et al 1974; Somerville 1977; Wilde 1975). At CANMET we hope to improve the quality of the service we provide to internal users by face-to-face interaction between information specialists and laboratory staff. In this way we can take advantage of the organizational factors whose importance is stressed in a recent article by Olson (1977).

Reaching and interacting with our external publics is quite a different problem. It is not easy to communicate effectively with, for example, an engineer at a gold mine in the Northwest Territories. Clearly, face-to-face discussion can't be used the way it can with our own laboratory staff, but there are other ways to get to know the user and how he feels about the service. For example, we make use of telephone follow-up, or pre-addressed evaluation questionnaires in the form of a postcard, sent to randomly selected clients (Fig. 2).

Above all we must pay close attention to the differences in approach required to serve different publics effectively. For example, it is probably safe to assume that "relevance" of information has a different meaning for the engineer in industry who has a technical

TO HELP US PROVIDE BETTER INFORMATION SERVICES, WE WOULD APPRECIATE YOUR COMMENTS.
PLEASE BE FRANK. ALL REPLIES WILL BE KEPT CONFIDENTIAL. DO NOT SIGN YOUR NAME.

OCCUPATIONAL GROUP

- ☐ RESEARCH
- ☐ PRODUCTION
- ☐ MANAGEMENT
- ☐ POLICY OR REGULATION
- ☐ CONSULTANT
- ☐ TEACHING
- ☐ STUDENT

AFFILIATION

- ☐ CANMET
- ☐ OTHER EMR
- ☐ OTHER FED GOVT
- ☐ PROV GOVT (incl Res Council)
- ☐ INDUSTRY
- ☐ CONSULTING FIRM
- ☐ UNIVERSITY
- ☐ OTHER.....

HOW DID YOU LEARN ABOUT THESE SERVICES

- ☐ BROCHURE
- ☐ ADVERTISEMENT
- ☐ DISPLAY OR EXHIBIT
- ☐ TELEPHONE DIRECTORY
- ☐ CANMET STAFF
- ☐ OTHER FED GOVT STAFF
- ☐ COLLEAGUES
- ☐ LIBRARY OR LIBRARIAN
- ☐ CANNOT RECALL
- ☐ OTHER.....

RATE YOUR SATISFACTION WITH EACH ASPECT OF THE SERVICE BELOW

	SATISFACTION		
	HIGH	MEDIUM	LOW
1. CONVENIENCE & EASE OF USING THE SERVICE			
2. HELPFULNESS OF THE INFORMATION OFFICER			
3. VALUE OF INFORMATION SUPPLIED			
4. TIME TAKEN FOR REPLY			

OTHER COMMENTS

FIGURE 2. User Evaluation Questionnaire

problem at hand than for the research scientist confronted with basic problems. The engineer has no time to sift through peripheral material, and generally wants the report or wants to speak to the expert who will help solve his problem. The research scientist, on the other hand, is more likely to want all the literature related to a particular subject, even if some of it is only tangentially related to his central concern.

The closer one looks into the problem of user needs, the more complicated it gets. To extend the above argument, the engineer working for a giant multinational corporation located near a large city probably has different information needs and expectations than his counterpart in the small company in a remote mining town, although both may be facing similar technical problems. When viewed in this way, the importance of knowing and interacting with the user in providing effective service cannot be overstressed.

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